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RESEARCH

Development of a Digital Thesaurus for Organic Agriculture: Enhancing Knowledge Accessibility for Young Agripreneurs

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ABSTRACT

PURPOSE: This study aims to develop a thesaurus for organic agriculture tailored to the needs of young agripreneurs, providing a controlled vocabulary within a digital platform to enhance data access, semantic search capabilities, and term interpretation.

DESIGN/METHODOLOGY/APPROACH: The research adopts principles of dictionary construction theory and employs the Tematres program for thesaurus creation and vocabulary management. The methodology encompassed four key stages: (1) Content Analysis: Identifying and analysing organic agriculture concepts and terminology; (2) Thesaurus Development: Constructing a hierarchical and associative vocabulary structure; (3) Digital Platform Development: Implementing the thesaurus on an interactive digital platform; and (4) Efficiency Evaluation: Assessing the platform's performance and usability.

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FINDINGS: The study identified 1,070 keywords related to organic agriculture, organised into a hierarchical structure comprising 1,037 hierarchical and 34 associative relationships. The developed platform facilitates keyword searches, term navigation, and detailed information retrieval, including definitions and relational hierarchies (broader, narrower, and related terms). It also supports alphabetical browsing and semantic exploration, significantly enhancing information accessibility and comprehension.

RESEARCH LIMITATIONS/IMPLICATIONS: This thesaurus and its digital platform provide a valuable resource for young agripreneurs, enabling efficient access to organic agriculture knowledge and fostering deeper engagement with the field.

ORIGINALITY: The platform's innovative approach to managing controlled vocabulary establishes a foundation for further advancements in agricultural information systems.

KEYWORDS: *Organic Agriculture; Thesaurus Development; Young Agripreneurs; Controlled Vocabulary; Digital Platform*

INTRODUCTION

The increasing global demand for sustainable agriculture has highlighted the importance of organic farming, a practice that prioritises environmental stewardship, resource conservation, and chemical-free food production. Organic farming is vital for public health and aligns with global trends advocating for safe, high-quality agricultural products (NOADC, 2017). In Thailand, however, organic agriculture faces significant challenges, including limited scalability, high production costs, and difficulties obtaining international organic certifications. These barriers hinder the sector's growth and its potential to position Thailand as a global food production hub or the "Kitchen of the World". As a response, the Thailand 4.0 policy emphasises transforming traditional farming into a modern, competitive sector driven by entrepreneurial farmers, aligning agricultural development with economic, social, and environmental goals (ARDA, 2018).

The transition of agriculture from subsistence to a commercially viable and sustainable sector has become a focal point in contemporary economic development discourse, particularly regarding youth engagement. Agricultural entrepreneurship, or agripreneurship, is a crucial strategy to address youth unemployment and promote rural economic revitalisation (Adeyanju *et al.*, 2024). With the increasing interest in empowering young farmers, several studies have explored the enablers and constraints shaping youth agripreneurial success across diverse contexts, providing insights into the mechanisms required to foster a thriving agricultural sector. This paper builds upon such efforts to examine the factors influencing agripreneurial outcomes and youth participation in agriculture, leveraging insights from existing literature.

Agripreneurship has emerged as a global concept aiming to transform agriculture into a competitive business, with its adoption varying across socio-economic and geographic contexts. Pliakoura *et al.* (2024) evaluated perceptions of young agripreneurs in western Greece and highlighted that internal funding, education, and training are pivotal determinants of entrepreneurial success. Gender differences and the type of farming, such as crop versus livestock production, further underscore the diversity of challenges and opportunities faced by agripreneurs. Similarly, Jolex and Tufa (2022) emphasised the role of information and communication technologies (ICT) in enhancing profitability for young agripreneurs, noting that ICT tools significantly impact the efficiency of agribusiness operations.

In developing countries, agripreneurship holds great potential to empower youth by fostering self-reliance and mitigating unemployment. For instance, in The Gambia, push and pull factors such as poverty, economic independence, and government support are key motivators for youth engagement in agribusiness ventures, as documented by Boye *et al.* (2022). Furthermore, Nurlaela *et al.* (2020) highlighted the importance of farmer groups and new media in horticultural agripreneurship in Indonesia, revealing how social learning platforms can enable young farmers to enhance their entrepreneurial skills.

While growing evidence of the positive impact of youth agribusiness empowerment programmes, challenges such as limited access to capital, inadequate institutional support, and insufficient knowledge remain persistent barriers. Thephavanh *et al.* (2023) and Nyang'au *et al.* (2020) examined these constraints in Laos and Kenya, respectively, and identified strategies to bridge the gaps, including showcasing success stories and improving institutional infrastructure. These strategies highlight the significance of mentorship, participatory decision-making, and policy interventions in motivating youth to pursue sustainable agripreneurship.

Young agripreneurs, as key stakeholders in this transition, possess the potential to drive innovation and address inefficiencies within the agricultural market. Their ability to process, analyse, and apply knowledge makes them well-positioned to identify opportunities and develop innovative business models. However, the scattered nature of agricultural knowledge and inconsistent categorisation of terms across information systems create significant obstacles. Users often face difficulties in locating relevant information due to keyword mismatches and incomplete indexing, leading to inefficiencies in knowledge retrieval and application (Gobierno de España, 2017).

Addressing these issues requires a systematic approach to knowledge management, focusing on organising, indexing, and defining relationships among agricultural concepts. A thesaurus is a proven tool for addressing such challenges, as it facilitates standardised vocabulary, semantic searches, and information retrieval by creating structured relationships among terms (Aitchison and Gilchrist, 1987). In particular, thesauri help resolve ambiguities by clarifying overlapping meanings and offering a framework for understanding complex terminologies (Kilgarriff, 2003).

Research has demonstrated the value of thesauri across diverse fields, from natural language processing (Shchitov *et al.*, 2017) and cybersecurity (Hazem *et al.*, 2020) to agriculture (FAO, 2023). Chansanam *et al.* (2021a) developed a bilingual (Thai and English) thesaurus and digital platform for the ethnic groups of the Mekong River Basin, enabling semantic search and linking open data integration through a systematic process of knowledge organisation, thesaurus construction, platform development using the Tematres web application, and evaluation, resulting in a database of 4,273 principal terms with hierarchical and associative relationships. For example, AGROVOC, a multilingual thesaurus developed by the Food and Agriculture Organization (FAO), has significantly enhanced information organisation and retrieval in agricultural systems. However, despite its success, AGROVOC lacks detailed coverage of organic agriculture, particularly in the context of young agripreneurs in Thailand. Existing studies have primarily addressed general agricultural knowledge, leaving a gap in tailored resources for organic farming entrepreneurs.

To address this gap, the present study aims to develop a thesaurus specifically for organic agriculture, designed to support young agripreneurs by facilitating access to structured, relevant knowledge. This research seeks to create a hierarchical vocabulary that enhances data access, semantic searches, and knowledge interpretation by employing dictionary construction theory and leveraging advanced digital tools. The thesaurus will be a critical resource for navigating organic agricultural knowledge, empowering young agripreneurs to innovate and contribute to the sector's growth and sustainability.

METHODOLOGY

This study employed a comprehensive research and development (R&D) methodology that was structured into four distinct and sequential stages to ensure the systematic development and evaluation of the project. The stages were designed to meet the specific needs of young agripreneurs in organic agriculture.

- **Content Analysis and Knowledge Synthesis:** The first stage involved an in-depth content analysis to identify and synthesise relevant concepts and terminology related to organic agriculture. This process included reviewing academic literature, industry reports, and expert opinions to compile a comprehensive list of key terms. The aim was to develop a clear and organised understanding of the language and concepts most pertinent to young agripreneurs in organic agriculture. The content analysis provided a solid foundation for the following stages of thesaurus development.
- **Thesaurus Development:** In the second stage, a thesaurus specifically tailored to organic agriculture was created with a focus on young agripreneurs. This thesaurus was designed to organise the identified terms hierarchically, with broader, narrower, and related concepts that could help facilitate semantic understanding and improve accessibility. The thesaurus

also aimed to provide a controlled vocabulary to enhance information retrieval and decision-making for young agripreneurs navigating the complex world of organic agriculture.

- **Digital Platform Creation:** The third stage involved developing a digital platform to implement and manage the thesaurus. This platform was designed to provide an interactive and user-friendly interface, allowing users to efficiently search for and access the terms and concepts in the thesaurus. The platform was equipped with keyword search, term navigation, access to definitions, relational hierarchies, and semantic exploration, ensuring users could easily interact with the knowledge base.
- **Platform Efficiency Evaluation:** The final stage evaluates the platform's efficiency and effectiveness in supporting young agripreneurs. This evaluation assessed the platform's usability, performance, and overall impact on the users' ability to navigate and apply the information within the thesaurus. Feedback from young agripreneurs was gathered to assess the platform's ability to meet their needs, and adjustments were made to improve its functionality.

Figure 1 clearly outlines and visually represents these stages, providing a structured and logical approach to achieving the study's objectives. The research methodology allowed for a step-by-step development and refinement of both the thesaurus and the digital platform, ensuring that the final product was well-suited to the target audience and effectively addressed their challenges in organic agriculture.

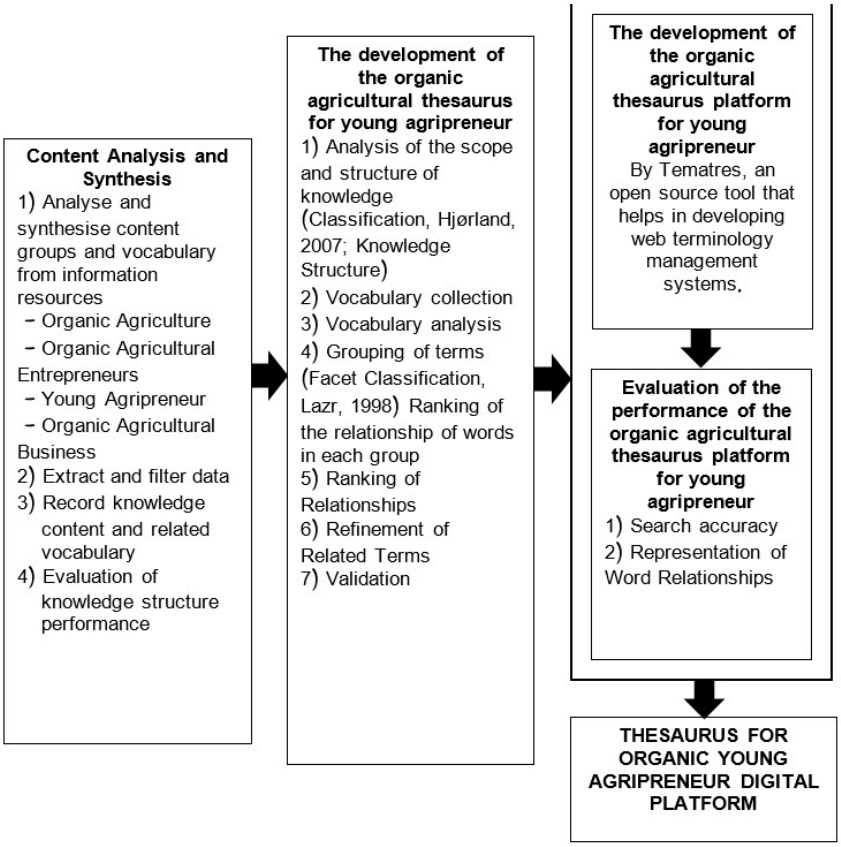

Figure 1: Conceptual Framework for Research and Development Activities

Source: Constructed by authors

Analysis and Synthesis of Knowledge Content Groups and Vocabulary from Information Resources

Information Sources for Analysing Resources Related to Organic Agriculture for Young Agripreneurs

The study utilised information resources from five key sources to analyse data on organic agriculture for young agripreneurs: (1) the Thai Library Integrated System (ThaiLIS) research database, accessible at https://tdc.thailis.or.th/tdc/basic.php; (2) the Scopus journal database, accessible at https://www.scopus.com/home.uri; (3) the Agricultural Extension Research and Development Division, Department of Agricultural Extension, accessible at http://new.research.doae.go.th/; (4) the Agricultural Research Development Agency (ARDA), accessible at https://tarr.arda.or.th/; and (5) private sector websites, such as Green Net, accessible at https://www.greennet.or.th/.

Data Collection

To collect relevant data, the researcher identified key terms for searching information within the sources listed in the previous paragraph. The search strategy involved using keywords and phrases such as "organic agriculture", "organic agricultural entrepreneurs", "young agripreneur", and "organic agricultural business" in titles, topics, headings, and abstracts. The analysis included a total of 39 information resources, summarised in Table 1.

Table 1: Number of Information Resource Items Analysed

Information resource	*Amount*
Manual, book, textbook	19 items
Study report, research report, academic report	3 items
Thesis	1 item
Article	14 items
Website Online	2 items
Total	**39 items**

Source: Constructed by authors

Keyword extraction

The researcher identified keywords by selecting terms with specific meanings relevant to organic agriculture, particularly for young agripreneurs. Repeated, synonymous, or ambiguous terms were identified, and the most frequently occurring terms were prioritised for use. Similar terms were recorded separately for further analysis and refinement.

Recording, verification, and correction of knowledge content

The researcher documented the knowledge content and related terms, ensuring accuracy by performing a meticulous double-checking process. Any identified inaccuracies were corrected to maintain the integrity of the data.

Evaluation of knowledge structure performance

The knowledge structure was evaluated by three experts using the Index of Item-Objective Congruence (IOC) as an assessment tool. The experts' evaluations were analysed to calculate the congruence scores and then used to interpret and refine the knowledge structure.

Thesaurus Development

The development of a thesaurus differs significantly from that of traditional dictionaries. While dictionaries primarily compile and define words, a thesaurus emphasises analysing term definitions

and meanings to organise words into conceptual groups based on their synonyms, representing shared concepts. Despite this conceptual grouping, terms are typically arranged alphabetically (Roget, 1997).

Analysis of scope and knowledge structure

The first step involves defining the scope and content fields related to organic agriculture for young agripreneurs. This process employs the knowledge classification and structural approach outlined by Hjørland (2007), ensuring that the thesaurus comprehensively covers relevant concepts and terminology.

Vocabulary collection

Vocabulary compilation involves gathering terms from analysed and synthesised information sources, focusing specifically on organic agriculture and terms relevant to new-generation agricultural entrepreneurs. The collected vocabulary and associated details are systematically recorded in an Excel spreadsheet for organisation and future reference.

Vocabulary analysis

The collected vocabulary is systematically reviewed and organised to ensure it is comprehensive and appropriately categorised, creating a foundational structure for further thesaurus development.

Vocabulary grouping

Related terms are grouped, their relationships ranked, and connections refined using the Facet Classification concept proposed by (Prieto-Diaz, 2002). This process facilitates the hierarchical organisation of terms within each group, enabling a structured representation of concepts.

Ranking relationships among words

The relationships within and between term groups are prioritised to align with the thesaurus structure. Terms are categorised into broader terms (BT) and narrower terms (NT) to establish a clear hierarchical framework for user navigation.

Adding related terms

Related terms (RT) and synonyms are incorporated to enrich the thesaurus. Synonymous or interchangeable terms are linked using “used for” (UF) relationships, ensuring that terms with identical or closely related meanings facilitate accurate and effective searches.

Verification

Finally, the thesaurus undergoes a verification process to ensure the effectiveness of all terms as keywords. The relational structure is reviewed to confirm proper linking and validate that terms can effectively display connections in subsequent relationship sequences, as illustrated in Figure 2.

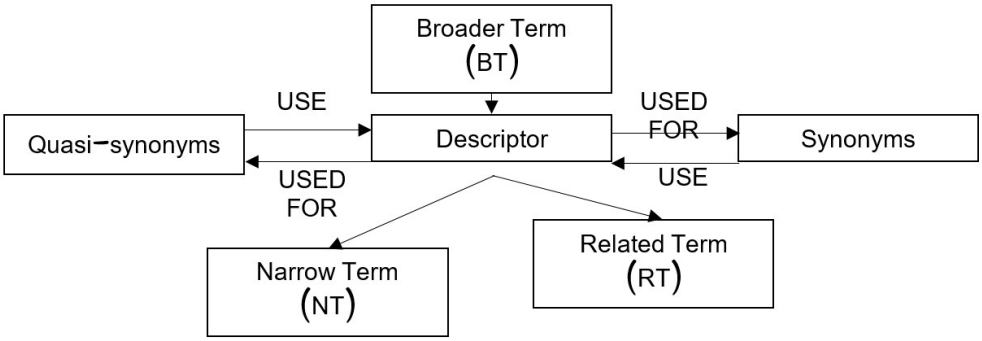

Figure 2: Diagram Depicting the Relationships within the Thesaurus

Source: Pradjayothins *et al.*, 1993

Development of an Organic Agricultural Digital Platform for Young Agripreneurs

The organic agricultural digital platform for young agripreneurs was developed using Tematres, a server-based software tool for managing controlled vocabulary that is freely available. Tematres supports creating and managing vocabulary frameworks such as thesauri, taxonomies, and other systems tailored to specific needs. It ensures consistency and clarity by organising controlled vocabularies, resolving ambiguities, and establishing synonym relationships. According to Gonzales-Aguilar *et al.* (2012), Tematres significantly enhances the accessibility and utility of data across various applications. Once the vocabulary was imported into the Tematres system, it was systematically organised alphabetically and hierarchically. The software maintains alphabetical order within defined relationships, facilitating an efficient and user-friendly approach to managing and retrieving terms.

Evaluation of the Efficiency of the Organic Agricultural Digital Platform for Young Agripreneurs

The efficiency of the organic agricultural digital platform for young agripreneurs was evaluated using a multifaceted approach. A questionnaire assessed user satisfaction with the Tematres system, focusing on content quality, accuracy, format, ease of use, timeliness, anticipated benefits, and search precision. Additionally, the evaluation aimed to measure the platform's performance by

analysing the relevance of retrieved results to user needs. This process involved observing the retrieval system's actual usage patterns and assessing search results' relevance based on user interactions and behaviours.

The evaluation methodology prioritised relevance determination without considering the order of retrieved results. The F-measure was applied to measure the platform's efficiency, integrating precision and recall values. This process included defining a sample dataset for testing the information retrieval system, calculating precision and recall to assess the system's effectiveness in retrieving relevant information, and evaluating user satisfaction through a structured tool based on the framework proposed by Baeza-Yates and Ribeiro-Neto (2011).

The findings from these evaluations provided valuable insights into the platform's overall efficiency and usability. The results confirmed the platform's alignment with the needs of young agricultural entrepreneurs, emphasising its potential to facilitate adequate access to organic agricultural information and support informed decision-making in this domain.

Precision

Precision is a key metric used to evaluate the accuracy of a system in retrieving relevant data while excluding irrelevant results. It is defined as the ratio of correctly retrieved data items to the total number of retrieved data items, providing insight into the relevance of the search results (Manning *et al.*, 2008). The formula for calculating precision is as follows:

$$\text{Precision} = \frac{A}{A+B} * 100\%$$

where:

A represents the number of correctly retrieved data items displayed in the search results.

B represents the number of incorrectly retrieved data items displayed in the search results.

This measure is particularly useful in assessing the system's ability to minimise false positives and deliver accurate information to users. A higher precision score indicates a greater proportion of relevant items within the retrieved set.

Recall

Recall is a critical metric in information retrieval, calculated as the ratio of the number of relevant data items retrieved to the total number of relevant data items available in the dataset. It evaluates the system's ability to identify and retrieve all relevant items, thereby ensuring comprehensive coverage of the desired information (Manning *et al.*, 2008). The recall formula is expressed as follows:

$$Recall = \frac{A}{A + C} * 100\%$$

where:

A The number of relevant data items correctly retrieved and displayed in the search results.

C The number of relevant data items that were not retrieved or displayed.

This metric highlights the system's effectiveness in minimising missed relevant items; this is particularly important in applications where completeness of retrieved information is critical (Baeza-Yates and Ribeiro-Neto, 2011).

Overall performance measurement of retrieval (F-measure)

The F-measure, also known as the F1-score, is a widely used performance metric in information retrieval and classification tasks. It combines precision and recall into a single value, offering a balanced assessment of a system's accuracy and completeness. Precision measures the proportion of correctly retrieved items among all retrieved items, while recall evaluates the proportion of correctly retrieved items among all relevant items. By harmonising these two metrics, the F-measure provides a comprehensive evaluation of the search system's performance. The formula for calculating the F-measure is expressed as follows:

$$\mathrm{F-measure} = 2 * \frac{\mathrm{Precision} * Recall}{\mathrm{Precision} + Recall}$$

This metric is particularly useful in contexts where both false positives and false negatives are important considerations (Vickery, 1979).

RESULTS

Development of the Organic Agricultural Thesaurus for Young Agripreneurs

The development of the organic agricultural thesaurus for young agripreneurs resulted in a structured vocabulary comprising 1,054 keywords. These keywords were systematically categorised into six hierarchical levels of depth, providing a comprehensive framework for semantic exploration. Specifically, the distribution includes 13 terms at Level 1, 63 terms at Level 2, 482 terms at Level 3, 396 terms at Level 4, 97 teams at Level 5, and 6 teams at Level 6. As illustrated in Figure 3, this hierarchical organisation ensures an intuitive and efficient structure for navigating and accessing relevant terms.

Figure 3: Diagram Depicting the Distribution of Words Across Vocabulary Depth Levels
Source: Constructed by authors

The analysis of the thesaurus structure revealed the following distribution of terms: 189 words were categorised as broader terms (BT), 1,041 as narrower terms (NT), 15 as unused terms (UF), and 15 as terms to be used instead (USE). Additionally, 40 terms were identified as associative or related terms (RT). These relationships are visually represented in Figure 4, illustrating the hierarchical and associative connections within the controlled vocabulary.

Figure 4: Diagram Illustrating the Distribution of Words Across Relationship Categories
Source: Constructed by authors

Evaluation of knowledge structure performance (More than 0.50 equals Appropriate)

Table 2 evaluates the performance of various knowledge structure categories in organic agriculture and business, revealing consistently high scores that far exceed the appropriateness threshold of 0.50. All 13 categories scored 0.95 or higher, demonstrating strong overall performance. Foundational categories, such as “Basics of Organic Agriculture” (0.95) and “Organic Standards”

(0.99), scored slightly lower than others but still performed exceptionally well. Notably, 11 out of the 13 categories achieved perfect scores 1.00, highlighting the framework's robustness. These categories are grouped into three main areas: core organic agriculture knowledge, encompassing foundational topics; business and entrepreneurship, integrating organic agriculture with business strategies; and operational aspects that address practical elements such as management, finance, marketing, and terminology. The results emphasise the exceptional effectiveness of the knowledge structure, with all categories performing well above the threshold for appropriateness and the majority achieving perfect scores.

Table 2: Evaluation Results of Knowledge Structure Performance

Categories	*Average evaluation score*	*Evaluation results*
1. Basics of organic agriculture	0.95	Appropriate
2. Organic standards	0.99	Appropriate
3. Substances allowed and prohibited for Use in Organic agriculture	1.00	Appropriate
4. Organic farming business	1.00	Appropriate
5. Organic farming entrepreneur	1.00	Appropriate
6. Organic business strategy	1.00	Appropriate
7. Organic product management	1.00	Appropriate
8. Accounting and financial management	1.00	Appropriate
9. Source of Investment	1.00	Appropriate
10. Factors affecting product pricing	1.00	Appropriate
11. Exporting organic agricultural products	1.00	Appropriate
12. Marketing channels	1.00	Appropriate
13. Terminology	1.00	Appropriate

Source: Constructed by authors

Development of the Organic Agriculture Thesaurus Platform for Young Agripreneurs

The Organic Agriculture Thesaurus Platform was developed as a digital tool to effectively manage controlled vocabulary, providing structured organisation and semantic relationships for terms related to organic agriculture. The platform automates data tracking by recording the number of terms, their hierarchical depth, and their interrelationships upon data entry. This automation ensures consistent and efficient vocabulary management, catering specifically to the needs of young agripreneurs.

Visualisation of data entry results

The platform effectively summarises and displays the data entry results, including 1,084 recorded terms. These terms are categorised into depth levels ranging from 2 to 6, with the majority concentrated at depth 3. A graphical representation (Figure 5) clearly visualises these hierarchical distributions. Furthermore, the system identifies and records 1,257 hierarchical relationships, 40 associative relationships, and 1,173 terms with detailed records. These features collectively enhance the platform's functionality, offering a comprehensive overview of the thesaurus structure and its associated relationships.

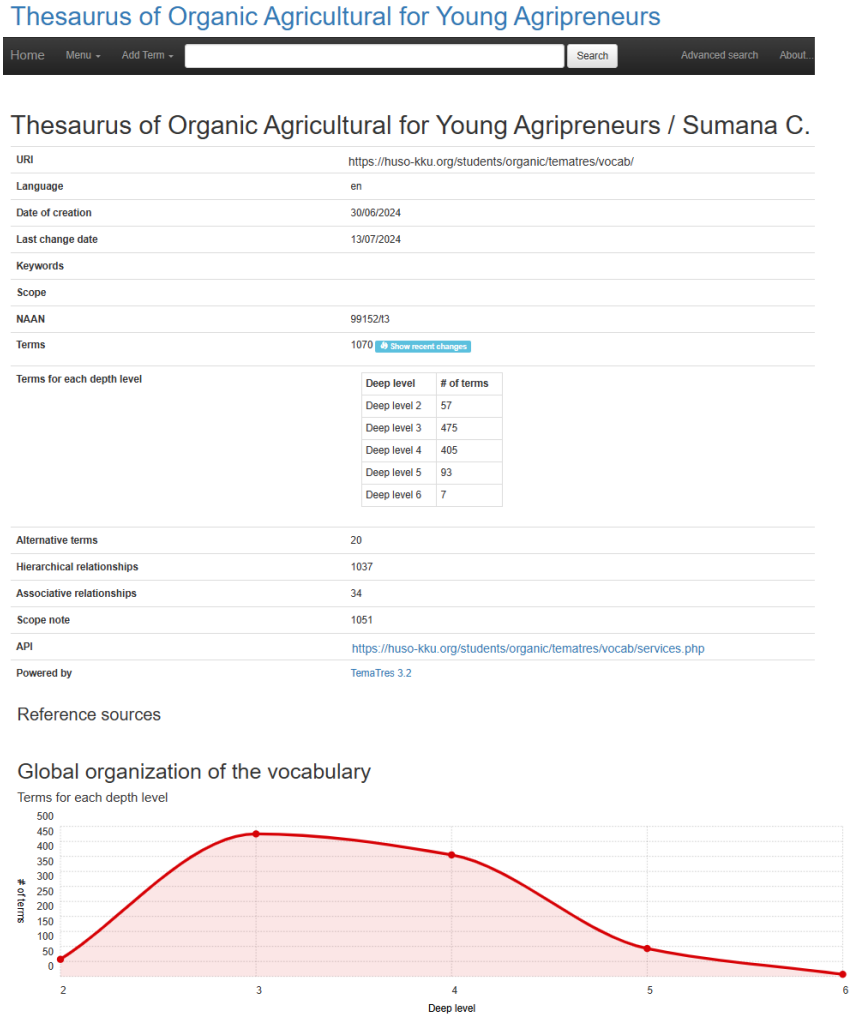

Figure 5: Overview of Data Entry Results in the Tematres System

Source: Constructed by authors

Displaying the platform's homepage vocabulary list

The platform's homepage prominently features top-level vocabulary, providing an accessible entry point for users. Specifically, the Organic Agriculture Thesaurus for young agripreneurs displays 13 related vocabulary items, systematically arranged in alphabetical order for ease of navigation and reference (see Figure 6). This design ensures that users can quickly locate and explore terms relevant to organic agriculture, thereby enhancing the overall functionality and usability of the platform.

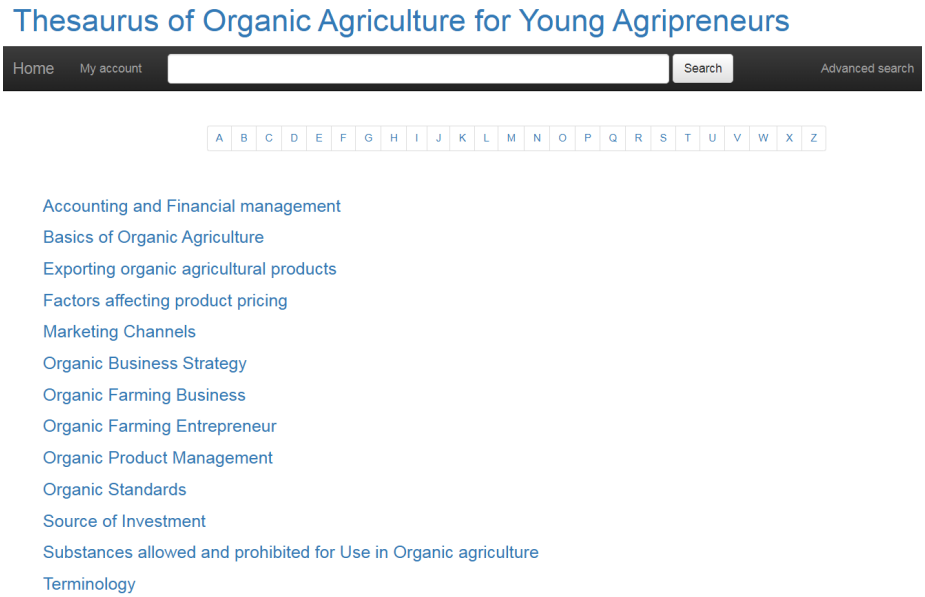

Figure 6: Digital Platform for Organic Farming: A Resource for Young Agripreneurs

Source: Constructed by authors

Displaying a list of keywords and related terms

When a keyword is selected, the system displays comprehensive results including the keyword itself, its definition, broader terms, narrower terms, related terms, and associated references. For instance, Basics of Organic Agriculture encompasses a scope note, more specific terms, and related terms. This term is a top-level keyword, demonstrating two types of relationships: hierarchical relationships with seven narrower terms, and associative relationships with one related term, as illustrated in Figure 7. Such an approach enhances the user's understanding by providing a structured and interconnected view of the controlled vocabulary.

Figure 7: Example of a Keyword Topic and Its Relationships to Associated Terms

Source: Constructed by authors

Displaying the secondary words list

When a secondary word or a term associated with the main term is selected, its broader-term relationship is displayed. For instance, the term "Farm Management" is identified as having a broader relationship with "Basics of Organic Agriculture", as illustrated in Figure 8. This hierarchical structure facilitates a clearer understanding of the relationships between terms, enhancing the thesaurus's usability and semantic functionality.

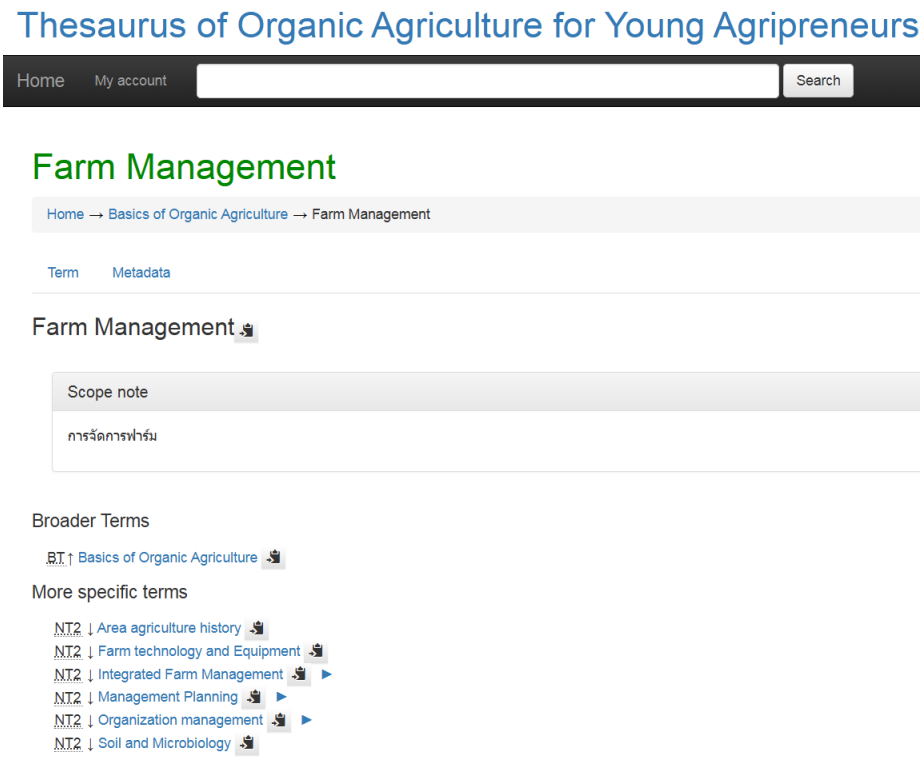

Figure 8: Example of a Keyword and Its Relationship to a Broader Term (BT)

Source: Constructed by authors

Displaying non-preferred terms and suggested terms

When users search for a non-preferred term, the platform offers suggested alternatives and links to the recommended terms for enhanced usability and semantic accuracy. For instance, a search for the term "Principles of Organic Agriculture" identifies it as a non-preferred term, prompting the platform to suggest "Organic Farming" as the preferred alternative, marked as "UF" (Use For), as illustrated in Figure 9. Conversely, when "Organic Farming" is searched, the platform designates it as the preferred term ("USE"). It links it to the non-preferred term "Principles of Organic Agriculture", as shown in Figure 10. This functionality ensures consistency in terminology and facilitates efficient access to relevant information within the thesaurus (APA citation for the source).

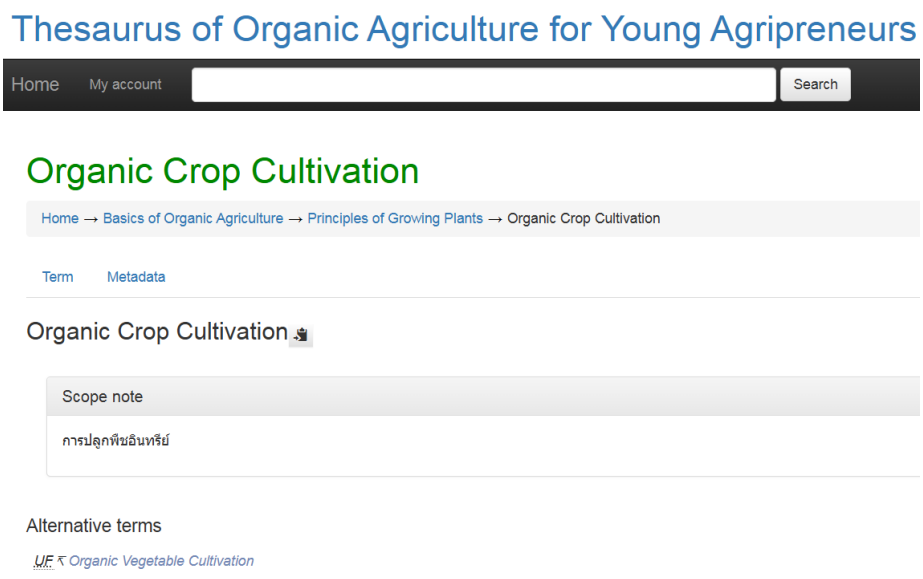

Figure 9: Examples of Keywords and Their "Use For" Relationships

Source: Constructed by authors

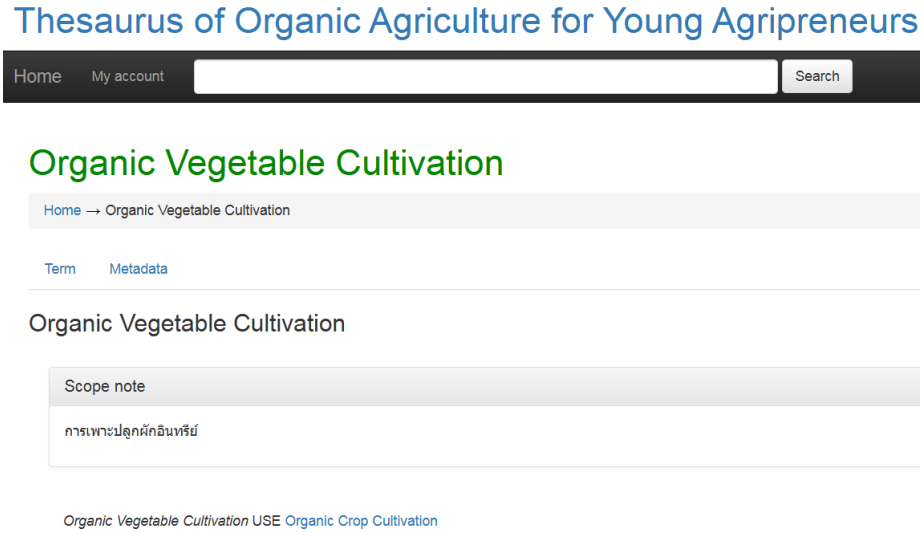

Figure 10: Examples of Terms with "Not Used" and "USE" Designations

Source: Constructed by authors

Evaluation of the Efficiency of the Organic Agricultural Digital Platform for Young Agripreneurs

The efficiency of the organic agricultural digital platform for young agripreneurs was assessed through a structured evaluation process. Experts were engaged to test the platform's performance, utilising predefined search terms across various categories to evaluate its functionality and effectiveness systematically. This approach ensured a comprehensive assessment of the platform's ability to facilitate accurate and efficient information retrieval.

Evaluation results of system performance across six metrics

This section presents the evaluation outcomes of the system's performance based on six distinct criteria. The assessment was conducted systematically to ensure the reliability and validity of the results. Each criterion was carefully analysed to determine the system's effectiveness in fulfilling its intended functions. The findings provide critical insights into the system's strengths and limitations, contributing to a comprehensive understanding of its operational capabilities. Detailed results for each evaluation item are discussed in the subsequent subsections.

Table 3: System Performance Evaluation Results Across Six Metrics

Evaluation Metrics	*Average evaluation score*	*Evaluation results*
1. Content		
1.1 The system displays correct and relevant information	4.67	As much as possible
1.2 The displayed results are relevant to the needs	4.33	As much as possible
1.3 The system provides sufficient information	4.67	As much as possible
2. Accuracy		
2.2.1 The system works correctly	4.33	As much as possible
2.2 The system can link relevant data and display results efficiently	4.67	As much as possible
2.3 Satisfaction with the correctness of the system	4.00	As much as possible
3.Format		
3.1 The system is presented in a useful format	4.67	As much as possible
3.2 The information is clear and complete	5.00	As much as possible
4. Ease to Use		
4.1 The system is easy to use	4.67	As much as possible
4.2 The system is convenient to use	4.33	As much as possible
5. Timeliness		
5.1 The usage process is not complicated and can be searched quickly	4.67	As much as possible
5.2 The system can access information quickly	4.67	As much as possible

Evaluation Metrics	Average evaluation score	Evaluation results
6. Perceived usefulness		
6.1 It helps to improve the efficiency of organic agricultural information search for new entrepreneurs	4.33	As much as possible
6.2 It helps to respond to the need for specialised information	4.67	As much as possible
6.3 It can be used to develop organic agricultural ontology for new entrepreneurs	4.67	As much as possible

Source: Constructed by authors

Table 3 presents the evaluation results, highlighting the system's strong performance across six key areas assessed. Regarding content quality, the system achieved notably high scores, ranging from 4.33 to 4.67, for displaying accurate, relevant, and sufficient information. The accuracy metrics demonstrated robust performance, with a particularly high score of 4.67 for data linking and result display. However, overall system satisfaction was slightly lower, with a score of 4.0.

The format category received outstanding ratings, achieving a score of 5.0 for information clarity and completeness and 4.67 for the usefulness of the presentation format. Usability metrics also reflected high accessibility, with scores of 4.67 for ease of use and 4.33 for convenience.

Timeliness metrics were consistently strong, with scores of 4.67 for quick search capabilities and rapid information access. The system's perceived usefulness yielded promising results, particularly in supporting the development of an organic agricultural ontology and meeting specialised information needs. Additionally, the system scored 4.33 for enhancing the efficiency of information searches in organic agriculture, specifically for new entrepreneurs.

The evaluation results demonstrate that the system is highly effective, performing exceptionally well across all measured dimensions. Most scores ranged between 4.33 and 5.0, and qualitative assessments consistently indicated "As much as possible" across all categories, reflecting the system's substantial contribution to supporting organic agricultural information management.

Search query results in an agricultural information system: precision and effectiveness analysis

Table 4: Results of Query Selection and Search Resource Analysis

No. of Query	Query	Search results	
		Relevant	Irrelevant
1	Plants, Prohibited Practices	15	0
2	Organic Rice, Audit Trail	27	0
3	Minerals, Substances used	19	0
4	Financial risk, Preparation	4	0
5	Farming system, Customer management techniques	2	0

No. of Query	Query	Search results	
		Relevant	Irrelevant
6	Market strategy, Competitive advantage	19	0
7	Agricultural, Management within the organisation, Agricultural production planning	67	0
8	Cost, Account management	50	0
9	Finance company	4	0
10	Investment, Internal factors, Source of Investment	9	0
11	Organic agricultural processing, Export formalities documents	10	0
12	Export market, Target consumer group	9	0
13	International trade, unit, Words used in International trade	27	0

Source: Constructed by authors

Table 4 presents the results of search queries conducted within an agricultural information system, highlighting its exceptional precision across thirteen queries. The system consistently delivered highly accurate outcomes, with all searches returning exclusively relevant results and no irrelevant matches. The queries spanned a range of topics, including organic farming practices, business management, and international trade, demonstrating the system's versatility in addressing diverse informational needs.

The effectiveness of the searches varied notably in terms of the number of relevant results. Queries related to agricultural management and production planning yielded the highest number of relevant matches, totalling 67. This was followed by queries concerning account management costs, which produced 50 relevant results. Other successful queries included those on organic rice audit trails and international trade terminology, each returning 27 relevant matches.

Conversely, some topics generated fewer results. Queries on farming systems and customer management techniques returned only two relevant matches, while searches related to financial risk preparation and finance companies yielded four matches each. The remaining queries, covering market strategy, prohibited practices, and export documentation, produced between 9 and 19 relevant results.

Notably, the absence of irrelevant results across all queries underscores the system's high level of precision in matching search terms to appropriate resources. This performance reflects a well-structured knowledge organisation framework and efficient query processing mechanisms, particularly for agriculture-related information management. Such precision demonstrates the system's potential as a reliable agricultural data retrieval and decision-making tool.

Experimentation results

Experimentation results were analysed to evaluate the performance of the system's precision and recall percentages. Precision, defined as the proportion of relevant results retrieved out of all retrieved results, measures the system's accuracy. On the other hand, recall represents the proportion of relevant results retrieved out of all relevant results available, highlighting the system's ability to retrieve comprehensive information.

Table 5: Experimentation Results with Precision and Recall

Query Number	*Total Relevant in the collections*	*Precision (%)*	*Recall (%)*
1	15	100	100
2	27	100	100
3	19	100	100
4	4	100	100
5	2	100	100
6	19	100	100
7	67	100	100
8	50	100	100
9	4	100	100
10	9	100	100
11	10	100	100
12	9	100	100
13	27	100	100
Average		100	100
Convert to integer		1.00	1.00

Source: Constructed by authors

Table 5 presents the mean precision and recall values achieved in this study, both recorded at 100%. When expressed as full integers (i.e., 1.00 and 1.00), these results demonstrate the system's high effectiveness in information retrieval and completeness. The F-measure, a widely recognised metric for evaluating system efficiency, was employed to assess performance using the following formula:

$$\mathrm{F-measure} = 2 * \frac{1 * 1}{1 + 1}$$

$$\mathrm{F-measure} = 1$$

The study achieved an F-measure value of 1.0, demonstrating the system's high efficiency and exceptional precision in information retrieval. This result underscores the effectiveness of the developed thesaurus with its controlled vocabulary in facilitating the retrieval of information related to the organic agricultural digital platform for young agripreneurs. These findings highlight the thesaurus's utility as a valuable tool for enhancing access to domain-specific knowledge and resources.

Table 5 presents a comprehensive analysis of search performance metrics across 13 queries. The results show remarkably consistent performance, with precision and recall achieving perfect scores of 100% across all queries. The number of relevant items in the collections varied significantly, ranging from as few as two documents (Query 5) to as many as 67 documents (Query 7), with other notable volumes including 50 documents for Query 8 and 27 documents each for Queries 2 and 13. Despite this variation in collection size, the system maintained perfect retrieval performance throughout the experiment. The average precision and recall both stood at 100%, which converts to a ratio of 1.00 when expressed as an integer. This exceptional performance suggests that the system successfully retrieved all relevant documents while avoiding any irrelevant results, regardless of the collection size or query complexity.

The study results are intricately linked to the research questions, providing a comprehensive response to the objectives outlined in the study. The first research question, which sought to identify and develop a thesaurus tailored to the needs of young agripreneurs, was addressed by creating a structured vocabulary comprising 1,054 keywords. These were systematically categorised across six hierarchical levels of depth, enabling semantic exploration and navigation. The terms were meticulously classified into broader terms (BT), narrower terms (NT), associative terms (RT), and non-preferred terms (UF). This hierarchical structure provided a robust framework for understanding organic agriculture terminology and its interrelationships, particularly for emerging entrepreneurs.

The second research question, focusing on the functionality and effectiveness of the thesaurus in facilitating knowledge organisation, was addressed through the development of a digital platform. Using the Tematres system, the platform effectively managed controlled vocabularies, allowing users to navigate relationships such as broader and narrower terms, related terms, and synonyms. The digital platform supported dynamic term entry and retrieval, visualising hierarchical structures and semantic relationships to enhance user accessibility and understanding.

Finally, the third research question, evaluating the efficiency and user satisfaction of the thesaurus platform, was rigorously tested through performance assessments. The platform demonstrated exceptional retrieval accuracy, achieving 100% precision and recall across all queries. The evaluation metrics confirmed the platform's ability to deliver relevant and comprehensive information. Users expressed high satisfaction with the system's ease of use, clarity, and timeliness, further validating its practical utility in organic agriculture knowledge management.

These findings affirm the study's contributions to knowledge organisation and accessibility for young agripreneurs. The thesaurus and its digital platform establish a pioneering model for integrating traditional knowledge organisation principles with advanced digital tools, supporting entrepreneurial growth in sustainable agriculture.

DISCUSSION

This study aimed to develop an organic agriculture thesaurus and digital platform tailored for young agripreneurs, addressing a significant gap in knowledge organisation and accessibility. The findings and implications of the study are discussed below, focusing on the knowledge structure, terminology analysis, thesaurus development, and digital platform creation.

The study identified and categorised knowledge relevant to organic agriculture for young agripreneurs, drawing from 39 information resources. Unlike previous studies that employed broader knowledge management approaches such as ontology and taxonomy (Xie *et al.*, 2015), this research expanded the scope by integrating agricultural methods, organic agriculture, and entrepreneurial concepts. The organic agriculture knowledge was organised into 13 main categories, including foundational concepts (e.g., basics of organic agriculture, organic standards), business strategies, financial management, and marketing channels. This nuanced categorisation surpasses earlier studies, providing a more tailored framework for emerging agripreneurs.

The analysis yielded 1,084 terms; the most significant vocabulary clusters were about organic standards (257 terms), organic agricultural businesses (157 terms), and basic organic agriculture (142 terms). Conversely, knowledge areas such as product pricing factors (13 terms), business strategies (18 terms), and specific terms (20 terms) had limited vocabulary, highlighting the need for further development. These findings suggest that these under-represented areas may hinder the application of knowledge, underscoring the necessity for targeted vocabulary enrichment to support young agripreneurs.

The thesaurus development followed a structured seven-step methodology, drawing on principles from knowledge classification (Hjørland, 2007) and Facet Classification (Prieto-Diaz, 2002). Key steps included vocabulary collection, grouping, prioritisation, and relationship definition. The thesaurus defines relationships such as Broader Terms (BT), Narrower Terms (NT), and Related Terms (RT), ensuring systematic term organisation.

The digital platform, implemented using Tematres (Ferreyra, 2021), enables dynamic knowledge management by incorporating controlled vocabulary, taxonomy, and glossary functions. The platform enhances user engagement by facilitating efficient navigation and understanding of relationships between terms, fostering accessibility and comprehensive learning (Chansanam *et al.*, 2021b). This approach aligns with the Food and Agriculture Organization's AGROVOC initiative, which integrates knowledge using thesauri and semantic web technologies (Caracciolo *et al.*, 2012).

This study addresses the fragmentation of organic agriculture knowledge by creating a structured thesaurus and an accessible digital platform. The platform's systematic organisation and relational features empower young agripreneurs to access and apply knowledge effectively, promoting entrepreneurial growth and sustainability in organic agriculture. Furthermore, this initiative contributes to broader agricultural knowledge systems by integrating entrepreneurial and organic agricultural concepts in a previously unexplored way.

Despite its contributions, the study has limitations. The thesaurus's vocabulary is not exhaustive, particularly in product pricing, business strategies, and specific terms. Future research should focus on expanding these categories to create a more comprehensive knowledge base. Additionally, while the digital platform demonstrates potential, its real-world applicability remains to be validated through user engagement and iterative feedback. Future studies could explore integrating user-generated content and linking the platform with other agricultural knowledge systems to foster collaboration and innovation.

The findings and conclusions of this study have significant implications for both practical applications and future research. The development of the thesaurus and digital platform provides young agripreneurs with an innovative tool to enhance their access to and understanding of organic agriculture knowledge, enabling informed decision-making and fostering entrepreneurial growth. The structured vocabulary and user-friendly platform bridge the gap between fragmented knowledge resources and the practical needs of agripreneurs, contributing to the development of a more efficient and sustainable organic agriculture sector. From a research perspective, this study establishes a foundational framework for integrating thesaurus construction with digital platforms, offering a replicable model for other fields requiring systematic knowledge organisation. Further research could expand the thesaurus to encompass additional domains, refine the platform's semantic capabilities, and explore its integration with ontological frameworks or linked open data technologies. These advancements could enhance knowledge retrieval and management, supporting broader sustainable agriculture, education, and entrepreneurship initiatives.

In conclusion, this study lays a foundation for structured knowledge management in organic agriculture tailored to young agripreneurs. Addressing gaps in vocabulary and accessibility offers a practical tool for knowledge dissemination, paving the way for enhanced collaboration and entrepreneurship in sustainable agriculture.

CONCLUSIONS

This study has significantly contributed to developing a thesaurus and digital platform for organic agriculture specifically tailored to the needs of young agripreneurs. The study identified key knowledge areas by systematically analysing and synthesising content from diverse information resources, including organic agricultural production, standards, business strategies, marketing channels, and logistics. The resulting thesaurus provides a structured framework for organising and accessing terminology in organic agriculture, offering a valuable tool for knowledge management and dissemination.

The study addresses critical gaps in organic agriculture research by combining traditional knowledge organisation methods with modern digital tools. The thesaurus, developed using Tematres, demonstrates the effectiveness of open-source platforms in facilitating vocabulary

recording, organising, and searching. Integrating academic principles with practical functionality enhances the accessibility and usability of organic agriculture knowledge, bridging the gap between theoretical research and real-world application.

Despite its strengths, the study has several limitations. The scope of analysed information resources and vocabulary was limited to certain aspects of organic agriculture and, while comprehensive, it may not encompass all possible related fields. Additionally, the thesaurus focuses primarily on young agripreneurs, leaving room for expansion to other user groups and contexts. The reliance on expert consultation while ensuring accuracy highlights the need for continuous updates and iterative improvements to reflect evolving practices in organic farming.

These limitations present opportunities for future research. Expanding the thesaurus to other domains, such as specific organic farming categories (e.g., organic aquaculture or apiculture), can further enhance its utility. Integrating thesaurus development with ontological frameworks could improve relational mapping and semantic search capabilities, offering more efficient information retrieval. Additionally, creating a comprehensive organic agricultural information system could serve as a centralised repository for knowledge, encompassing raw material production, processing, storage, and transportation, thereby supporting sustainable development in the organic agriculture sector.

In conclusion, this study provides a foundational framework for advancing knowledge organisation in organic agriculture. The thesaurus and digital platform support young agripreneurs and serve as a model for knowledge management in other fields. By fostering improved information access and dissemination, this research has the potential to contribute significantly to the growth of organic agriculture and sustainable practices, ultimately benefiting farmers, entrepreneurs, and policy-makers in the global agricultural community.

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