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# Exploration of the Conceptualization of the Third Mission of Agricultural Faculties: A Qualitative Metasynthesis Study

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**Abstract**

This study addresses the ambiguity surrounding the third mission of universities, which stems from a lack of a unified definition. It provides a comprehensive investigation of this mission within agricultural faculties by employing a systematic review of 150 articles, culminating in the selection of 32 final articles for qualitative analysis. The findings identify six primary approaches to the third mission, extracting their key components and corresponding activities. These approaches are then compared based on 16 distinct features. By clarifying the factors that influence the selection of each approach, this research offers a clear picture of the third mission and the outcomes associated of each path. The results show that the most suitable approach for implementing this mission must be holistic and tailored to the specific conditions of each country and society. Ultimately, by providing a transparent view of the third mission, the study's findings can guide policymakers in selecting the appropriate approach for this critical mission.

*Keywords: higher education impact, partnership models, university–society engagement, higher education policy, institutional accountability*

In the last few decades, the third mission (TM) of universities has developed as a new mission beyond teaching and research to engage with various stakeholders and support economic and social development. The university's role in addressing societal challenges and fostering informed and productive citizens and promoting civic engagement through the TM has gained consensus, but the exact definition of university engagement and the mechanisms to fulfill this role remain elusive (Izadi et al., 2020).

Universities increasingly prioritize their TM, societal engagement. However, approaches vary. The traditional bottom-up model, emphasizing trust, faces challenges from top-down pressures for formalization (Menter, 2024). According to recent studies, certain public universities in Europe do not have a well-structured framework for their TM endeavors, resulting in inconsistencies in their societal and economic engagements (Spânu et al., 2024). Agricultural faculties, for instance, delegate rural community needs to other departments, neglecting broader well-being (Nanseki & Nguyen, 2023).

Given these challenges, universities, particularly agricultural faculties, face specific obstacles in implementing their TM. A lack of clarity regarding the university's societal role hinders understanding of TM benefits and operations (Uyarra, 2010). Diverse perspectives exist on restructuring universities for the TM, but declining public funding and shifting priorities necessitate adapting managerial, organizational, and financial paradigms. The absence of a definitive TM framework has led to entrepreneurial strategies and increased industry collaborations (Compagnucci & Spigarelli, 2020).

The lack of a unified interpretation of the TM hinders the translation of findings into practical applications and generates ambiguity in the literature. The absence of a precise TM definition leads to unclear measurement indicators, undefined dimensions, and limited understanding of the factors influencing TM emergence. Consequently, universities often focus on narrow aspects of their TM, failing to grasp its holistic nature. Conversely, policymakers require a comprehensive understanding of the TM's multifaceted nature.

To address these challenges, this study conducts a systematic review and comparative analysis of existing TM literature. The analysis identifies diverse university–society engagement approaches within the TM framework, further exploring the dimensions, activities, and influential factors associated with each approach.

## The Third Mission of the University: Definitions and History

Academic literature identifies three distinct generations of universities: the teaching-focused medieval university, the research-oriented modern university, and the contemporary university with a strong emphasis on societal engagement over time. Universities have evolved from primarily educational institutions to entities that combine teaching, research, and societal impact. The first and second generations concentrated on academic activities within the institution, but the third generation focuses on universities using their external capabilities to solve social problems and create innovation (Schneijderberg et al., 2021).

Boyer (1996) introduced the paradigm of the TM of universities, emphasizing the application of knowledge. This mission focuses on societal engagement, extending beyond traditional teaching and research. Third-generation universities aim to create societal value by transferring knowledge and capabilities to society. They collaborate with various stakeholders, including industry and government, to address societal challenges and drive innovation (Maximova et al., 2016).

The TM of higher education institutions can be understood from two primary perspectives. The first perspective examines how universities function economically through their role in competitiveness, workforce development, and knowledge commercialization (Pinheiro et al., 2017; Trencher et al., 2014). The second perspective focuses on social university impact through social development, individual empowerment, and community engagement (Mdleleni, 2022). These perspectives, known as "backward linkages" and "forward linkages," determine the multiple ways universities engage with society.

The TM in agricultural higher education in the United States originated from the Morrill Act of 1862. The Morrill Act of 1862 established land-grant universities to meet national agricultural and scientific requirements. The institutions operated to connect academic knowledge with societal needs while promoting innovation and economic growth. The Hatch Act together with the Smith-Lever Act expanded agricultural faculties' responsibilities for community development and extension services. The programs established connections between university researchers and farmers and rural communities to deliver education and resources, which enhanced agricultural techniques and rural living standards. The Boyer Report (1998) established a turning point by declaring engagement as an essential mission for universities. The "third mission" concept emerged as a result of this development, which defines universities' role in solving societal problems through knowledge generation and practical implementation and knowledge sharing.

## Theoretical Framework: The Six Approaches of the Third Mission

The TM of universities and agricultural faculties can indeed be achieved through the six approaches. These approaches include the knowledge factory, engagement with industry, entrepreneurship, social entrepreneurship, sustainability, and a committed system.

The knowledge factory approach emphasizes the outputs of a university, which are its graduates and the knowledge generated through various channels such as books, articles, and journals. This approach recognizes the importance of fundamental research and exploration in generating value for industry, the economy, and the general public (Matthews, 2023).

Engagement with industry refers to the exchange of knowledge and technology between universities and industry. This

collaboration aims to benefit both parties and is characterized by stability and the avoidance of interference with either party's primary responsibilities and functions (Scandura & Iammarino, 2022).

The entrepreneurial approach involves universities focusing on transforming commercialization and intellectual property into institutional objectives. This approach includes activities related to technology transfer and the utilization of intellectual property while maintaining engagement with the university's traditional missions (Feola et al., 2021).

Social impact is an important aspect of the TM, and universities contribute to society by adopting an entrepreneurial approach that emphasizes social benefits. By pooling resources and creating innovative uses of these resources, universities generate social benefits and contribute to societal change (Lehmann et al., 2024).

Sustainability in higher education involves implementing sustainable development principles and concepts within universities. This approach includes identifying and finding solutions for sustainable economic, social, and environmental development, as well as applying these principles in the university's infrastructure and daily operations (Podgórska & Zdonek, 2023).

The systemic approach focuses on empowering and promoting regional development. It involves establishing thorough contact between governmental and nongovernmental players at the regional level and prioritizing regional needs and adaptive responses by universities. This approach views universities as interconnected nodes within a regional–global innovation system (Rusciano, 2024).

The theoretical framework, illustrated in Appendix A, provides a conceptual foundation for understanding the six approaches to the TM of universities and agricultural faculties.

## Research Method

The qualitative research method of metasynthesis combines and interprets multiple qualitative study findings to produce a more complete understanding of a phenomenon. The purpose of metasynthesis differs from that of meta-analysis in that metasynthesis creates new theoretical frameworks instead of analyzing quantitative data. The process of comparing and translating and interpreting data from different studies through metasynthesis enables researchers to gain a more profound understanding of intricate social and educational matters, including the transformation management of universities and higher education institutions (Bergdahl, 2019).

In this study, the six-phase method developed by Lachal et al. (2017) was employed to conduct the metasynthesis analysis. This structured approach comprises multiple precise steps for extracting, synthesizing, and interpreting data from various qualitative studies. Figure 1 shows the flow steps, and each of these steps will be explained in the following sections.

1. Formulating the Research Question

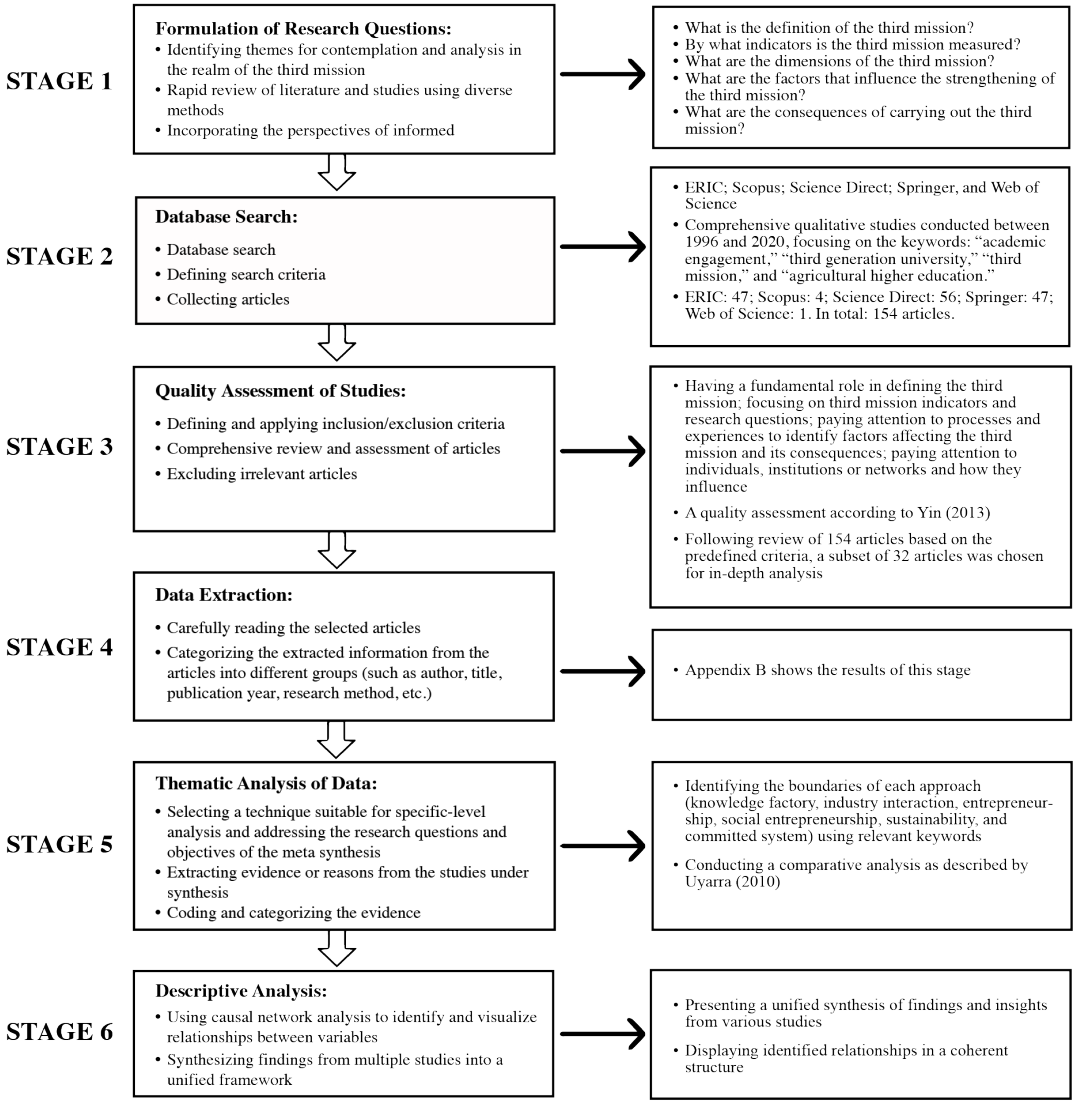
   In conducting a metasynthesis and reviewing the literature, the study centered on five primary inquiries:

   - What constitutes the definition of the TM?
   - What encompasses the dimensions of the TM?
   - What factors impact the enhancement of the TM?
   - What outcomes result from the TM?
   - Overall, what characterizes the TM of agricultural faculties?

2. Searching the articles in databases and modifying the search parameters

   To gather articles, five social science databases—ERIC, Scopus, ScienceDirect, Springer, and Web of Science—were utilized. The search was conducted in English, focusing on four keywords: "academic engagement," "third generation university," "third mission," and "agricultural higher education". Articles within the time frame of 1996 to 2020 were retrieved. Boyer's research in 1996 emphasized significant scientific advancements and a paradigm shift in higher education concerning the TM and societal engagement. This time frame was chosen to align with this shift.

**Figure 1. Metasynthesis Process Flow**




3. Assessment of the studies' quality and the criteria for the article inclusion in the final analyses

In the metasynthesis process, the third phase involved incorporating qualitative case studies that were relevant to the primary analysis. These articles specifically focused on the university's TM and contributed significantly to understanding it. Table 1 outlines the criteria for including articles in the analysis. Throughout the article review process, any articles that did not prioritize the TM as the main subject or failed to address the research questions were excluded. Articles that underwent review and employed either a qualitative or synthetic methodology were included, and those lacking clarity in separating qualitative and quantitative components were omitted. Although appropriate keywords were used, the initial search yielded articles unrelated to the subject or from fields other than agriculture. These articles were discarded. After a thorough examination and assessment based on the criteria, a total of 154 qualitative studies were retrieved.

**Table 1. Inclusion and Exclusion Criteria**

| Criteria | Reason/logic |
|---|---|
| Making a significant contribution to the establishment of the TM's definition | This criterion aids in conceptualizing the TM and its definition. |
| Focusing on examining the metrics related to the TM by analyzing previous studies and research questions | This criterion allows for the evaluation of studies that have research questions or aims that are connected to the functional definition of the TM. |
| Focusing on the procedures and experiences to discern the elements that influence the TM | This criterion facilitates the identification of the influential factors and their impact based on past experiences. |
| Focusing on the procedures and experiences of the TM to ascertain the outcomes resulting from it | This criterion allows for the assessment of the outcomes of the TM based on past experiences. |
| Focusing on the individuals, institutions, or networks and how they affect the TM | This criterion facilitates the identification of the principal activists involved in executing the TM. |
| Examining the quality | The quality of all studies has been assessed based on their precise reporting style, clear integration of theory and empirical evidence, comprehensive background information, clarity of research objectives and data sources, ability to address research questions, explicit presentation of findings, utilization of appropriate research methods, and consideration of ethical concerns. |

4. Extracting and presenting official data

The evaluation process resulted in selecting 32 articles for the final analysis. The selected articles were organized in Appendix B, which includes an assigned number for identification, author names, journal, and research methodology.

5. Data analysis

The researchers analyzed 34 articles through data analysis to extract findings and discussions from each article. The research partners agreed on data extraction and categorization methods that were applied to each article through coding. The process involved choosing an appropriate method for specific-level analysis, addressing research questions and objectives of the metasynthesis, extracting evidence or reasons from the studies under synthesis, and coding and categorizing the evidence.

6. Presentation of analysis

The purpose of this metasynthesis stage was to provide a comprehensive understanding of the multifaceted nature of the TM, examining its various components, dimensions, and outcomes. A descriptive, inductive approach was adopted, involving a two-level analysis: individual article analysis, followed by a synthesis of the entire data set. To enhance the rigor of the analysis, two reviewers independently coded and analyzed the data.

## Findings

### Components of the Third Mission: Synergy of Six Approaches

The TM operates through a collaborative needs-based method that goes beyond disciplinary limitations. The approach requires active participation together with systematic engagement of multiple stakeholders. These

sustainable activities are founded on innovation, which appears in multiple ways. The TM establishes value creation as its main objective while maintaining ethical principles. Its diversity and flexibility are influenced by contextual factors and diverse pathways. Through these conditions, the TM demonstrates its informative and educational potential. Appendix C provides a comprehensive overview of the specific types of engagement between universities and society.

### Third Mission Activities: A Comprehensive Perspective on Six Approaches

The TM works to establish sustainable development in particular geographic areas or social subsystems. The TM adopts social dimensions as its main focus through a social entrepreneurship perspective, whereas the entrepreneurial approach focuses on economic development and industry connections. The systemic approach evaluates development through economic, cultural, social, and environmental aspects. The TM activities fall into the following five domains: (1) development and extension, (2) continuous education and learning, (3) innovation and technology transfer, (4) networking and public communication, and (5) collaborative and interactive research. Appendix D provides a detailed overview of these dimensions and illustrative examples of activities based on the examined articles.

### Comparative Analysis of Engagement Strategies Between Universities and Communities

A comparative analysis of the six distinct university–society engagement approaches is presented in Appendix E. These approaches are characterized by a unique combination of 16 components, including the philosophical underpinnings that explore fundamental questions related to the university's TM and address challenges faced by academics and policymakers. Additionally, these components encompass the academic orientation toward societal engagement, stakeholder engagement strategies, the essence of engagement itself, key influencing factors for implementation, political implications, and the university's focus on innovation. The time frame for planning and realizing outcomes, communication channels with stakeholders (e.g., industry, government, organizations, civil society), and the university's institutional framework for TM implementation are also considered. The framework consists of structural components, management and administration autonomy, and organizational focus that motivates members. We analyze these components to understand better the elements that affect university–society engagement strategies' quality and effectiveness.

### Selection of Approaches: Factors Influencing the Selection of the Six Approaches of the Third Mission

The choice of TM approach depends on multiple internal organizational elements and external environmental factors. The university needs to assess its ability to draw in businesses and its current corporate values. The following factors will be examined in detail to determine their impact on the decision-making process.

#### *Attitude and Knowledge Toward University*

The orientation of the TM is significantly influenced by societal expectations. In certain private universities, a heightened parental focus on future career prospects can lead to a greater emphasis on business-oriented education. Moreover, private universities often rely on their reputation within society. The perception of university science, the acceptance of the university's role, and the value attributed to its research by stakeholders significantly impact the priority given to the TM, regardless of the specific approach employed.

The preferred approach for engagement depends on multiple factors, including stakeholder views about university science value, university social acceptance, research worth, and regional obstacles. The university needs to build trust with society to establish effective connections with its stakeholders.

The trust placed in university research and technology by society, particularly industry, is vital for initiating engagement, especially through economic means.

#### *The State of Collaboration With the Agricultural Industry*

The level of engagement between universities and the agricultural industry is influenced by a variety of factors. Indicators of entrepreneurship and the ability to attract enterprises are significant determinants of the extent of university–industry collaboration and TM implementation. The development of these relationships depends on both entrepreneurial methods and successful

communication with industry partners.

Multiple obstacles prevent both collaboration and the implementation of advanced university technologies. The unpredictable nature of resource and technology prices, together with their limited sustainability, creates challenges for industrial owners to evaluate and forecast risks, which restricts their decision-making abilities. The limited willingness of industrial owners to collaborate with universities for entrepreneurial purposes stems from their restricted adoption of university technologies.

The financial condition of enterprises also plays a critical role. Companies facing financial difficulties are often unable to invest in scientific research and practical applications conducted by universities. Government grants serve as effective instruments to foster partnerships between academic institutions, industrial sectors, and public authorities. The grants offer financial backing to small firms that lack research and development capabilities to establish triple helix collaborations. This support creates knowledge-based macro policies that will boost domestic entrepreneurship.

*Macro Policies of the Country*

Higher education systems operate within national frameworks because policymakers and government entities determine their purpose and function. National development programs use higher education as a key driver to advance both social and economic development. Consequently, a country's macro policies and decisions significantly influence the approach taken toward the TM.

Macro policies directly impact the organization, administration, and investment in the TM. However, conflicting objectives among different government entities can sometimes lead to systemic challenges. The process of seeking funding and resources becomes more favorable when universities follow national, provincial, or industry policies and procedures. As a result, society will actively seek university engagement to address their concerns.

The government's policies have a direct impact on the TM activities of the university through financial resources, revenue, and intermediate structures. Tax incentives and exemptions for industry–university collaborations can enhance access; stimulate research, particularly in emerging technologies; and promote entrepreneurship. Additionally, government mandates for specific TM approaches and their associated corrective processes can significantly impact the university's primary missions.

*The Level of Development of the Country*

The level of national development, particularly economic growth, significantly influences the selection of TM approaches. Universities in developing economies usually focus on their function in national development strategies and nation-building programs. Conversely, countries with higher incomes and rankings prioritize having the best research and knowledge-based universities.

When companies engage in the TM, they often adopt a knowledge factory approach to achieve their goals. Economic development has been a significant factor in determining university rankings. Incentive policies and informal incentives offered by ministries and organizations further influence the impact of economic development on the TM. The emphasis on rankings and financial gains sometimes creates distance between the TM and other organizational elements, especially social and cultural aspects.

The economic development level of a nation determines its capacity to build relationships with universities. Better economic conditions enable private companies to pay their employees and scholars higher wages, which affects the way they engage with the university. The economic crisis has led to reduced budgets for the TM and challenges in obtaining financial support from government, departments, and foundations. Such challenges can hinder the growth of social entrepreneurship.

*International Factors*

International goals and policies, such as the Millennium Development Goals, can impact TM methods by shaping curricula and influencing internal organizational objectives and strategies. Global ranking indicators also play a significant role in determining the most suitable TM approach by influencing university policies and promotion laws.

It is important to note that although the university's global ranking is a factor, the TM is implemented distinctively. The aspiration to achieve a higher global ranking, particularly in terms of TM performance, has a significant impact on the university's approach.

### Third Mission Implications: Expected Results from Each Approach

The implementation of the TM with an economic focus requires the creation of new business concepts, the improvement of existing ones, and the development of cost-effective business operations. The approach works to improve both job market understanding and management decision-making abilities while maintaining industry regulations and local government requirements. The approach aims to boost product quality while reducing investment risks and building partnerships between entrepreneurs. Universities can reduce production costs and start new manufacturing processes through their research activities that focus on economic challenges. This type of private sector partnership leads to financial stability, practical technology development, and regional economic growth stimulation.

The sustainability-oriented TM method works to protect the environment while reaching particular goals. Educational initiatives for sustainability at universities help improve industrial operations while dealing with climate change effects. The approach delivers additional social advantages, which include increased self-assurance, knowledge development, and stakeholder empowerment. The approach supports the achievement of sustainable development goals through its efforts to eliminate hunger and promote inclusive education and establish sustainable economic systems. Universities can enhance health and well-being, promote gender equality, and improve resource accessibility by actively involving local communities in their innovation system.

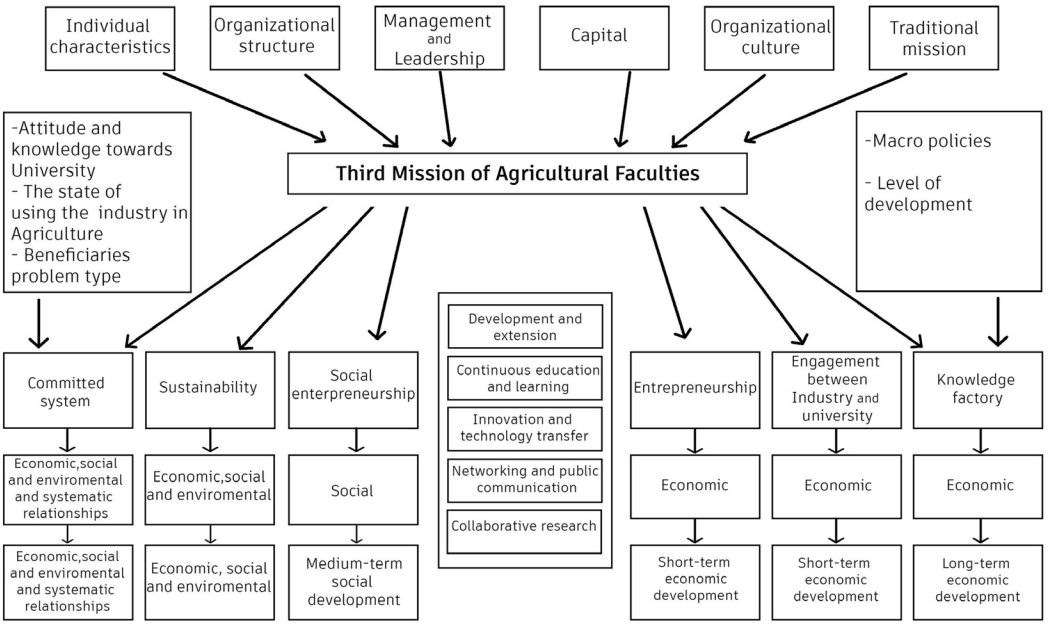
The implementation of the TM through any method produces similar results, which include developing social trust, employee participation, staff development, curriculum improvement, and research excellence. Appendix F presents the TM's outcomes based on its constituent approaches.

## Conclusion

The TM stakeholders, who include policymakers and higher education administrators, show strong interest in comprehending the diverse aspects of this initiative. The university's TM faces challenges because of insufficient understanding and irregular implementation, which reduces its effectiveness. Existing research lacks a unified interpretation and clear measurement indicators, leading to fragmented approaches.

This study addresses these limitations by conducting a systematic review of various approaches to university–society engagement within the TM framework. By providing

**Figure 2. The Third Mission of Agricultural Faculties Based on Six Approaches**



a comprehensive understanding of its dimensions, activities, and influential factors, this research aims to bridge the gap between theory and practice. Based on the findings of this study, we propose a framework for understanding the TM in agricultural faculties, highlighting key dimensions, activities, and influential factors. Figure 2 provides a comprehensive overview of the TM in agricultural faculties as delineated in this study.

The TM varies across six distinct approaches in terms of dimensions, influential factors, and outcomes. The optimal approach depends on evaluating external elements, which include societal demand alongside the nature of societal problems, the state of the agricultural industry, national development level, and national policy. The absence of a universal solution exists even when countries share economic, social, political, and cultural elements. The various resources and capabilities of universities prevent them from implementing a single uniform approach to their social engagement. A strategic approach that includes specific goals and steady measures will prove more successful than fragmented approaches for achieving TM objectives. Because of its complex nature, the agricultural sector demands a systemic and holistic approach to achieve overall societal well-being and comfort.

The implementation of an integrated method becomes necessary for maximizing agricultural knowledge; applying science and technology for solving poverty and hunger; optimizing human nutrition; and achieving livelihood improvement, equity, environmental sustainability, and economic prosperity. The achievement of the TM along with sustainable development depends on an innovation system that consists of multiple interconnected elements. Agricultural faculties must establish a systemic approach that emphasizes university involvement in the innovation system because sustainable agricultural growth represents their highest priority.

The TM requires policymakers and higher education institutions and researchers to work together for establishing supportive environments that promote innovation. Research should focus on the particular challenges and prospects of TM implementation across various settings, with emphasis on developing countries. The resolution of these matters will enable us to achieve the TM's complete potential while creating a sustainable and equitable future.

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## Appendix A. Theoretical Framework of University–Society Engagement Approaches and Key Concepts

| | Approach types | | |
|---|---|---|---|
| | **Knowledge factory** | **Engagement between industry and university** | **Entrepreneurship** |
| **Keywords** | Contingent value (Determine the value of knowledge based on its potential market application)<br>One-way transfer of knowledge (To transfer knowledge primarily from the university to society, with limited interaction or feedback)<br>Profitability (To generate financial returns)<br>Basic research (Aimed at advancing knowledge, without immediate practical applications)<br>Knowledge-based economy (To foster an economy driven by the creation and application of knowledge)<br>Research institutions (To conduct research and generate new knowledge) | Triple helix (To model innovation involving universities, industry, and government)<br>Technology transfer (The process of transferring technology from research institutions to industry)<br>Economic development (The process of improving the economic well-being of a region or nation)<br>Technology and development (The application of technology to address societal challenges)<br>Industry productivity (The efficiency and effectiveness of industrial processes)<br>Profitability (The emphasis is on generating financial returns)<br>Commercialization (To bring new products or services to market)<br>Technological innovation (To develop new technologies)<br>Knowledge-based economy (To foster an economy driven by the creation and application of knowledge)<br>Gaining wealth (To accumulate wealth through economic activities)<br>Employment creation (To generate jobs)<br>Relationships (To establish and maintain connections between industry and university) | Entrepreneur university (To foster a university environment that encourages entrepreneurial thinking, innovation, and the creation of new ventures)<br>Technology transfer<br>Technical innovation (To develop new technical solutions)<br>Science and technology parks (To create environments that foster innovation and technology development)<br>Intellectual property and royalties (To protect and monetize intellectual property rights)<br>Technology and development<br>Organizational structure (To establish and maintain an effective organizational structure)<br>Profitability<br>Commercialization<br>Technological innovation<br>Knowledge-based economy<br>Gaining wealth<br>Employment creation |

| | Approach types | | |
|---|---|---|---|
| | **Social entrepreneurship** | **Sustainability** | **Committed system** |
| **Keywords** | Social sensitivity (Awareness of social issues and a commitment to addressing them)<br><br>Social innovation (The development of innovative solutions to social problems)<br><br>Charity affairs (Charitable activities and donations)<br><br>Voluntary contributions (Donations made voluntarily)<br><br>Spiritual action (Actions motivated by spiritual or ethical principles)<br><br>Philanthropy (Charitable giving) | Balanced development (To develop in a way that meets the needs of the present without compromising the ability of future generations to meet their own needs)<br><br>Environmental protection (Protecting the environment and natural resources)<br><br>Sustainable development<br><br>Process innovation (Innovation in the way products or services are produced or delivered) | Continuous education (Ongoing learning and development)<br><br>Social, economic, and cultural development (Development that encompasses social, economic, and cultural aspects)<br><br>Enlightenment of society (Educating and empowering the public)<br><br>Quadruple helix (A model of innovation involving universities, industry, government, and society)<br><br>Innovation system (A system that fosters innovation and technological change)<br><br>Co-creation (Collaborative creation of new products or services)<br><br>Cultural growth centers (Centers that promote cultural development)<br><br>Local and regional development (Development at the local and regional level) |

## Appendix B. Final Articles Used in Metasynthesis

| No. | Author, year | Research methodology | Journal |
|---|---|---|---|
| 1 | Lee et al., 2020 | Documentary research | Comparative Education |
| 2 | Kesten, 2019 | Content analysis | International Journal of Educational Methodology |
| 3 | Mejlgaard & Ryan, 2017 | Documentary research | Research Evaluation |
| 4 | Rinaldi et al., 2017 | Case study | International Journal of Sustainability in Higher Education |
| 5 | Hadidi & Kirby, 2012 | Interview | Industry and Higher Education |
| 6 | Callagher et al., 2015 | Documentary research | International Journal of Learning and Change |
| 7 | Koryakina et al., 2015 | Case study | European Journal of Higher Education |
| 8 | Benneworth et al., 2015 | Case study | European Journal of Higher Education |
| 9 | Woollard et al., 2007 | Interview | Industry and Higher Education |
| 10 | Hellström, 2007 | Content analysis | Policy Futures in Education |
| 11 | Salarnzadeh et al., 2011 | Interview and documentary research | Global Business and Management Research: An International Journal |
| 12 | Lyon et al., 2011 | Collaborative research | Journal of Rural Studies |
| 13 | Enciso et al., 2017 | Case study | Turkish Online Journal of Educational Technology (TOJET) |
| 14 | Neary & Osborne, 2018 | Case study | Australian Journal of Adult Learning |
| 15 | Preece, 2011 | Case study and action research | Journal of Adult and Continuing Education |
| 16 | Sataøen, 2016 | Documentary research | Scandinavian Journal of Educational Research |

| No. | Author, year | Research methodology | Journal |
|---|---|---|---|
| 17 | Galvão et al., 2020 | Case study | Journal of Rural Studies |
| 18 | Maximova et al., 2016 | Case study | International Journal of Environmental and Science Education |
| 19 | Puangpronpitag, 2019 | Grounded theory | Procedia Computer Science |
| 20 | Dentoni & Bitzer, 2014 | Grounded theory | Journal of Cleaner Production |
| 21 | Brundiers, 2017 | Content analysis | International Journal of Disaster Risk Reduction |
| 22 | Gosens et al., 2018 | Case study | Energy Research & Social Science |
| 23 | Wakkee et al., 2018 | Interview and observation | Technological Forecasting and Social Change |
| 24 | Etzkowitz et al., 2018 | Case study | Technological Forecasting and Social Change |
| 25 | Rinaldi et al., 2020 | Case study | Journal of Sustainable Tourism |
| 26 | Kruss and Gastrow, 2017 | Case study | Science and Public Policy |
| 27 | Hansson et al., 2005 | Case study | Technovation |
| 28 | Zavale & Macamo, 2016 | Interview | International Journal of Educational Development |
| 29 | Rinaldi & Cavicchi, 2016 | Case study | Agriculture and Agricultural Science Procedia |
| 30 | Liefner & Schiller, 2008 | Case study | Research Policy |
| 31 | Dalmarco et al., 2017 | Content analysis | Technological Forecasting and Social Change |
| 32 | Hansson et al., 2005 | Case study | Technovation |

## Appendix C. Synergy of University Engagement Approaches with Society in the Third Mission in Constituent Components

| Approach type / Component | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Confirming articles |
|---|---|---|---|---|---|---|---|
| Informative and instructive | * | * | * | * | * | * | 14, 25, 28, 30, 31 |
| Diverse and flexible | Insufficient evidence | Insufficient evidence | * | Insufficient evidence | * | * | 6, 7, 8, 13 |
| Systematic and organized | Insufficient evidence | Insufficient evidence | * | Insufficient evidence | * | * | 7, 25 |
| With added value | * | Insufficient evidence | * | Insufficient evidence | * | * | 6, 19 |
| Interdisciplinary and comprehensive | Insufficient evidence | Insufficient evidence | * | Insufficient evidence | * | * | 6, 16, 19, 20, 24, 25, 26 |
| Engagement-oriented and communication-based | Insufficient evidence | Insufficient evidence | * | * | * | * | 4, 5 |
| Ethical | Insufficient evidence | Insufficient evidence | * | * | * | * | 4, 5 |
| Both ends are beneficial | Insufficient evidence | * | * | * | * | * | 21, 25, 17, 18, 14 |
| Small scale | Insufficient evidence | Insufficient evidence | * | Insufficient evidence | * | * | 6, 26 |
| Being innovative | * | * | * | * | * | * | 4, 8, 23, 26 |
| Based on specific time and place | Insufficient evidence | * | * | * | * | * | 4, 6, 14, 23, 25 |
| Participation oriented | Insufficient evidence | * | * | * | * | * | 4, 6, 7, 12, 14, 21 |

*Note.* "Insufficient evidence" in the reviewed articles highlights a need for further research to clarify university–society engagement approaches.

## Appendix D. Activities of the Third Mission Based on the Approaches of Engagement Between the University and Society

| Activities | Example | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Confirming articles |
|---|---|---|---|---|---|---|---|---|
| Development and extension | Developing traditional rural art forms | | | | | | | |
| | Supporting the production of diverse and native agricultural products | | | | | | | |
| | Development of the value chain of agricultural products | | * | * | * | * | * | 4, 14, 25, 30 |
| | Integrating traditional knowledge with modern agricultural techniques | | | | | | | |
| | Revitalizing rural culture with local handicrafts | | | | | | | |
| Continuous education and learning | Extension publications | | | | | | | |
| | Presentation of the seminar | | | | | | | |
| | Short-term courses | | | | | | | |
| | Farm day | | * | * | * | * | * | 28, 5, 7, 4, 1, 6, 20, 31 |
| | Manuals | | | | | | | |
| | Field visits | | | | | | | |
| | Comprehensive training of people | | | | | | | |

| Activities | Example | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Confirming articles |
|---|---|---|---|---|---|---|---|---|
| Innovation and technology transfer | Issuing patent licenses and “knowledge” licenses to industries | * | * | * | * | * | * | 27, 2, 3, 8, 6 |
| | Sharing facilities (such as laboratories, equipment, and physical environment) | | | | | | | |
| | Providing advice to industry or organizations | | | | | | | |
| | Patent | | | | | | | |
| | Granting permission | | | | | | | |
| | Launching a new production line in companies | | | | | | | |
| Networking and public communication | Memorandums of understanding | | * | * | * | * | * | 4, 16, 17, 20, 14, 24 |
| | Radio and television programs | | | | | | | |
| | Web interviews | | | | | | | |
| | Oral questions and answers | | | | | | | |
| | Media articles | | | | | | | |
| | Membership in councils and committees | | | | | | | |
| | Membership in the board of directors of companies or private sector organizations | | | | | | | |
| Collaborative and interactive research | Joint laboratories | * | * | * | * | * | * | 29, 6, 7, 16 |
| | Contractual research | | | | | | | |
| | Collaborative research | | | | | | | |
| | Consulting services | | | | | | | |

## Appendix E. Comparison of the Six Approaches in the Main Constituent Components

| Approaches and features | Knowledge factory | Engagement between industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system |
|---|---|---|---|---|---|---|
| Philosophy | • Materialism | • Materialism | • Idealism | • Humanism | • Perennialism | • Pragmatism |
| Target | • Production of scientific knowledge<br>• Increase in income | • Data exchange<br>• Increase in income | • Active commercial role and increase income | • Production of knowledge with the aim of spiritual action | • Application of knowledge for balanced development | • Developmental role |
| The core of the university | • Basic research | • Practical faculty members with strong industry connections | • Market | • Ethics and values | • University students and graduates | • Extension and involvement in the innovation system |
| Engagement orientation | • Unidirectional | • Implicit reciprocity | • Open two-way | • One-way engagement between university and civil society | • Open two-way | • Responsive |
| Political implication | • Joint collaboration based on the geographical location of university and industry<br>• Increasing capital for research | • Promotion of certain types of communication links or communication channels over others | • The necessity of mediators and organizational arrangements and incentives to confirm communication | • Adding value and human dimension to the engagement of the university with society | • The need to increase knowledge, encourage open-mindedness, and improve skills and social responsibility in establishing interaction for sustainable development | • Connecting university missions and other policies at different levels |
| Approach to innovation | • Product innovation | • Product innovation | • Process innovation | • Social innovation | • Organizational structure innovation | • Community-oriented and systemic innovation |
| Time frame | • Short term | • Short term | • Short term | • Medium term | • Medium term | • Long term |

| Approaches and features | Knowledge factory | Engagement between industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system |
|---|---|---|---|---|---|---|
| Structures | • Basic research institutions<br>• Scientific centers | • Industry liaison offices<br>• Research and development centers | • Innovative growth centers<br>• Technological growth centers<br>• Science and technology parks<br>• Applied research centers | • Social networks<br>• NGOs | • Teaching and training facilities and equipment | • Cultural growth centers<br>• Technological, innovative growth centers<br>• Problem-based transfer<br>• Continuing education and professional development centers and implementation of joint programs |
| Government budget | • Many | • Average | • Average | • Many | • Average | • Low to average<br>• Solving real problems in society |
| Gaining budget | • Publishing authoritative research | • Project oriented<br>• Technology transfer<br>• Mutual investment<br>• Third party | • Patent<br>• Reproductive companies<br>• Startups | • Grants<br>• Loans<br>• Crowdfunding | • Green investments<br>• Green technologies | • Diverse |
| Diversity of income streams | • Dependent on government aid | • Private | • Provision of licenses<br>• Intellectual property rights<br>• Third-party funding | • People's aid<br>• International organizations<br>• Charity funds | • Reducing resource consumption and optimal consumption<br>• Reducing waste production<br>• Optimizing water consumption<br>• Management of repair and maintenance of devices and equipment instead of replacement | • Stakeholders and partners |

| Approaches and features | Knowledge factory | Engagement between industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system |
|---|---|---|---|---|---|---|
| Key influencing factors | • University inputs, resources, and infrastructure required for research | • Structural factors of companies such as size, age, absorption capacity, research and development budget, innovation strategy | • Organizational structure, management practices, and faculty behavior and motivations (faculty members) | • Individual characteristics | • Knowledge, attitude, and skills of graduates and students, responsibility of academics | • Number and synergy between universities or groups, university leadership, coherence or alignment of policies/ incentives, regional system configuration, regional policy and institutional capacity of universities. |
| Channels | • Publications | • Publications<br>• Personal relationships | • Providing patents, licenses and through structures | • Personal relationships | • Education<br>• Research<br>• Scientific seminars | • Diverse |
| Main stakeholders | • University<br>• Industry | • University<br>• Industry<br>• Government | • University<br>• Entrepreneurial companies<br>• Small and medium businesses<br>• Government | • University<br>• Charities<br>• Civil Society | • University<br>• Other universities<br>• Graduates | • University<br>• Industry<br>• Government<br>• Farmers<br>• Nongovernmental institutions<br>• Researchers |
| Organizational focus | • Raw materials and equipment<br>• Buildings | • Raw materials and equipment<br>• Buildings<br>• Professional students | • Project oriented<br>• High level technology<br>• Development of people | • Persons<br>• Personality characteristics<br>• Norms and values | • Improving processes<br>• Skill development | • Leadership<br>• Synergy of groups<br>• Connections |
| Control and management | • Government and senior officials outside the organization | • Hierarchical and bureaucratic | • Entrepreneurial<br>• Flexible | • Open control system | • Hierarchical but collaborative<br>• Collaborative management between groups | • Flexible<br>• Collaborative management with external stakeholders |

## Appendix F. The Result of the Third Mission Based on Constituent Approaches

| Dimension | Examples | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Sample articles |
|---|---|---|---|---|---|---|---|---|
| Economic development | New business process design | | * | * | | | | 30 |
| | Development of new technologies | | | | * | * | * | 12 |
| | Reduce production cost | | * | * | | | | 27 |
| | Launching a new production line | | * | * | | | | 27 |
| | Reducing production costs | | * | * | | | | 27 |
| | Change in production materials | | * | * | | | | 27 |
| | Improving the production process | | | | * | | * | 23 |
| | Reducing investment risk | | * | * | | | | 30 |
| | Market dynamics | | | | * | | * | 12 |
| | Change in market potential | | * | * | | | | 27 |
| | Sustainable economy | | | * | * | * | * | 25 |
| | Creation of new companies | | * | * | | | | 21 |
| | Development of existing companies | | * | * | | | | 21 |
| | Provision of skilled labor | * | * | * | | | | 7 |
| | Helping small and large businesses | * | * | * | | | | 7 |
| | Increase product quality | | * | * | | * | | 30 |

| Dimension | Examples | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Sample articles |
|---|---|---|---|---|---|---|---|---|
| Development of job opportunities | Better understanding and knowledge about the job situation | | * | * | | | | 30 |
| | Providing experiences and learning | | * | * | | | | 30 |
| | Career success | | * | * | | | | 30 |
| | Getting to know the rules with business | | * | * | | | | 30 |
| | Addressing the knowledge gap of stakeholders | | * | * | | | | 30 |
| Development of traditional missions | Learning and increasing the information and knowledge of business managers | | | | * | | * | 23 |
| | Access to resources | | | | * | | * | 13 |
| | Curriculum development | | | * | | * | | 18 |
| | Conduct qualitative research | | * | * | | | | 27, 18 |
| Increasing university income | University profits | | * | * | | | | 27 |
| | Financial stability of the university | | | * | * | | * | 29 |
| Environmental development | Development of green technologies in the university | | | | | * | | 30 |
| | Reducing the effects of climate change | | | | * | * | * | 23 |
| | Food security | | | * | * | * | * | 25 |
| | Increase health and well-being | | | | * | * | * | 12 |
| | Making green innovations | | * | * | | * | | 30 |

| Dimension | Examples | Knowledge factory | Industry and university | Entrepreneurship | Social entrepreneurship | Sustainability | Committed system | Sample articles |
|---|---|---|---|---|---|---|---|---|
| Social Development | Gender equality | | | * | * | | * | 25 |
| | Community empowerment | | | * | * | | * | 25 |
| | Altruism | | | | * | | * | 13 |
| | Diversity and social inclusion | * | * | * | | | * | 7 |