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Using facet analytico-synthetic method for organizing Thai's indigenous rice knowledge

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Abstract

This study presents the results of research where the content and the structure of Thai indigenous rice knowledge (TIRK) were analyzed using the facet analytico-synthetic method (FASM). Six libraries sites were selected as research areas and their TIRK contents collected from the current library classification system, domain specialists' definitions, and TIRK information resources. The methods used to analyze were content analysis, domain analysis, and a knowledge classification approach using the FASM. The research tools used were an analysis form and the results indicated that the TIRK content had 12,326 items which could be classified into 262 concepts and 11,064 terms. These contents were classified into 3 classes, 9 subclasses, and 22 divisions. The first class was core knowledge which was divided into 2 subclasses: 1) rice plants, comprising 2 divisions: 1.1 rice varieties and 1.2 ethnobotany of rice; and 2) rice production comprising 4 divisions: 2.1 rice planting methods, 2.2 rice planting process, 2.3 rice field maintenance, and 2.4 rice harvesting process. The second class was rice culture which was divided into 2 subclasses: 1) material culture, comprising 2 divisions: 1.1 equipment and 1.2 rice products; and 2) non-material culture, comprising 9 divisions: 2.1 language, 2.2 customs, 2.3 rituals, 2.4 legends, 2.5 folk literature, 2.6 folk tales, 2.7 folk music, 2.8 performing arts, and 2.9 recreation. The third class was endemic knowledge which was divided into 4 subclasses: 1) local scholars, 2) ages, 3) ethnics group, and 4) geographical area.

Introduction

The basic component of any country's knowledge system is its indigenous knowledge, which revolves around the skills sets, experiences, and insights of people, applied to maintain or improve their livelihood. Indigenous knowledge also provides the basis for problem-solving strategies for rural areas (World Bank, 1998). Consequently, indigenous knowledge is a type of traditional knowledge, which has been passed on from one generation to another. Moreover, indigenous knowledge is the main driver for economic and social development in communities (United Nations Environmental Programme [UNEP], 2008).

Thailand's National Economic and Social Development Board (NESDB, 1986) has applied indigenous knowledge to the agricultural development policy since the end of the fifth National Economic and Social Development Plan. The sixth plan (1987–1991) continued restructuring so that it was conducive to social and economic self-reliance by farmers. The plans let groups resolve problems with their accumulated knowledge in the local context. Later, the

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government effectively used the concept of indigenous knowledge in the seventh National Economic and Social Development Plan (1992–1996) to promote the campaign for farmers to use organic fertilizers or organic compost to reduce production costs, to encourage the farmers to pesticides with natural methods to reduce the use of chemicals that are harmful to consumers and the farmers themselves, for example (NESDB, 1991). In addition, the eighth National Economic and Social Development Plan (1997–2001) requested all participating sectors to work together on conservation; dissemination of indigenous knowledge available in the local area, and learning to process construction for farmers extensively (NESDB, 1997). Accordingly, the ninth National Economic and Social Development Plan (2002–2006) encouraged farmers' network and organizations to work together to develop a database to support the indigenous knowledge of each area (NESDB, 2002). The tenth National Economic and Social Development Plan (2007–2011) drove collaboration between farmers and research communities to decode indigenous knowledge to create values from local resources (NESDB, 2007). Furthermore, the eleventh National Economic and Social Development Plan (2012–2016) focused on agricultural sector development. The plan set the policy for fostering the accumulation of farmer knowledge and local wisdom in agricultural areas (NESDB, 2012). Likewise, the eighth national research policy and strategy (2012–2016) required knowledge management of indigenous people be include in the database technology, especially in the rice domain (Office of the National Research Council of Thailand [NRCT], 2011). These policies contribute to the broadening of the Thai indigenous rice knowledge.

Thai indigenous rice knowledge (TIRK) is folk knowledge regarding different aspects of rice, such as in terms of folklore, TIRK has been used to describe the deep relationship between people and rice (Na Talang, 2001). Historians have used TIRK to reflect the beliefs, ritual traditions, and stereotypes of Thai society (Sirindhorn, 1994). Agriculturalists have used TIRK to explain the use of a mechanism implementing folk technology to increase rice yield (Polthanee, 2010). Anthropologists have used TIRK to study the food stability of ethnic groups (Warren, 1991). Educators have used TIRK to study indigenous rice farming technology and the dynamics of rice farming transitions in central Thailand (Traimongkolkul, Tanpichai, & Srisuantang, 2001) and linguists have used TIRK to study civilization in the inheritance of knowledge and wisdom of human culture (Thongdee, 2008). In addition, Thai researchers have applied TIRK to study and develop extensive commercial products, such as the development of native rice genetics to increase productivity, the development of patient-friendly rice hypertensive plates, and adding value to tourism destinations with rice culture (Damsri & Kuikaew, 2001; Kaosa–ard, 2005; Panyakul, 1997). These research reports revealed the endemic characteristics of TIRK that reflect on the achievements of the farmers in different contexts and the richness of local Thai and ethnic languages. With the mentioned situation, the concepts and terminologies in these research reports are complex and in some respects, TIRK has a vague knowledge structure, which inevitably affects the user's ability to access and retrieve intellectual property knowledge. Therefore, the objectives of the study were: (1) to analyze the content of TIRK using the facet analytico-synthetic method, and (2) to propose a conceptual model for exploring the knowledge structure of TIRK.

Literature Review

Defining knowledge structure that is endemic and different in many respects requires in-depth analysis of the variety of specific aspects, for which one option is to apply the facet approach (Vickery, 1960) also known as facet analysis which was invented by Ranganathan, the father of the Indian library (Ranganathan, 1987) by dividing knowledge in any knowledge-based field into phenomena by which the content in those disciplines has some common features. Later, the British Classification Research Group developed it into a facet analytico-synthetic method (FASM), which was used to analyze interdisciplinary knowledge structures and applied to the knowledge of TIRK, which was related to many fields of science as well. The guidelines for grouping knowledge using named facets appear in the content of knowledge. The facet was defined to divide the content of knowledge, to help analyze the concept in greater detail, and to help present the structure of TIRK in a very accurate and profound way. It also analyzed the relationship of knowledge content by the concept of each side (a faceted concept) independently and it was very useful to users who wanted to find knowledge and learn about the actual view or idea in the document in detail by explaining concepts and terms within each knowledge group of TIRK based on empirical evidence (Rational Intuition) to establish the logic of the relationship within the TIRK domain.

The aim of the current research was to organize Thai indigenous rice knowledge using mainly content analysis to take concepts and terminology from Thai indigenous rice knowledge resources (Taylor, 2004) and to use domain analysis to define knowledge groups that correspond to definitions of Thai indigenous rice knowledge (Hjorland, 2001) and then, to consider the relationship between knowledge groups using a knowledge classification approach to identify the same and similar content. The structure of knowledge domain is divided into class, subclass and division, respectively (Broughton, 2006; Kumar, 1985) and uses the FASM to group new knowledge into fields of complexity (Vickery, 1960) and to identify the characteristics of Thai indigenous rice knowledge clearly (Ranganathan, 1987).

Methods

The use of the FASM for Thai indigenous rice knowledge is qualitative research that used documentary studies involving three processes as follows:

1. Content analysis and domain analysis of Thai indigenous rice knowledge

1.1. To analyze content that appears in today's knowledge organization system, the researchers study knowledge organization system which is the source of information of current Thai indigenous rice knowledge. Sources

investigated were: Dewey Classification System (DC), Library of Congress Classification System (LC), Sears List of Subject Headings (SLSH), and Thai Subject Headings (TSH) and the AGROVOC Thesaurus by the Food and Agriculture Organization of the United Nations (FAO, 2016). The research method used was document analysis. The research tools were recording content, data collection using in-depth analysis for structural analysis, (by class, subclass, division, and special characteristics). The relationships between contents were sorted by category according to the knowledge classification approach.

1.2. To analyze the domain of Thai indigenous rice knowledge, the researchers analyzed the domain of Thai indigenous rice knowledge according to the literature guides of Hjorland (2001), by synthesizing definitions from experts such as Damsri and Kuikaew (2001), Narasach (2009), Satsanguan (1993), Sirisai (1995), Sondrawong and Kabmala (2014), Thai Indigenous Rice Knowledge Encyclopedia (Biodiversity –based Economy Development Office [BEDO], 2009), Thammathi (2013), Thongdee (2008), and Traimongkolkul et al. (2001). The research tools were recording content, data collection using the definition of Thai indigenous rice knowledge from the experts and then combining the synthesized results to define the complete scope and description of the knowledge by analyzing definitions, sorting by topic, and applying the results of the analysis grouped according to the knowledge classification approach.

2. Analysis of knowledge content from information resources

2.1. The sampling used in this research study was information resources of Thai indigenous rice knowledge, such as books, textbooks, documents, research reports, and academic journals from six places which had been providing their services to TIRK for a long time, namely: 1) Library of Ministry of Agriculture, 2) Kasetsart University Library, 3) Research Library of the National Research Council, 4) Thailand Research Fund Library, 5) Sirindhorn Anthropology Center Library (Public Organization), and 6) Library of the Institute of Language and Culture of Asia, Mahidol University. The researcher used only the following main title entries to select information resources: “The indigenous rice knowledge”, “Local knowledge about rice”, “The indigenous knowledge of farmers”, and “Rice culture.” Then, the details were studied in the books, such as main titles, subtitles, preface, content, chapter titles, topic titles, and important content of each title and these were then grouped according to their contents. It was found that the number of information resources meeting the criteria was 460 as shown in Table 1.

2.2. For sample selection, the researcher grouped knowledge content of Thai indigenous rice knowledge information resources by titles which were divided into five knowledge groups. Then, to reduce duplication of the criteria for document selection, only one book was selected from the information resources with the same topic or with a slightly different name but with same content by selecting the most complete content which was based on the contents, year of publication, and up-to-date content of the book. When the researchers grouped the documents by title and selected the sample to study according to the criteria, it was found that the information resources with the knowledge content did not overlap and involved 131 books, as detailed in Table 2.

Table 1
Information resources classified by area of study

Source of information	Amount	Number of entries
1. Library of Ministry of Agriculture	13,290	80
2. Kasetsart University Library	169,799	146
3. Research Library of the National Research Council	87,295	98
4. Thailand Research Fund Library	9,505	22
5. Sirindhorn Anthropology Center Library	107,300	37
6. Library of the Institute of Language and Culture of Asia	24,361	77
Total (items)	411,550	460

2.3. For the content analysis of information resources of Thai indigenous rice knowledge, the researchers used the concept of Taylor and Joudrey (2009) to examine the important content of each item and to define the representative concepts and terms. Concept analysis considered the titles and other information as it appeared in the main titles, subtitles, preface, table of contents, and term analysis. It especially considered the key vocabulary that was important and which appeared in the title, subtitle, and index at the end of the book. There was also checking for duplication by cutting off similar terms or concepts, but keeping different vocabulary or concepts with the same meanings, including the same vocabulary or concepts with different contents. At this stage, the researcher used the knowledge classification approach, whereby the concepts or terminologies used in the analysis were organized into the same content group and similar content groups were kept close together. The tool used was a content analysis model that provided hierarchical knowledge structure, which was divided

Table 2
Information resources of TIRK analyzed by content grouping

Content group	Description of scope of knowledge content	Participants	Samples
1. Rice plantation	Rice plantation, maintenance and harvest	115	34
2. Local technology	Traditional farming tools made for rice cultivation	24	12
3. Rice culture	Values, beliefs, and rituals, associated with rice	215	45
4. Natural resources	Strategies for using natural resources for rice cultivation	87	29
5. Local scholar	Concept and transfer of skills from local scholar	19	11
Total (items)		460	131

into classes, subclasses, and divisions, respectively, with description of knowledge. If any content was found to be not in any group, it was put in a new group immediately.

3. Structuring of Thai indigenous rice knowledge using facet analytico-synthetic method

The structuring of Thai indigenous rice knowledge using FASM involved:

3.1. Determining the content and subject domain according to the structure of Thai indigenous rice knowledge.

3.2. Selecting attributes that indicated the essence of Thai indigenous rice knowledge by defining the basic attributes of each facet for analysis of content in each category using ideas or words to analyze according to the definition of meaning in each word and considering which content in each category showed the attributes of the factor.

3.3. Choosing a way to group or divide ideas from a variety of perspectives in order to classify knowledge of Thai indigenous rice knowledge that provided knowledge structures showing the extent of knowledge content hierarchically to represent knowledge groups in classes, subclasses, and divisions, respectively.

3.4. Classifying knowledge or dividing knowledge by considering common and differentiating attributes based on some fundamental aspects common in multidisciplinary subjects to use as indicators in the synthesis of knowledge at the subclass and division levels which are based on the structure of Thai indigenous rice knowledge.

3.5. Structuring knowledge into a system (citation order) on the basis of relevant succession or in chronological order or alphabetical order. Then, considering the relationship between knowledge based on the concept of order and focus (principle for citation order of facets and foci).

Results and Discussion

Content Analysis of TIRK as Revealed in Current Knowledge Classification System

1. Analysis of Knowledge Classification System

1.1. The results of system analysis of the knowledge organization system using Dewey Classification System model (DC) and the Library of Congress (LC) identified that Thai indigenous rice knowledge was one knowledge group that appeared in the knowledge structure of the DC and the LC systems and it was divided into 60 domains, 23 classes, 103 subclasses, and 2,217 divisions. However, when using the FASM and grouping the same contents together, relevant contents were found to be grouped into 5 domains, 22 classes, 78 subclasses, and 161 divisions, respectively, as shown in Table 3.

1.2. For grouping the new contents at the domain level, the researchers considered the 60 domain-level content from the DC and LC systems, and it was found that the knowledge structure showed knowledge content from general to the specific and expressed the relationship within content as classes, subclasses, divisions, and subdivisions in accordance with the Principle of Knowledge Organization. The contents of domain were synthesized and related to each other in accordance with the principles of the knowledge classification approach, which resulted in a classification into 5 domains and 22 classes.

1.3. For grouping of new contents at the subclass level, the researchers considered 103 subclass contents from the DC and LC systems and again grouped them into new categories of subclasses within each category by using the principle of grouping knowledge under the subclasses that the researcher had set earlier. It was found that the knowledge of Thai indigenous rice knowledge could be classified into 78 subclasses.

1.4. For grouping of new contents at the division level, the researchers used the FASM method by merging the DC and LC systems content into a group of 2,217 divisions. They were again grouped and subdivided into subclasses within each category to group the knowledge under the subclasses that the researcher had set earlier. It was found that the Thai indigenous rice knowledge could be classified into 161 divisions.

Table 3
Knowledge group of knowledge organization by classification system having TIRK content

Knowledge organization system	Domain	Class	Subclass	Division
1. Dewey Classification System	28	9	45	465
2. Library of Congress Classification System	32	14	64	1,752
Total	60	23	103	2,217

Thai indigenous rice knowledge was not the main domain, while there was development of universal knowledge, thus making the content of TIRK appear as subclasses or subdivisions under classes of the knowledge system, such as cooperative labor culture. The DC system organized at the subclass level of the exchange connector (Barter) [332.54], while the LC system was organized into a wider system of balance of trade subclasses [HF1014–1020]. These findings provide evidence that TIRK has a wide range of interdisciplinary knowledge latently embedded in the various categories. At the same time, while under TIRK the groups should be placed closed to each other, different knowledge groups were arranged at different level. For example, farm irrigation systems in the DC system were classified as subsistence systems into 627 subclasses of hydraulic engineering and also appeared in the 333.91 subclasses of water resources for irrigation. In the LC system, classification of farm irrigation was included in subclass HD1711 of irrigation and in subclass TC801 of hydraulic engineering. Therefore, an important finding from these results is the need for the TIRK system to be clear and to cover the special features of TIRK, such as beliefs, customs, rituals, ethnic groups, and dialects.

2. Analyzing currently available content manuals

The results of the analysis of the current content manuals involved: 1) AGROVOC Thesaurus, 2) Thai Agricultural Thesaurus, 3) Sears List of Subject Headings, and 4) Thai Subject Headings. It was found that the knowledge structure of these manuals showed the knowledge relationships in broader, narrow, and related terms as well as the content description (scope note), with more than 4,000 vocabularies analyzed in depth, specifically related to Thai indigenous rice knowledge using the validated term "indigenous rice knowledge". It was found out that this term was not defined as a heading or in the main vocabulary. The researchers then split the term into sections and typed the new words "indigenous knowledge" or "rice culture" respectively, and found out that there was a collection of 388 vocabularies which were divided into main groups and associated groups, which are shown in detail in Table 4.

3. Synthesis of defining meaning of Thai indigenous rice knowledge

The researcher analyzed the results of the LC and DC knowledge organization systems, as well as using the analysis results of the manuals that defined the content that was currently available by reclassifying it into new knowledge groups and using the FASM method as well as the definition of TIRK from experts such as Damsri and Kuikaew (2001), Narasach (2009), Satsanguan (1993), Sirisai (1995), Sondrawong and Kabmala (2014), Thai Indigenous Rice Knowledge Encyclopedia (BEDO, 2009), Thammathi (2013), Traimongkolkul et al. (2001), and Thongdee (2008). It was found they could be classified into 11 classes, 100 subclasses and 364 terms, where the 11 classes were: 1) farming, 2) rice, 3) resource knowledge, 4) knowledge of agricultural tools, 5) knowledge of animal husbandry in rice fields 6) knowledge of rice production, 7) value knowledge, 8) traditional knowledge, 9) ritual knowledge, 10) folklore knowledge, and 11) endemic knowledge.

Content Analysis of Knowledge from Information Resources

1. Content analysis of knowledge from information resources of TIRK

The researcher analyzed the knowledge content in TIRK, totaling 11,536 items, grouped as 262 concepts and 11,274 words where the top three classes were rice class with 5,783 items, number of beliefs and contraindications class with 1,032 items, and rice planting class with 1,024 items, respectively. After that, the researcher introduced the concepts and terminologies which were analyzed and combined with the results of content analysis from information resources by reconsidering the knowledge content of all knowledge classes and all levels of knowledge according to the knowledge classification approach to determine the knowledge structure that showed the knowledge content of the TIRK hierarchical structure. They were divided into classes, subclasses, divisions, and subdivisions, respectively. Including the classification of knowledge contents of TIRK from general to the specific

Table 4
Knowledge group of knowledge organization by contents manuals having TIRK content

Items	Border term	Narrow term	Related term	Border term	Narrow term	Related term	Total
1. AGROVOC Thesaurus	–	8	10	–	23	82	123
2. Thai Agricultural Thesaurus	–	9	8	–	25	62	126
3. Sears List of Subject Headings	5	18	7	27	23	35	95
4. Thai Subject Headings	13	6	6	5	12	4	44
Total	–	8	10	–	23	82	123

Table 5
Content analysis of knowledge from information resources of TIRK

Knowledge domain	Concept[a]	Vocabulary[a]	Total[a]	Terminology[b]	Duplicated	Remaining
First class, TIRK's core domain						
1.1 Rice	7	5,776	5,783	95	23	5,855
1.2 Rice plantation	107	754	861	192	29	1,024
Second class TIRK's relative domain						
2.1 Tools and equipment	18	245	263	24	–	287
2.2 Rice production	8	235	243	82	5	320
2.3 Value and method	12	865	877	24	18	883
2.4 Beliefs and prohibition	37	995	1,032	85	5	1,112
2.5 Traditions and rituals	28	700	728	58	–	786
2.6 Folklore and recreation	24	358	382	147	–	529
Third class, TIRK's special domain						
3.1 Local scholar	1	78	79	–	–	79
3.2 Ages	8	10	18	32	4	15
3.3 Ethnicity	1	77	78	27	27	51
3.4 Geographic area	2	1,080	1,082	77	77	1,005
Total (items)	262	11,274	11,536	674	125	12,326

[a] Vocabulary from TIRK information resources
[b] Terminology analyzed from the current knowledge classification system and the experts

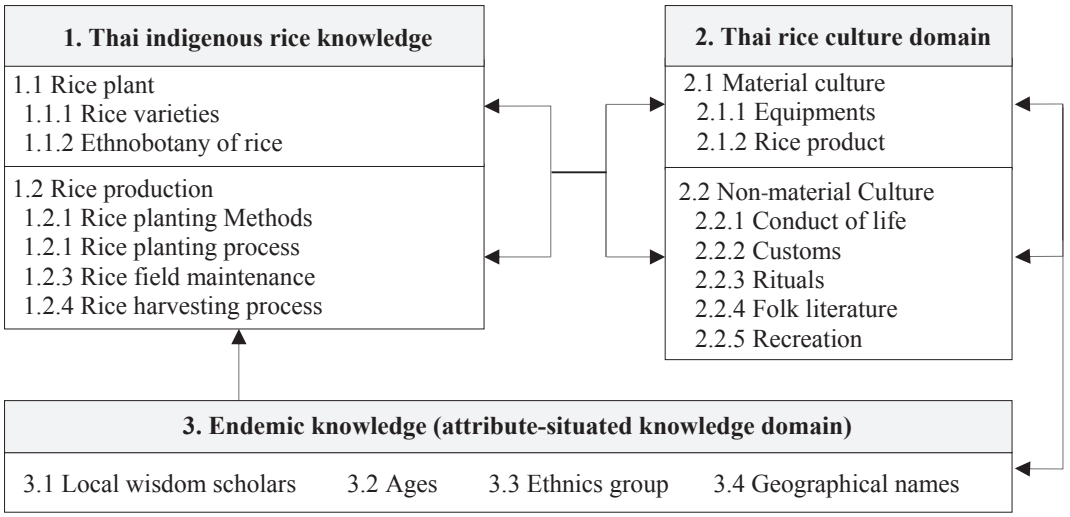

Figure 1 Thai indigenous rice knowledge conceptual model

Table 6
Thai indigenous rice knowledge structure: class 1 core knowledge of TIRK

Subclass	Division	Special attributes
1) Rice	1.1) Rice varieties	– List of rice varieties
	1.1.1) Name of varieties of rice	– Beliefs
	1.1.2) Types of rice	– Value
	1.1.3) Rice rigin	– Tradition
	1.1.4) Special characteristics of rice varieties	– Ritual
	1.1.5) Utilization of rice varieties	
	1.1.6) History of rice	
	1.1.7) Founder/developer of rice varieties	
	1.2) Ethnobotany of rice	– Beliefs
	1.2.1) The structure of naming the indigenous rice.	– Value
	1.2.2) Classification of indigenous rice	– Tradition
	1.2.3) Meaning of rice name	– Ritual
2) Rice production	2.1) Rice planting method	– List of ways to grow rice
	2.1.1) Rice planting method by water used for plantation	– List of types of water resources
	2.1.2) Seasonal rice cultivation	– List of soil types
	2.1.3) Rice planting method by condition of water	– List of area types
	2.1.4) Rice planting methods by area condition	–List of related animals
	2.1.5) Rice planting method by harvesting condition	– Beliefs
	2.1.6) Rice planting methods by animal labor	– Value
	2.1.7) Rice planting methods divided by light sensitivity	– Tradition
	2.1.8) Rice planting methods by rice age	– Ritual
	2.2) Rice cultivation process	– List of rice lanting processes
	2.2.1) Preparation of space	– Beliefs
	2.2.2) Soil preparation	– Value
	2.2.3) Sowing	– Tradition
	2.2.4) Seedling production	– Ritual
	2.2.5) Transplanting	
	2.3) Rice maintenance	– List of diseases and insects
	2.3.1) Climate factors	– List of herbs used to care rice.
	2.3.2) Water in agriculture	– Fertilizer and nutrient formula.
	2.3.3) Putting fertilizer	– Beliefs
	2.3.4) Prevention from rice pests	– Value
	2.3.5) Weed control	– Tradition
	2.3.6) Prevention of rice disease	– Ritual
	2.4) Harvesting of rice	– Beliefs
	2.4.1) Rice collection	– Value
	2.4.2) Harvesting	– Tradition
	2.4.3) Drying	– Ritual
	2.4.4) Threshing	
	2.4.5) Rice and grain storage	

and when compared with the current knowledge-based system, the concepts and terminologies analyzed made up 12,326 items which were classified as 262 concepts, and 11,274 terminologies. There were three domains. The first domain was the TIRK core domain which comprised: 1) rice and 2) rice plantation. The second domain was Thai rice culture which consisted of: 1) tools and equipment, 2) rice production, 3) value, 4) beliefs, 5) traditions and rituals, and 6) recreation. The third domain was endemic knowledge which consisted of: 1) local scholar, 2) age, 3) ethnicity, and 4) geographical area; as shown in detail in Table 5.

2. Determination of the structure of Thai indigenous rice knowledge

The researchers analyzed the specific vocabularies which were subclasses using faceted approach and using FASM to group new knowledge according to complexity and to identify the characteristics of TIRK clearly (Ranganathan, 1987; Vickery, 1960). This was done according to Prieto–Diaz (2002) who proposed custom-made classification schemes by developing classification schemes in the field of linguistics which were convenient for domain models and expressed the relationship between different hierarchies also known as "literary warrant". The researchers chose the class title of classified information resources and listed each vocabulary based on actual terms. Then, the related vocabularies were grouped in classes with the synthesis classification from the bottom to top (bottom-up) to describe the relationship of vocabulary (descriptors) in a clear knowledge structure (Vickery, 1960). The results of the knowledge analysis revealed 262 items classified as concepts and 11,064 items classified as terms, totaling 12,326 items. The knowledge structure of Thai indigenous rice knowledge was divided into 3 classes, 9 subclasses, 22 divisions, 6 special attributes, and 116 relations. The details are shown in Figure 1 and Tables 6–8.

3. Characteristics of Thai indigenous rice knowledge

Thai indigenous rice knowledge is knowledge that comes from the way of life by adapting it with nature until it has become the social order with rice as the basic factor. It causes Thai indigenous rice knowledge to be integrated knowledge that links content to different branches of science and to have the characteristic of endemic knowledge (situated knowledge) which has specific geographical and social-cultural context. Therefore, Thai indigenous rice knowledge is conveyed in different Thai dialects and is also tightly linked to the value, beliefs, and relationships of ethnic groups.

4. Relationships among Thai indigenous rice knowledge

The structure of Thai indigenous rice knowledge shows the relationship between hierarchical content (hierarchical relationship) from the most general to specific content, respectively, by aligning the same knowledge content and related content close together. Therefore, the nature of the relationship of Thai indigenous rice knowledge is an associative relationship between main Thai indigenous rice knowledge, rice culture knowledge class, and endemic knowledge class, such as the process of preparing the soil, plowing tools, rituals during plowing, beliefs about soil, and the concept of soil of each local scholar.

Table 7
Thai indigenous rice knowledge structure: class 2 Thai rice culture

Subclass	Division	Special attributes
1) Material culture	1.1) Tools and equipment	– List of tools and equipment
	1.1.1) Tools used to plant rice	– Beliefs
	1.1.2) Infrastructure related to rice	– Value
	1.1.3) Transportation of rice	– Tradition
	1.1.4) Rice weighing scale	– Ritual
	1.2) Rice products	– List of rice products
	1.2.1) Rice as food	– Beliefs
	1.2.2) Rice snacks	– Value
	1.2.3) Rice drinks	– Tradition
	1.2.4) Rice supplies	– Ritual
	1.2.5) Waste from rice planting	
2) Non-material culture	2.1) Lifestyle	– List of lifestyle
	2.2) Rice-related traditions	– List of traditions
	2.3) Rituals related to rice	– List of rituals
	2.4) Folk literature	– List of folk literature
	2.4.1) Myths about rice	– List of myths
	2.4.2) Native narrative related to rice	– List of native tales
	2.5) Recreation related to rice	– List of folk music
	2.5.1) Folk music related to rice	– List of performing arts
	2.5.2) Performing arts related to rice	– List of folk sports
	2.5.3) Folk sports related to rice	– List of folk games
	2.5.4) Traditional folk games	

Conclusion and Recommendation

Classification of Thai indigenous rice knowledge using the facet analytico-synthetic method (FASM) helped to show the structure of knowledge based on evidence or literary warrant that can link all related content (principle of containing relation) by classifying from the general to the specific which reflects the characteristics of a specific field (discipline), concepts, and terminology that are

Table 8
Thai indigenous rice knowledge structure: class 3 endemic knowledge

Subclass	Division	Special attributes
1) Person	1.1) Local scholars	– List of local scholar
2) Ages	2.1) Prehistory age	– List of ages
	2.2) Historical age	
	2.3) Current age	
3) Ethnic groups	3.1) Ethnics groups in Thailand	– List of ethnic groups
4) Geographical area	4.1) Provincial level	– List of geographical territories
	4.2) District level	

interrelated within the knowledge group (Broughton, 2006) which define the structure of TIRK that is specialized knowledge (discipline) should take into account specific aspects as well, such as rice cultivation, rice culture, value, beliefs, customs, and rituals related to rice. This is in line with the concept of wealth (Santasombut, 1999) that describes the structure of TIRK into four levels: knowledge at the resource level, knowledge at the resource management system level, knowledge in faith-ritual, and knowledge at the level of thought developed from the relationship between people and people, people with nature, and people with the supernatural. Therefore, TIRK can be developed to convey modern knowledge according to the concept of Taylor (2004) by setting the domain and structure of TIRK into subclasses. Furthermore, it shows the relationship between concepts within those sub classes, including the special characteristics of specific knowledge. The use of the analytical method and organizing structure of Thai indigenous rice knowledge systematically (systematic order) facilitated the development of TIRK ontology and should be evaluated by TIRK knowledge domain experts in the future.

Conflict of Interest

There are no conflicts of interest to be declared.

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References

Biodiversity—Based Economy Development Office. (2009). *Thai indigenous rice knowledge encyclopedia*. Bangkok, Thailand: Author. [in Thai]

Broughton, V. (2006). *Essential classification*. London, UK: Facet Environment.

Damsri, W., & Kuikaew, P. (2001). *The rice culture and community potency in the areas around the Songkhla Lagoon*. Bangkok, Thailand: The Thailand Research Fund. [in Thai]

Food and Agriculture Organization of the United Nations. (2016). *AGROVOC Thesaurus*. Rome, Italy: Author. Retrieved from http://aims.fao.org/standards/agrovoc.

Hjorland, B. (2001). Domain analysis in information science. *Journal of Documentation, 58*(4), 422—462.

Kaosa—ard, M. (2005). *Local wisdom evaluation: Thai rice varieties*. Chiang Mai, Thailand: Chiang Mai University. [in Thai]

Kumar, K. (1985). *Theory of classification*. New Delhi, India: Vani Educational Book.

Na Talang, A. (2001). *Thai wisdom*. Bangkok, Thailand: Amarin Printing. [in Thai]

Narasach, B. (2009). *History of Isan's local knowledge*. Khon Kaen, Thailand: Khon Kaen University. [in Thai]

National Economic and Social Development Board. (1986). *Sixth national economic and social development plan (1987—1991)*. Bangkok, Thailand: Author. [in Thai]

National Economic and Social Development Board. (1991). *Seventh national economic and social development plan (1992—1996)*. Bangkok, Thailand: Author. [in Thai]

National Economic and Social Development Board. (1997). *Eight national economic and social development plan (1997—2001)*. Bangkok, Thailand: Author. [in Thai]

National Economic and Social Development Board. (2002). *Ninth national economic and social development plan (2002—2006)*. Bangkok, Thailand: Author. [in Thai]

National Economic and Social Development Board. (2007). *Tenth national economic and social development plan (2007—2011)*. Bangkok, Thailand: Author. [in Thai]

National Economic and Social Development Board. (2012). *Eleventh national economic and social development plan (2012—2016)*. Bangkok, Thailand: Author. [in Thai]

Office of the National Research Council of Thailand. (2011). *Eighth national research policy and strategy (2012—2016)*. Bangkok, Thailand: Author. [in Thai]

Panyakul, P. (1997). *Indigenous knowledge and biodiversity*. Bangkok, Thailand: Green Net's Foundation's. [in Thai]

Polthanee, A. (2010). Indigenous agricultural knowledge—A sample of practice in Northeast Thailand. *International Journal of Environmental and Rural Development, 1*(1), 68—73.

Prieto—Diaz, R. (2002). *A faceted approach to building ontologies*. Paper presented at International Conference on Conceptual Modeling, Tampere, Finland, October 7–11, 2002.

Ranganathan, S. R. (1987). *Colon classification*. Bangalore, India: Sarada Ranganathan Endowment for Library Science.

Santasombut, Y. (1999). *Biodiversity and indigenous knowledge*. Chiang Mai, Thailand: Nupaburee Press. [in Thai]

Satsanguan, N. (1993). *Rice culture in Thai society*. Bangkok, Thailand: Chulalongkorn University. [in Thai]

Sirindhorn, H. R. H. Princess Maha Chakri (1994). *Thai rice to Japan*. Bangkok, Thailand: Amarin Printing. [in Thai]

Sirisai, S. (1995). *Goddess of rice, soul of the nation*. Nakhon Pathom, Thailand: Mahidol University. [in Thai]

Sondrawong, P., & Kabmala, M. (2014). *An analysis of knowledge agricultural local wisdom*. Chiang Mai, Thailand: Maejo University. [in Thai]

Taylor, A. G. (2004). *The organization of information* (2nd ed.). Wesport, CT: Libraries Unlimited.

Taylor, A. G., & Joudrey, D. N. (2009). *The organization of information* (3rd ed.). Wesport, CT: Libraries Unlimited.

Thammathi, S. (2013). *Traditions and rituals — Ancient Lanna farming*. Chiang Mai, Thailand: Chiang Mai University. [in Thai]

Thongdee, O. (2008). *The rice culture: Rituals concerning rice and farming, the technology of the past, the tradition at present, legend of the future*. Bangkok, Thailand: Mahidol University. [in Thai]

Traimongkolkul, P., Tanpichai, P., & Srisuantang, S. (2001). From indigenous technology to modern technology in rice farming. *Kasetsart Journal: Social Sciences, 22*(1), 1—13. [in Thai]

United Nations Environmental Programme. (2008). *Indigenous knowledge in disaster management in Africa*. Retrieved from http://www.unep.org/ik.

Vickery, B. C. (1960). *Faceted classification: A guide to construction and use of special schemes*. London, UK: Aslib.

Warren, D. M. (1991). *Using indigenous knowledge in agricultural development: World bank discussion paper no. 127*. Washington, DC: The World Bank.

World Bank. (1998). *Indigenous knowledge for development. A framework for action*. Knowledge and Learning Center, African Region. Washington, DC: Author.