

Aree Thunkijjanukij 2009: Ontology Development for Agricultural Research Knowledge Management: A Case Study for Thai Rice. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Professor Supamard Panichsakpatana, Ph.D. 249 pages.

This research is a pilot project aiming to develop a prototype ontology for plant production using Thai rice as a case study. It is expected that the developed ontology will be a prototype model for other efforts aimed to develop plant production ontology in the future. This rice production ontology is created from scratch using known ontological development processes, but it is the first of its kind based on a specific crop. Rice was chosen as the topic because of its importance to Thai society and the accumulated knowledge on it within Thailand. The Thai Rice Production Ontology provides an organizational framework of 2,322 concepts and 5,603 terms, in a system of hierarchical relations, together with 57 associative relations and 12 equivalence relations that allows reasoning about rice production knowledge. 2,687 terms in the ontology (about 48 percent) already exist in the Thai AGROVOC Thesaurus. Concepts and relations were formalized, then verified, and imported into the AGROVOC Concept Server Workbench. A specific Thai Agricultural Ontology Visualization tool was developed to present a graphical view of the ontology, and thus facilitate ontology editors. With this graphical facility, and with the criteria validated by experts, the ontology could be further refined. Guidelines and criteria, together with rules for maintaining the ontology, were created from the development process. The rice production ontology query expansion can improve information retrieval performance and answer questions which a retrieval system without ontology cannot. Terms in the ontology were used to query the Thai Rice Research Database (1,350 records). The efficiency of the query is measured in terms of precision and recall. The experiment was conducted using 5 competency questions, and 93 queries were also defined. Retrieval experiments were compared between conventional search and ontology search, supported with rice production ontology-based query expansion. The results showed that precision and recall rates increased averagely from 0.08 to 0.72 and 0.01 to 0.64, which means an improved efficiency of more than nine and sixty four times from the conventional search.

This study has implications for guiding the construction of other plant production ontologies for research knowledge management in Thailand. The guidelines and criteria will facilitate agricultural information specialists and agriculture domain experts to develop their own domain ontologies. Finally, the developed Thai Rice Production Ontology will be a knowledge base for rice production research knowledge management in Thailand.

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Thesis Advisor's signature

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