

## Use of Ontology in Content Management by Developing Concept Maps and Topic Maps

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### ABSTRACT

*Currently, we find farmers facing various problems while cultivating a crop. They approach research organizations for a better solution. A delay in obtaining the solution can badly affect the farmer and he may incur a huge loss. Therefore, getting a real time solution is very important to the farmer for his sustainable source of revenue. Information & Communication Technology (ICT) can play a key role in providing solutions in time. Though various ICT tools are available, mostly computers with Internet are being widely used to provide information to farmers. As farmers find difficulty in operating a computer, extension worker can act as a mediator to retrieve the data and provide it to a farmer. The extension worker spends much time to search the content available at various sources in a scattered manner and then provide the appropriate information required by the farmer. The content management systems (CMS) help in maintaining the scattered content present in a particular format. But, through CMS it is difficult to retrieve the definite data while, ontology helps in easy retrieval of data and also describes resource location. Ontology is a model of organized knowledge in a restricted domain. It refers to the representation of various concepts and the relationships between these concepts. Concept maps and topic maps use ontology to represent relationships among various concepts and topics. The present study was taken up during 2008 to develop concept maps and topic maps for Sorghum crop.*

**Key words:** Content; Concept maps; Topic maps;

Agriculture is the backbone of our country where about two third of the population depend on agriculture for their livelihood. While cultivating a crop, farmers face various problems with regard to cultivation practices, weed management, disease and pest management and others. Hence, they approach research organizations for better solutions. A delay in getting the solution can make much difference to a farmer and there is possibility that he may lose the crop. Use of Information and Communication Technology (ICT) can play a major role in giving solutions to farmers in time.

Information and Communication Technology refers to the dissemination of information using various communication devices such as television, radio, telephone, etc. Among the available ICT tools, mostly computers with Internet are being used to provide information to farmers. To fulfill the needs of the farmer, Research Organizations are striving hard to provide information from lab to land by using ICT. The extension

worker may act as a mediator in operating the computer as farmers may find difficulty in operating it.

Content Management Systems (CMS) can play a major role in giving the required information to the farmers. In CMS, the content is made available at various sources and is present in a scattered manner. Hence, a user takes much time in retrieving the information using CMS. Use of Ontology in Content Management can act as a solution for the above mentioned limitation by facilitating a fast search and retrieval of information by the user.

Ontology is the representation of various concepts and relationships between them. It increases the efficiency and consistency of describing resources. Concept maps and topic maps use ontology to represent relationships among various concepts and topics. A concept map is a diagram showing relationships among concepts. These maps are used to generate new ideas and to aid creativity. A Topic Map is an ISO standard

for the representation and interchange of knowledge, with an emphasis on the findability of information.

The present study is on developing the concept maps and topic maps for Sorghum crop. To develop the concept maps the open source software called Institute for Human and Machine Cognition was used. Three concept maps were developed with proper modification of terminology in relationships in each map. In third map AGROVOC relationships were used which showed good relationships among concepts.

To develop a topic map, the open source software Topic Map for e-Learning was used. The topic maps are published in Omnigator where these maps can be vizigated. Omnigator facilitates the view of associations and occurrences in the topic map.

## METHODOLOGY

“A Content Management System is a distributed software system which treats information in a granular way, enabling the access, versioning, and dynamic assembly of pieces of information, named contents, such as diagrams, tables, images, or pieces of text” (Canfora G *et.al*, 2002).

In computer science terms, ontology is defined as “an explicit specification of conceptualization” (Gruber, 1993). A Concept map is the diagram showing the relationships among the concepts. The relationships are labeled arrows connecting the concepts. In general, concepts are represented in rectangle boxes and relationships with arrows. This gives the hierarchical structures ([http://en.wikipedia.org/wiki/Concept\\_map](http://en.wikipedia.org/wiki/Concept_map)). The software Institute for Human and Machine Cognition (IHMC) was used to develop Concept maps.

Topic Map is an ISO standard for the representation and interchange of knowledge, with an emphasis on the findability of information (Piedad Garrido, Jesús Tramullas, 2004). A topic map is a formalism to represent knowledge about the structure of an information resource and to organize it in topics. These topics have occurrences and associations that represent and define relationships between them. Information about the topics can be inferred by examining the associations and occurrences linked to the topic. A collection of topics and associations is called a topic map (D.V.Janardhan Rao, *et.al*, 2006). These maps enable a user to retrieve the data easily as they act like a cover page over the content that is available and specify the location of the resource. The software

called Topic Map for e-Learning (TM4L) was used to develop topic maps.

The two softwares that is Institute for Human and Machine Cognition and Topic Map for e-Learning are open source softwares.

Initially, the concept maps were developed by using the software IHMC Cmap Tools. The first concept map is the articulation of the basic idea about Sorghum crop present in the mind. Later, another concept map has been developed making few changes in the first map. The difference between the two maps is the terminology used to describe the relationships between the concepts. Third concept map was developed using AGROVOC relationships which shows good relationships among concepts and conveys proper meaning to the concept.

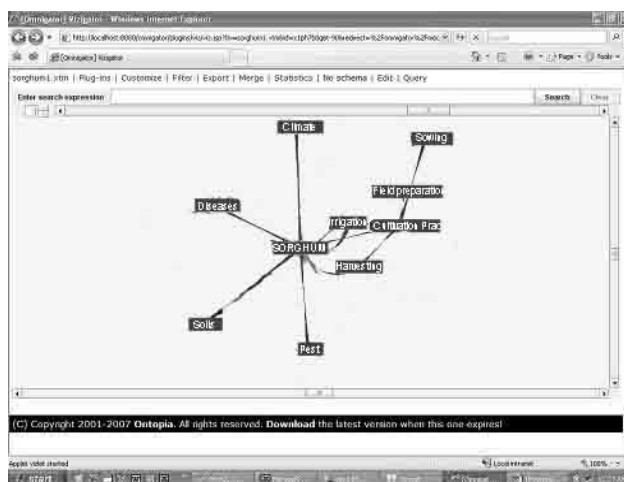
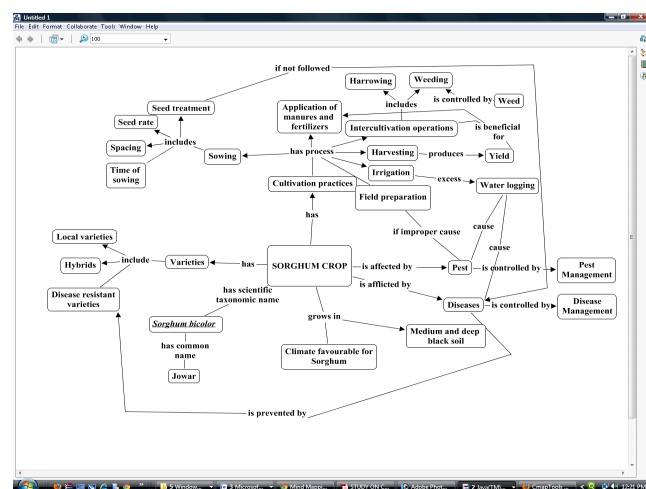
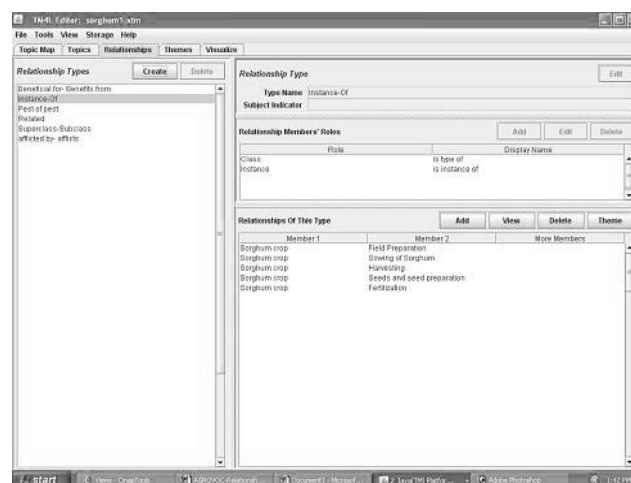
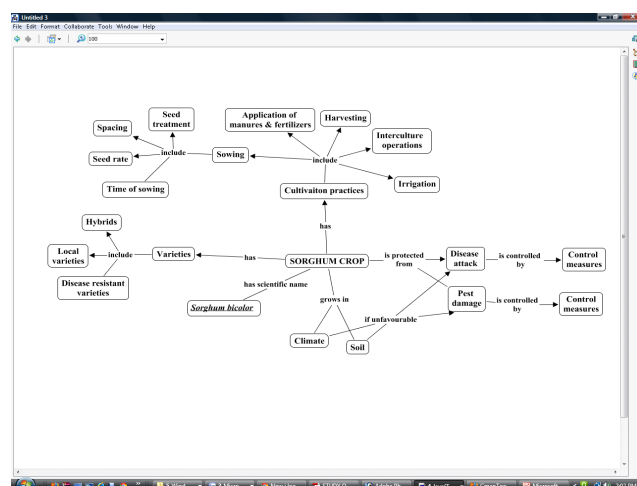
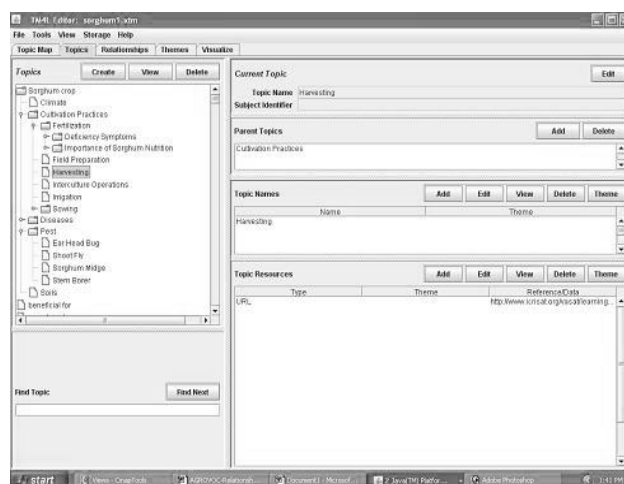
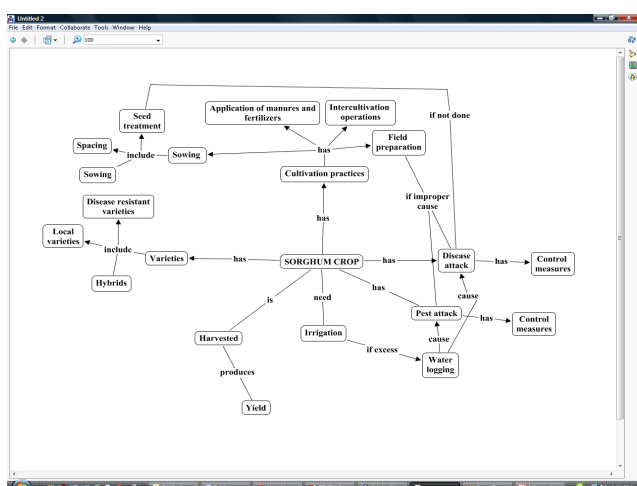
In the third concept map much emphasis was laid on Fertilizer application, Pest and Diseases using AGROVOC relationships. Hence, separate concept maps were developed for each of these concepts which is an elaboration of the main map.

To develop topic maps the open source software TM4L software was used. The features of the software include Topic Map, Topic, Relationships, Themes, Visualize. The topics can be created, edited and deleted. The resources of the topic can be added, viewed, edited and deleted. The resource is given as description or a URL can be provided. The relationships are used to connect the topics. The relationships used in these topic maps were “Instance of”, “Related”, “afflicted by-afflicts”, “pest of pest”, beneficial for-benefits from”. The new relationships can be created, viewed and deleted. The topics and relationships can be seen using the icon “Visualize” where a map will be displayed.

The topic map can be published using Omnigator. This software is run on Tomcat server. Using this, the topic maps can be vizigated. The associations and occurrences can be viewed in Omnigator.

## RESULTS AND DISCUSSION

*Concept Maps:* The concept maps were developed by using the software IHMC Cmap Tools. The concepts are represented in rectangular boxes and the relationships with arrows. The first concept map in figure 1 is the articulation of the basic idea about Sorghum crop present in the mind. Later, another concept map in figure 2 has been developed making few changes in the first map. The difference between the two maps is the terminology used to describe the relationships between the concepts.



Third concept map in figure 3 was developed using AGROVOC relationships which shows good relationships among concepts and conveys proper meaning to the concept.

In the second map proper terminology was used which showed good relationships among the concepts. The second concept map is showed in Fig 2.

To know the difference between the two maps (i.e., first and second concept maps), let us consider an example, where, in the first map in the disease concept it is cited “disease attack *has* control measures”. But, in second map it is “disease attack *is controlled by* control measures”. When both the relationships were compared i.e., *has* and *is controlled by*, the later relationship conveys proper meaning and shows good relation between the two concepts.

The third concept map was developed using AGROVOC relationships. The third concept map is shown in Fig 3.

**Topic Maps:** To develop topic maps the open source software TM4L software was used. The features of the software include Topic Map, Topic, Relationships, Themes, Visualize. The topics can be created, edited and deleted. The resources of the topic can be added, viewed, edited and deleted. The resource is given as description or a URL can be provided. The relationships are used to connect the topics. The relationships used in these topic maps were “Instance of”, “Related”, “afflicted by-afflicts”, “pest of pest”, beneficial for-

benefits from”. The new relationships can be created, viewed and deleted. The topics and relationships can be seen using the icon “Visualize” where a map will be displayed. The topics with resources are shown in Figure 4 while the relationships are shown in Figure 5

**Omnigator:** Omnigator is an application that loads and browses any topic map. The topic map published in Omnigator is shown in Fig 6. The associations and occurrences can be viewed in omnigator.

## CONCLUSION

At present most of the information is available at various sources but, it is difficult for the user to retrieve the information. Hence, use of Ontology in Content Management will act as a good solution in making the scattered data available for the user at one point. The concept maps and topic maps which were developed using ontology are used to locate the resources by linking information from various sources. These help him in fast and easy retrieval of information. In general, concept maps are used to articulate the basic idea of the concept present in the brain. Whereas, topic maps are used for easy navigation and search. These maps describe good relationships among the various concepts and topics. Use of these maps may enable the user to save lot of time and helps him in acquiring the information at one point.

*Paper received on* : April 16, 2013

*Accepted on* : April 23, 2013

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