

A PROPOSED AGRICULTURAL EXTENSION MODEL FOR ROMANIA: LEVERAGING UNIVERSITIES' RESOURCES TO CREATE A COST- EFFICIENT AND IMPACTFUL KNOWLEDGE TRANSFER SYSTEM INSPIRED BY THE U.S. MODEL

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Abstract

This study proposes an university-based agricultural extension model, inspired by the U.S. agricultural extension system, to address systemic challenges in Romania's agriculture. By integrating research, education, and community engagement, the model aims to bridge the gap between academia and rural communities while promoting sustainable rural development. The model was developed through the Fulbright-RAF Scholar Award program, where Romanian scholars collaborated with U.S. extension experts at the University of Georgia. Romanian scholars acquired valuable expertise through field visits, stakeholder engagement, and institutional analysis, which formed the foundation for adapting the U.S. system to Romania's unique agricultural context. The model proposes the establishment of extension hubs within Romanian agronomic universities, leveraging existing resources and involving students at all academic levels in extension activities. Key initiatives include tailored advisory services, a centralized knowledge platform, and community engagement programs such as workshops, online resources, and farmer interactions on social media groups. The proposed model fosters innovation and ecological practices by aligning academic activities with regional needs and ensuring effective knowledge transfer. This phased, cost-effective system empowers farmers to overcome systemic challenges, strengthens rural communities, and positions universities as leaders in agricultural modernization and rural development. Through the integrating collaboration and optimizing resources, the model provides a transformative framework for a sustainable agricultural future in Romania.

Key words: agricultural extension model, financial viability and scalability, knowledge gap, research transfer, rural development

INTRODUCTION

Romania's rural regions host a vibrant and diverse agricultural sector, which remains a cornerstone of both the national economy and the country's cultural heritage [20]. Over 45% of the population resides in rural areas, where agriculture provides the primary source of income for many families. Despite its

significance, the sector faces persistent challenges that have slowed its modernization and limited its economic potential [11].

Many farms in Romania are small and family-run, relying on traditional practices with little access to modern technology, advanced equipment, or research-based methods. This reliance on outdated approaches leads to low productivity, diminished competitiveness, and

a limited ability to adapt to environmental and economic challenges [17]. Furthermore, fragmented land ownership and a lack of organizational infrastructure exacerbate these difficulties. Most farmers work on plots smaller than five hectares, which restricts their ability to invest in new technologies or achieve the economies of scale needed for significant improvements in production and profitability [1, 12]. Access to financial resources is another critical hurdle. Rural communities often face challenges in obtaining credit, navigating EU funding programs, and accessing subsidies that could help alleviate financial constraints [16]. These financial barriers are compounded by a shortage of labour in rural areas, driven largely by migration to urban centres or abroad in search of better economic opportunities [3].

A significant obstacle to progress lies in the knowledge gap between modern agricultural practices and the traditional methods still widely used in rural Romania [23]. Although the country boasts several respected agronomic universities with robust research capabilities, the transfer of this knowledge to local farmers remains limited. As a result, many farmers lack the necessary guidance to adopt green, productive, and market-oriented practices that could enhance their livelihoods and competitiveness [8].

Addressing these challenges requires a more structured and accessible support system to bridge the divide between academic research and practical farming needs. A cooperative agricultural extension system, inspired by proven international models, could provide Romanian farmers with the technical support, training, and resources they need to succeed. Such a system would offer tailored knowledge and solutions to meet the specific needs of different regions, helping farmers improve yields, manage resources with prudence, and adapt to evolving market demands [7].

The U.S. agricultural extension system, established over a century ago, offers a valuable example of how universities can play a central role in supporting farmers and rural communities [2]. This model emphasizes collaboration between universities, local

governments, and agricultural producers to deliver practical, research-based solutions [4]. Recognizing the potential of this approach, a group of Romanian scholars participated in the Fulbright-RAF Scholar Award in Agricultural Extension Services. During their semester-long residency at the University of Georgia (UGA), these scholars studied the operational frameworks, community engagement strategies, and adaptability of the U.S. extension system across diverse agricultural contexts.

As part of their residency, the scholars engaged in hands-on learning through visits to research centres, community-based extension programs, and rural areas facing significant challenges. Scholars observed how extension agents provide tailored support to farmers and participated in discussions with administrators, policymakers, and agribusiness representatives to understand the funding mechanisms and institutional structures sustaining the U.S. model. These experiences allowed them to conceptualize a Romanian adaptation of the system, tailored to the specific realities of the country's agricultural sector [10].

This study proposes a university-based agricultural extension model for Romania, with a focus on regional specificity. Each agronomic university would act as a hub of knowledge and support for the rural areas surrounding it. The proposed system ensures the use of existing resources and reallocating personnel, the model aims to deliver cost-effective, accessible assistance to address the unique challenges of Romania's rural communities. The following sections detail the methodology and key components identified by the scholars, outlining the foundation for a feasible extension system capable of driving agricultural and rural development in Romania.

MATERIALS AND METHODS

The methodology of this study is based on the direct experiences of the authors, who participated as scholars in the Fulbright-RAF scholar award in agricultural extension services. This program selected five

Romanian academics from agronomic universities and the Polytechnic University of Bucharest to complete a semester-long residency at the University of Georgia (UGA), College of Agricultural and Environmental Sciences (CAES), during the 2024-2025 academic year, building upon an exchange initiated the previous year.

During their residency, the scholars engaged in a variety of field-based learning activities, gaining a thorough understanding of the U.S. agricultural extension system, from its operational frameworks to its impact on agricultural and rural environments.

Field-based learning across diverse agricultural contexts

A major part of the methodology involved field visits to multiple counties in Georgia, providing scholars with comprehensions into a wide range of agricultural extension activities. These visits included tours of UGA research centers and local extension offices, where the scholars observed extension agents working with farmers, agribusiness owners, and rural communities. These activities demonstrated how extension services are adapted to different farm sizes—from small family-owned operations to large commercial enterprises—showcasing the flexibility of the U.S. model.

Each scholar was paired with an experienced extension specialist who acted as a mentor throughout the program. This mentorship enabled scholars to actively participate in activities such as consultations with farmers, community workshops, and on-site advisory services. Scholars attended courses at UGA, where they observed the integration of extension activities into research and teaching. Additionally, the scholars shared their reflections with faculty and students at the College of Agricultural and Environmental Sciences (CAES).

Engagement with extension leaders and stakeholders

The scholars interacted with leaders of the extension system, including deans, department heads, and key personnel involved in the management of extension services. These discussions provided important information into the institutional

frameworks and strategies required to sustain an effective extension system. A visit to Washington, D.C., included meetings with officials from the Romanian Embassy, the American Farm Bureau Federation, and the United States Department of Agriculture (USDA), offering a broader understanding of the policies supporting the U.S. system. These engagements informed the scholars about the governmental involvement needed to establish a similar system in Romania.

Collaboration with authorities and underserved communities

The scholars also engaged with central, regional, and local government authorities, highlighting the importance of multi-level support for sustaining extension services. Visits to underserved communities and a correctional facility showcased the social impact of extension programs, such as initiatives to reintegrate inmates and support disadvantaged populations.

Interactions with farmers and agribusinesses

Throughout their residency, the scholars engaged with a diverse range of stakeholders, including farmers, agribusiness owners, and program leaders. These interactions provided practical understandings into the challenges faced by agricultural practitioners. Observing volunteer-driven programs like the Master Gardener initiative offered inspiration for community engagement strategies that could be adapted to Romania.

Designing a cost-effective extension model

Informed by their observations, the scholars developed a model tailored to Romania's budget constraints. The proposed system involves establishing extension offices at agronomic universities by leveraging existing resources and infrastructure. The model incorporates doctoral, master's, and undergraduate students into research and community outreach activities, while potential revenue streams, such as consultancy services and certifications, ensure financial efficiency.

Limitations of the study

The study identifies several limitations. Unlike the U.S., where extension systems are supported by federal and state funding, Romania's system must focus on cost-

effective strategies, which may restrict scalability. Additionally, cultural and institutional differences could pose challenges in adapting volunteer-driven and community-focused practices. The limited duration of the scholars' residency in the U.S. also means that long-term operational insights might not have been fully captured.

Adapting knowledge transfer to local contexts

Mentorship from UGA specialists was essential in understanding how knowledge transfer works between universities and rural communities. Scholars participated in training sessions, field visits, and community programs that illustrated how academic research can be transformed into actionable advice. To gain broader experience and insights, scholars also visited extension systems at other institutions, such as Virginia Tech, North Carolina State University, and agricultural colleges like Fort Valley State University and North Carolina Agricultural and Technical State University. These visits provided a diverse perspective on operational models, outreach strategies, and innovative practices in agricultural extension.

Based on these findings, the scholars proposed creating extension hubs within Romanian agronomic universities. These hubs would act as knowledge centers for workshops, advisory services, and regional solutions tailored to the specific needs of local farmers. Through the incorporation of best practices observed across multiple extension systems and aligning them with Romania's unique agricultural challenges, the proposed system prioritizes resource efficiency, financial conscientiousness, and practical solutions for long-term development.

RESULTS AND DISCUSSIONS

The suggested model for a university-based agricultural extension system in Romania offers a comprehensive strategy to establish agronomic universities as central hubs for agricultural expertise, rural development, and community involvement. Grounded in the extensive experience of Romanian scholars within the extension system at the University

of Georgia (UGA), this initiative focuses on practical and regionally tailored solutions, aiming to utilize current resources more effectively, reorganize staff responsibilities, and capitalize on the academic strengths of these institutions. The system is designed to meet the specific agricultural requirements of various regions in Romania while fostering innovation and experiential learning opportunities.

With a structured implementation over four years, this model envisions a fully operational extension network involving all major agronomic universities. Each institution would act as a regional anchor, offering advisory services, facilitating the exchange of knowledge, and aligning research efforts with the realities of local agriculture. This phased approach supports gradual expansion, allows for ongoing improvement, and strengthens collaborations with farmers, local governments, and agribusinesses.

Regional allocation and collaborative framework

To optimize operations, the responsibilities for extension services are divided among Romania's primary agronomic universities. Each university will provide support to counties in its vicinity, reducing travel costs and strengthening local ties by building on its familiarity with the region's agricultural practices.



Map 1. Universities regional allocation possibility
Source: Own conception.

The allocation presented in Map 1 considers the number of students and faculty resources available at each institution, ensuring that capacity aligns with regional demand. For

instance, USAMV-Bucharest can handle the southern and southeastern regions, the University of Life Sciences in Iași can cover the northeast, USAMV Cluj can oversee the central and northwestern areas, and the University of Life Sciences in Timișoara can manage the western and southwestern regions. Moreover, the model proposes partnerships with other Romanian universities, including those specializing in technical fields like polytechnic institutions, as well as faculties focusing on food science, agricultural economics, and rural development.

Objectives and strategic goals of the proposed project

The main aim of this project is to integrate agronomic universities more closely with the surrounding rural communities by customizing their research, education, and outreach activities to address local needs. By aligning academic objectives with the challenges of the agricultural sector, universities can play a pivotal role in modernizing agriculture and promoting sustainable development.

Key objectives include:

1.Strengthening community connections and building trust

Universities will focus on developing strong relationships with farmers, cooperatives, producer associations, and other regional stakeholders. Initial efforts will involve actively bringing knowledge on farmers social media groups, participating in local agricultural events, and conducting consultations to better understand the unique needs of the area [9].

2.Aligning academic research with community needs

Academic research will be closely aligned with the priorities of the regions served. Doctoral, master's, and undergraduate students will focus on relevant topics identified through consultations with farmers, agribusinesses, and local authorities.

3.Establishing extension offices as community hubs

Each university will establish an extension office to act as a center for knowledge exchange, training, and advisory services. These hubs will serve both farmers and

students, offering workshops, consultations, and practical advice on topics like crop management and pest control. Over time, they will become trusted community resources.

4.Developing a centralized knowledge platform

A digital platform will be created to consolidate data, research findings, and educational materials. Organized by region and topic, this platform will enable collaboration across disciplines and institutions, fostering efficient sharing of information and resources.

5.Creating financially sustainable revenue streams

Extension offices will offer consultancy services to help farmers secure EU funding and implement green practices. A success-based fee model will minimize risk for farmers while generating revenue to support extension activities.

6.Attracting students and increasing university visibility

By actively engaging in rural development and addressing real-world agricultural challenges, universities will attract a larger pool of students. High school students interested in agriculture will view these universities as practical and impactful, while higher-level students will appreciate the opportunities for hands-on learning and meaningful research [6].

Building an ecosystem for knowledge transfer and extension services

By embedding these community-oriented initiatives within the extension system, universities will establish themselves as key resources for agricultural education and rural development. These programs not only address local challenges but also create a dynamic flow of knowledge among farmers, students, and agricultural professionals [19].

The concept presented in Figure 1 emphasizes the interconnected nature of a university's core missions: research, education, and community engagement. It highlights how these elements are not standalone functions but rather work together to create a synergistic system that amplifies the university's impact.

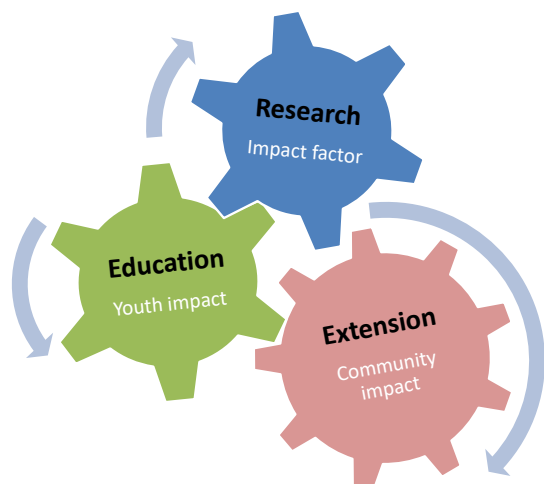


Fig. 1. Knowledge transfer ecosystem
 Source: Own conception.

Research drives innovation and generates knowledge that informs both teaching and practical solutions [15]. Education translates this knowledge into meaningful learning experiences, empowering students to address societal challenges and contribute as skilled professionals. Extension serves as the bridge between academia and society, ensuring that the knowledge generated and taught is applied in real-world contexts to benefit communities [17]. This interconnected approach fosters a continuous cycle of improvement, where feedback from extension activities informs research priorities and educational practices, while education develops future leaders who can advance both research and community development [21]. By aligning these functions, the model demonstrates how universities can become central to addressing societal challenges and fostering feasible growth, creating a ripple effect that benefits both individuals and communities at multiple levels.

The result is a cohesive network where academic research informs practical application, and real-world needs guide university activities. This ecosystem will empower rural communities, strengthen the agricultural workforce, and position Romanian universities as leaders in innovation and public service.

Multilevel Framework for Romania's Agricultural Extension Strategy

The pyramid framework presented in figure 2 can align academic research efforts with

practical agricultural needs across Romania, focusing on research made in the Management in Agriculture and Rural Development domain.

This approach ensures targeted data collection and analysis at multiple administrative levels, creating the foundation for a robust agricultural extension strategy and identifying future research topics in other fields.



Fig. 2. Proposed multilevel framework for agricultural extension strategy
 Source: Own conception.

1. Top Level: Strategy Formation: University administrators integrate findings from all research levels—doctoral, master's, and undergraduate—into a cohesive extension strategy tailored to Romania's agricultural landscape. Insights from this research will also generate new topics for other domains, such as agronomy, horticulture, animal science, and food product engineering.

2. Regional Level: Doctoral Theses (4): Four doctoral theses, one for each macro-region of Romania, will focus on systemic agricultural challenges, such as regional policy design, resource management, or rural economic development. These theses consolidate regional data, addressing broad-scale issues and guiding the national strategy.

3. County Level: Master's Dissertations (41): Each county in Romania will be the subject of a master's dissertation. These studies will analyze specific agricultural challenges and opportunities within the county, offering practical recommendations and creating a bridge between regional insights and local implementation.

4. UAT Level: Undergraduate Diploma Projects (3,181): Each UAT (administrative-

territorial unit) in Romania will be studied through an undergraduate diploma project. These projects will gather granular data from specific communities or agribusinesses, providing important information into the agricultural practices, needs, and potential of each UAT.

5. Undergraduate Class Projects: In addition to diploma projects, undergraduate students will engage in class projects that involve direct interactions with local farmers and producers. These projects will complement the larger research efforts, ensuring continuous community involvement and practical learning.

Phased development approach through a four-year progression

The proposed agricultural extension system in Romania presented in table 1 focuses on creating a self-sustaining, cost-effective model by strategically leveraging the existing resources of agronomic universities and establishing a well-organized research framework across all academic levels. This systematic approach ensures that each university contributes to a layered body of research, addressing local and regional agricultural needs to form a comprehensive understanding of challenges and opportunities.

Each university will oversee a designated region, with doctoral theses addressing broad, systemic issues, master's dissertations focusing on county-level challenges, and undergraduate projects delving into specific localities or agribusinesses.

This hierarchical approach guarantees a thorough analysis of agricultural practices at various scales while aligning academic activities with practical extension objectives. While much of this research already takes place in individual universities, this proposed model consolidates these efforts into a cohesive framework, enabling better coordination and practical application.

Year 1: Foundation and resource allocation

The first year will focus on laying the groundwork for the extension system. This involves setting up dedicated extension offices and launching pilot programs that

heavily involve doctoral students and faculty. Key activities include:

•**Establishing extension offices:** Each university will set up an extension office as a central hub for coordinating extension activities, managing resources, and fostering partnerships with local stakeholders. Minimal new infrastructure is needed, as these offices will utilize existing university spaces and equipment.

•**Doctoral student pilot program:** Research scholarships will be offered to doctoral students who align their research themes with the specific challenges of their assigned regions. These students will play a central role in the extension system by integrating their academic work with real-world agricultural needs. The program will primarily rely on doctoral students with scholarships in the field of Engineering and Management in Agriculture and Rural Development, who can develop theses focused on agricultural extension.

•**Data collection and stakeholder analysis:** Doctoral students will receive training and begin gathering data on local agricultural issues through surveys, community consultations, and online farmer forums.

•**Community engagement and networking:** Students will attend agricultural events, initiate conversations with farmers, and connect with agribusiness representatives to build relationships and identify the region's most pressing needs. This initial engagement will help establish trust and visibility for the extension program.

Year 2: Fieldwork and expansion of extension activities

In the second year, the system will shift toward applying understandings gained from the initial data collection and community interactions. Extension activities will begin to provide tangible support to farmers both online and in person.

•**On-the-ground support:** Doctoral students will actively respond to inquiries from farmers on digital platforms, offering practical advice and sharing research findings. When necessary, students will consult with faculty to ensure the accuracy of their recommendations.

•**Field visits and advisory services:** Regular visits to farms will allow students to gather updated data and offer direct support to farmers in areas such as pest control, crop management, and green farming practices.

•**Research themes for undergraduate and master’s students:** Findings from doctoral research will guide the development of

research projects for students at all levels, ensuring academic work is aligned with real-world agricultural challenges.

•**Mentorship:** Doctoral students in their second year can mentor undergraduate and master’s students, fostering a collaborative learning environment and ensuring continuity in the extension work.

Table 1. Proposed timeline for implementing a university-based agricultural extension model

Extension model timeline	Year 1	Year 2	Year 3	Year 4	Year 5
	Foundation and resource allocation	Fieldwork and expansion:	Advanced research and thesis development:	Finalization and system institutionalization:	Functional extension system
Administrators	Establish extension offices at each university as coordination hubs. Providing resources for the digital platform for data collection and knowledge sharing.	Identify new research topics and developing strategy. Expand collaboration with agribusiness and technical partners for additional resources	Developing the university extension strategy. Assess and adapt resource allocation, faculty involvement, and program goals based on feedback from extension activities.	The finalization of the extension strategy based on research findings. Universities can consider hiring graduates as extension agents or extension specialists to sustain outreach activities.	Establishing and coordinating the extension offices at, regional level and local branches.
Extension specialists and Fulbright-RAF alumnus	Disseminating the principles of university extension among their peers. Help at launching a pilot program with PhD candidates focusing on regional agricultural challenges. Development of pilot projects for disseminating information online: podcasts, online workshops, presentation videos.	Begin aligning undergraduate and master’s research projects with regional priorities. The launch of a large online campaign to promote extension. on all major social media and streaming platforms. Extension advisory services and fostering the pilot projects.	Establish ongoing mentorship for involved master and undergraduate students to support continuity. Identify new research topics for graduate and undergraduate students and maintain communication with them. Extension advisory services, knowledge transfer and fostering the pilot projects. Working on the centralized digital platform.	Encourage collaboration among students at different levels to promote a coherent, integrated approach to data collection and problem-solving. Extension advisory services, knowledge transfer and fostering the pilot projects. Finalizing the centralized digital platform.	Identify new research topics for new PhD thesis and graduate and undergraduate students and maintain communication with them. Extension advisory services and knowledge transfer fostering the pilot projects.
PhD candidates	Initial data collection and stakeholder analysis through surveys, interviews, and community events. Gathering information and provide advice on farmers’ social media groups.	Doctoral candidates start provide advisory services online and attend community events and continue data collection. Participate in the online campaign to promote extension. on all major social media and streaming platforms.	Concentrate on thesis work addressing comprehensive regional issues and conduct regular field visits and offer targeted support face to face and online. They identify new research topics for graduate and undergraduate students and maintain communication with them. Extension advisory services under extension specialist supervision.	PhD candidates defend their theses and provide recommendations for extension model scaling Introducing research findings on the centralized digital platform. Extension advisory services under extension specialist supervision.	Extension advisory services . Disseminating research findings in journals and online: podcasts, online workshops, presentation videos on university websites, and on major social media and streaming platforms. Actively participate in following discussions in online farmer groups
Graduate and undergraduate students	The allocation of research topics based on the principle of university extension begins. Gathering information on farmers’ social media groups.	Collecting data in specific communities or individual agribusinesses, gathering granular data. Start to actively participate in following discussions in online farmer groups and provide advice to farmers under supervision.	They begin presenting the results of the research conducted, actively participate in following discussions in online farmer groups, and provide advice to farmers. Consolidating data at the county level, knowledge transfer	Disseminating information online: podcasts, online workshops, presentation videos on university websites, and on major social media and streaming platforms. knowledge transfer Introducing research findings on the centralized digital platform.	Introducing research findings on the centralized digital platform. Disseminating information online: podcasts, online workshops, presentation videos on university websites, and on major social media and streaming platforms. knowledge transfer

Source: Own results based on proposed model.

Year 3: Advanced research and thesis development

The third year will focus on deepening research efforts and preparing doctoral theses that will serve as feasibility studies for the long-term implementation of the extension system.

•**Region-specific research:** Graduate students will conduct detailed studies on issues such as soil health, water management, and economic conditions within their regions. These findings will guide future research and extension activities at all academic levels.

•**Collaboration and mentorship:** Senior doctoral students will continue mentoring younger peers, sharing data, and building on previous years' work. This collaboration ensures that research efforts remain consistent and comprehensive.

Year 4: Finalization and establishment of the extension system

The fourth and final year will culminate in the establishment of a permanent extension system. Doctoral students will defend their theses and provide actionable recommendations for scaling the program.

•**Comprehensive feasibility studies:** Doctoral theses will offer in-depth analyses of regional agricultural challenges, providing a detailed roadmap for a fully operational extension system.

•**Recruitment of extension agents:** Graduates from the program will be well-prepared to take on roles as extension agents, equipped with the knowledge and experience necessary to address local agricultural needs.

•**Establishing regional and local offices:** Based on the research findings, universities will determine the required number and specialization of local extension offices to ensure responsive and efficient service delivery.

Collaborative and interdisciplinary partnerships

The extension system will collaborate with a wide range of institutions and stakeholders to maximize its reach and impact:

•**Technical universities and research centers:** These institutions will provide expertise in precision agriculture, digital

farming, and innovative technologies to support modernization efforts.

•**Progressive farmers and pilot farms:** Model farms will serve as practical examples of best practices, offering example and techniques that can be shared with the broader farming community.

•**Private sector collaborations:** Agribusiness companies and technology providers will contribute technical support, sponsorships, and access to cutting-edge tools and equipment. These partnerships will also create opportunities for direct farmer engagement and education.

By integrating these partnerships and leveraging the expertise of diverse stakeholders, the extension system will foster innovation and ensure its feasibility, benefiting Romania's agricultural sector for years to come.

Financial sustainability through consultancy services

To secure the long-term viability of the agricultural extension system, university-based extension offices will provide consultancy services aimed at assisting farmers in accessing European Union funding, particularly CAP grants. Using a success-based fee structure, commissions will be charged only on successful applications, reducing financial risk for farmers while maintaining accessibility.

•**Accessible support:** Farmers can access expert advice without upfront costs, encouraging participation and fostering trust in the system.

•**Revenue generation:** Success fees will ensure a consistent income stream to cover operational expenses, support outreach programs, and advance research.

•**Building credibility:** Fair and transparent consultancy practices will position universities as trusted partners, strengthening relationships with the agricultural community.

State partnership and funding

An important aspect of this proposal is securing long-term support from the Romanian government. Inspired by the American model, the system suggests that local, regional, and central authorities should commit funding to the agricultural extension

system once its effectiveness is demonstrated through pilot programs. This financial backing would enable universities to establish an efficient extension network, directly benefiting rural communities and agriculture nationwide [18].

•**Ensuring continuity and expansion:** State funding would allow universities to expand their services, hire specialized extension agents, and implement targeted programs tailored to regional needs.

Institutionalization and scaling of the extension model

As the pilot programs evolve, each university's extension office will transition into a formalized, institutionally supported center, funded through a mix of government resources, EU grants, and revenue from consultancy services.

1.**Regular evaluation and adaptation:** Extension offices will continuously assess their programs' effectiveness, responding to community feedback and emerging agricultural challenges.

2.**Nationwide network:** Once fully established, the system can be scaled to include all major agricultural regions, creating a coordinated national framework for extension services.

3.**Centralized knowledge repository:** A digital platform will house all research, data, and program materials, ensuring easy access and promoting collaboration among stakeholders.

By institutionalizing the extension model, Romanian universities will create a lasting impact on agriculture, education, and rural development, ensuring the system's relevance and effectiveness for years to come.

The integrated knowledge platform

To promote effective information sharing, the proposal includes the development of a centralized digital platform. This platform will serve as a repository for data, research findings, and educational resources, ensuring they are easily accessible to students, faculty, and extension staff. The main features of the platform include:

•**Regionally organized data:** Information gathered from various counties will be structured and mapped geographically,

making it easier to manage data and encouraging interdisciplinary collaboration [5].

•**Resource and activity coordination:** Acting as a central hub, the platform will streamline the management of extension activities, ensuring that students and staff can efficiently plan, coordinate, and execute programs.

•**Long-term strategic planning:** By consolidating resources, the platform will aid in identifying future research opportunities, refining extension initiatives, and optimizing resource allocation to better align with regional needs.

Development of community-focused programs

The proposed extension model incorporates community-focused initiatives, drawing inspiration from successful U.S. programs like 4-H, Master Gardener, Farm-to-table, beginning farmer and rancher program, Family and consumer sciences, etc.. These programs aim to engage youth, promote green practices, encourage agricultural innovation, and foster active community participation. Volunteer involvement is integral, providing opportunities for knowledge sharing, skill development, and strengthening social ties [13].

Additionally, some of these programs may generate revenue through certification opportunities, appealing to those seeking formal recognition of their skills. However, the model ensures these programs remain free for students and disadvantaged groups to maintain equitable access to agricultural education and resources [14].

(1)4-H youth development program

A program modeled on 4-H would focus on engaging young people in agriculture, STEM, and leadership activities. It would encourage rural youth to consider careers in agriculture while fostering skills such as critical thinking and collaboration. University students and alumni could act as mentors, enriching the program with their expertise and experiences.

(2)Master gardener program

This program would train community volunteers in sustainable gardening techniques and plant health. Certification as a master gardener could provide a revenue stream for

universities while offering participants practical expertise. University students would access this training for free, gaining credentials alongside their academic studies.

(3) Farm-to-table initiatives

Programs connecting local farmers with consumers and institutions such as schools or hospitals would support rural economies while promoting fresh, local produce. Volunteers would play a key role in building these market connections and educating consumers about the benefits of local agriculture.

(4) Beginning farmer and rancher program

Designed for new and aspiring farmers, this initiative would provide training in areas like financial management, marketing, and modern farming practices. Experienced farmers and agribusiness professionals could volunteer as mentors, sharing practical advice and insights.

(5) Family and consumer sciences (FCS) program

A program addressing life skills like nutrition, financial literacy, and food safety would improve the quality of life for rural families. Volunteers, including students from relevant disciplines, would extend the program's reach. While disadvantaged groups would access these resources for free, fee-based workshops could be offered to other participants, providing an income stream for universities.

(6) Small farm program

Aimed at supporting small-scale farmers, this program would focus on sustainable farming practices, product marketing, and market access. Volunteers from universities and the agricultural sector would share their knowledge and facilitate networking opportunities.

(7) Nutrition education programs

Inspired by SNAP-Ed and EFNEP in the U.S., these programs would promote healthy eating and food safety among vulnerable groups. Volunteers from nutrition, health sciences, and related fields would provide outreach and education, creating a practical learning experience for students.

Expanding volunteer involvement and certifications

Volunteer participation is a cornerstone of these community programs. It provides students with hands-on experience and fosters a sense of community involvement. Students from diverse fields—agriculture, economics, engineering—could contribute to initiatives that align with or broaden their academic interests.

To enhance the system's sustainability, certain programs may offer fee-based certifications. For example, individuals seeking advanced credentials such as master gardener or beginning farmer certification could pay for these courses, generating revenue to support extension activities. University students, however, would access these programs free of charge, enriching their educational experience without additional financial burdens.

Balancing time, budget, and quality: a triple constraints analysis of Romania's proposed agricultural extension system

The proposed agricultural extension model is assessed using the triple constraints framework, focusing on time, budget, and quality. By positioning agronomic universities as key regional centers for knowledge and community engagement, the project aims to foster rural economic development and address the specific needs of Romanian agriculture. The phased four-year implementation seeks to establish a fully functional and self-sustaining network that balances these three important factors.

Time

The proposed timeline spans four years, providing a structured and gradual implementation process. The initial stages focus on foundational steps such as setting up extension offices, engaging with local agricultural stakeholders, and defining research priorities tailored to regional needs. Later phases will introduce advanced components, including the centralized digital platform and tailored consultancy services.

This step-by-step approach prevents rushed development, allowing each stage to build on the previous one while incorporating feedback and adjustments. However, efficient time management will be critical. Delays in any phase could create bottlenecks, potentially

jeopardizing the overall schedule for full implementation.

Budget

The project is designed to be cost-effective, primarily by leveraging existing university infrastructure and human resources. Extension offices will use current university facilities, while faculty and students at all academic levels will contribute to research, outreach, and data collection.

Financial sustainability is further bolstered by introducing revenue-generating activities, such as offering consultancy services on a success-fee basis to help farmers secure EU funding. Certifications, such as those for master gardener or beginning farmer programs, will also provide an additional income stream. Careful financial oversight will be necessary to ensure these initiatives generate sufficient revenue to cover operational expenses and allow for scaling the system.

Quality

Maintaining high standards is a central objective of the model. Each extension office will act as a knowledge hub, combining academic research with practical outreach tailored to local agricultural challenges. The system emphasizes interdisciplinary collaboration among faculties, including agronomy, engineering, and economics, to develop well-rounded solutions.

Community-focused programs, such as 4-H youth initiatives and master gardener training, will enhance quality by encouraging active engagement, fostering practical skills, and supporting green practices [22]. Regular evaluations will ensure that each office adapts its programs to meet local needs effectively.

Integrated analysis

The proposed extension model strategically balances time, budget, and quality to maximize impact and success. By leveraging existing resources, implementing a phased approach, and emphasizing tailored, high-quality programs, the model provides a realistic path for enhancing Romanian agriculture. However, careful monitoring and adaptation will be needed to address challenges as they arise, ensuring the system's relevance and success.

CONCLUSIONS

The proposed university-based agricultural extension system represents a transformative opportunity for Romania to address the persistent challenges in its rural and agricultural sectors. By leveraging lessons from the U.S. extension model and tailoring them to Romania's unique needs, the system provides a framework for modernizing agricultural practices, fostering rural development, and bridging the gap between academic research and practical farming needs.

The model's strength lies in its multi-level approach, which integrates the efforts of doctoral, master's, and undergraduate students to collect data and address challenges at regional, county, and local levels. This hierarchical structure ensures a comprehensive analysis of agricultural needs while aligning academic objectives with real-world challenges. The incorporation of community-focused programs, such as 4-H youth initiatives and master gardener training, reinforces the system's impact by directly engaging local communities and promoting green agricultural practices.

The phased implementation timeline enhances the model's feasibility, allowing for gradual development, flexibility, and scalability. By utilizing existing university infrastructure and integrating revenue-generating activities, such as consultancy services and certification programs, the model addresses financial constraints while ensuring long-term sustainability. Partnerships with government entities, EU funding bodies, and private sector stakeholders will further enhance the system's reach and effectiveness.

Despite potential obstacles, including cultural differences and budget limitations, the model demonstrates how Romanian universities can play a central role in driving innovation, education, and rural development. It highlights the importance of continuous evaluation and refinement to adapt to emerging challenges and ensure the system's relevance.

Ultimately, this extension system not only addresses the immediate needs of Romanian

farmers but also fosters a skilled workforce equipped to lead future agricultural and rural development initiatives. With proper oversight, collaboration, and commitment from all stakeholders, the proposed system has the potential to significantly enhance the resilience and efficiency of Romania's agricultural sector, contributing to broader economic and social progress.

ACKNOWLEDGEMENTS

The authors wish to express their gratitude to the Romanian-American Foundation for its financial support and to the Romanian Fulbright Commission for facilitating the implementation of this program. Special thanks are extended to the College of Agricultural and Environmental Sciences at the University of Georgia for providing an immersive experience in the U.S. agricultural extension system, as well as to the mentors, specialists, and staff who contributed their expertise and guidance throughout this journey.

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