

# Database System Development for Creating Clusters of Information Exchange on Raw Materials and Herbs Processing In Uttaradit Province, Thailand

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## ABSTRACT

This research was conducted to design and develop herbs database system in order to build the information's network of herbs in Uttaradit Province. Based on system development and propagation of herbs information in Uttaradit Province it was found that information database system was able to support production activity of persons related in supply chain of herbs business in Uttaradit Province in the form of clusters for sharing raw materials divided into 2 clusters including: A. Cluster between herbs farmers and producers or processor, i.e., producers were able to select raw materials based on information of farmers for raw materials pricing and delivering; B. Cluster between farmers and Thai traditional medicine group. The results of this research showed that both clusters were assembled and consisted of 15 farmers, 3 herbal drugstore entrepreneurs, 20 physicians of Thai traditional medicine, 4 academics of hospitals, and 5 herbs processing factories. Whereas, Jintana Herbs factory that was one of those herbs processing factories was able to reduce its cost of raw materials by 12.91% in overall. In addition, farmers were able to increase their sales volume of herbs by 18.45% due to the assembly of cluster between farmers and processors. In overall, it could be seen that clusters established in Uttaradit Province started to develop their businesses as well as improve their abilities and potential on herbs market competition in Uttaradit Province increasingly.

## CCS Concepts

Information systems → Data management systems

## Keywords

Cluster; supply chain; Thai herbs; knowledge network; database; information exchange.

## 1. INTRODUCTION

Herbs are a kind of local plants spreading in all regions throughout Thailand. They are considered as the natural resource that can be found easily with cheap price and safety for consumers. Humans have learned to use herbs for preventing and healing Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from [Permissions@acm.org](mailto:Permissions@acm.org).

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diseases since ancient time to present. Thai herbs business is considered as an interesting business because Thai herbs are considered as a kind of products with high opportunity in world market. According to information of Department of International Trade Promotion, it specifies that herbs classified as supplementary food had value of usage and exportation over than 80 billion baht while herbs classified as spa products had approximate value of 10 billion baht. In addition, herbs classified as Thai traditional herbs upon local wisdom had approximate value of 10 billion baht. For Thailand, there were some policies promoting the use of herbs for healing diseases extensively [1]-[2].

Design and development of database and knowledge network on important Thai herbs of Uttaradit Province gave benefits obtained from gathering knowledge on Thai herbs in the communities as the sources of additional knowledge for anyone interested. In addition, it also helped to pass on knowledge obtained from work experiences related to Thai herbs of farmers, processors, or physicians of Thai traditional medicine. As a result, knowledge database improvement was another way to build stability of agricultural information and publish information to anyone interested [3]. Consequently, the researcher has demanded to study on this topic in order to design and develop database system to be the specific knowledge network. This means making Thai herbs in Uttaradit Province as the network and source for developing knowledge, publishing information, and improving the potential of the communities. In addition, it is also beneficial for persons related in supply chain of herbs business in Uttaradit Province.

## 2. OBJECTIVES

2.1 To design and develop database system for building information network of Thai herbs in Uttaradit Province.

2.2 To create clusters for exchanging information on raw materials and herbs processing in Uttaradit Province.

## 3. METHODOLOGY

This research is an applied research.

### 3.1 Populations and Sample Group

3.1.1 Populations used in this research were farmers' leaders, herbs growers, processors or producers, and physicians of Thai traditional medicine in Uttaradit Province.

3.1.2 The researcher interviewed with and collected data from 28 interviewees who registered to participate in this project in the community forum. These interviewees were herbs farmers, processors or producers, and physicians of Thai traditional medicine in Uttaradit Province.

3.1.3 Persons who used to test herbs database system.

### 3.2 Data Collection

This research is an applied research consisted of the following procedures:

3.2.1 Contact and ask for cooperation from farmers' leaders, herbs growers, processors, or producers, and physicians of Thai traditional medicine in Uttaradit Province in order to ask for basic information on herbs as well as to build understanding and collect information on herbs from farmers in Uttaradit Province.

3.2.2 Collect information from farmers' leaders, herbs growers, processors or producers, and physicians of Thai traditional medicine in Uttaradit Province through interviewing and responding to the survey on basic information of herbs, herbal formulary, and herbal products produced in Uttaradit Province.

### 3.3 Information System Development

The researcher designed and developed the network of database and knowledge by using AppServ, database and website design program, and MySQL as tools for designing and developing herbal database in order to build the network of knowledge on Thai herbs in Uttaradit Province as well as to design webpages for publishing information [4]–[5]. Herbal database was consisted of several parts of information, for example, information of related persons, herbs information, herbal formulary information, etc. As a result, database design was very important for information system development. Accordingly [6]–[7], he researcher designed the relationship of database as shown in Figure 1.

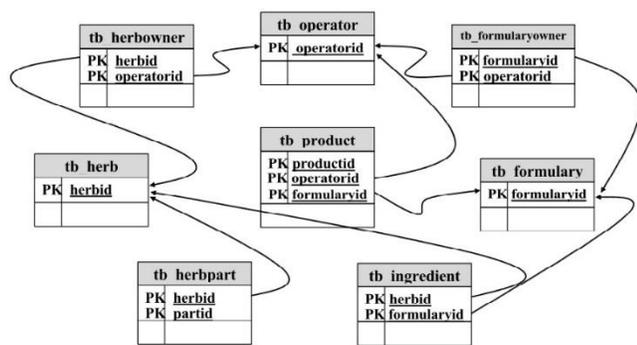


Figure 1: Relationship Network of Database

### 3.4 Database System Test

The researcher designed User Interface test conducted with 20 users who were volunteers participating in database system test in order to analyze information and the results were interpreted by using the questionnaire on satisfaction assessment.

## 4. RESULTS

Based on database system development and test conducted with 20 samples, the important topics could be concluded based on herbs database system publishing as follows:

**4.1 The samples of this research**, consisted of 28 samples, participated in this project voluntarily in order to provide information on herbs database system development and the related persons could be classified into 3 types including 12 farmers, 6 processors or producers, and 10 physicians of Thai traditional medicine. When considering on informants based on the above information, it was found that most related persons were farmers calculated to be 42.86% while physicians of Thai traditional

medicine calculated to be 35.71% and processors or producers were calculated to be 21.43%, respectively.

**4.2 Herbs information system** was developed based on survey and data collection conducted with 28 samples. Subsequently, data was input to database system and the obtained results were concluded and classified upon 9 districts of the areas for growing herbs in Uttaradit Province as follows:



Figure 2: Example of Webpage Showing information and Details of Each Type of Herbs (Thai Language)

From Figure 2, after concluding input data spatially, it was found that there were 146 types of herbs grown in Uttaradit Province. According to Figure 3, it could be concluded in percentage as follows: the area with the highest level of herbs growing was Lublue District with the rate of 38.36% and the distinctiveness of Lublue District was agriculture and most populations of such district were farmers; followed by Mueang Uttaradit District with the rate of 20.54%, Pichai District with the rate of 19.18%, Tron District with the rate of 8.91%, Ta Pla District with the rate of 4.12%, Nampad District with the rate of 3.42%, Ban Koke District with the rate of 2.74%, Fakta District with the rate of 2.05%, and Thong Saeng Chan District with the rate of 0.68%.

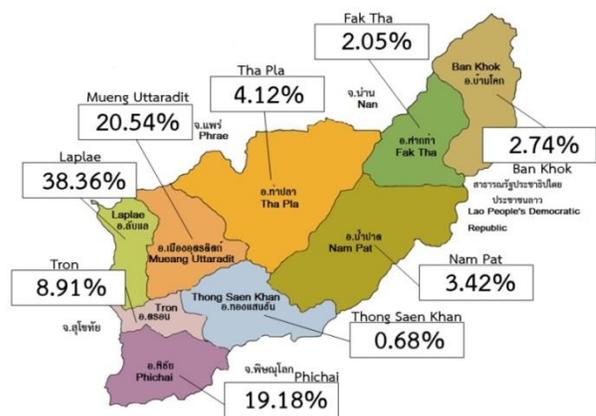


Figure 3: Map Scale of Herbs in Uttaradit Province

**4.3 For obtained data**, they were input to information system. Besides related persons and herbs information,

information on formulary and herbal products was also input. The information of formulary was consisted of 120 types of herbs and this formulary was created by physicians of Thai traditional medicine in Uttaradit Province completely. In addition, there was also some information on 25 types of herbal products that are OTOP products of the province.

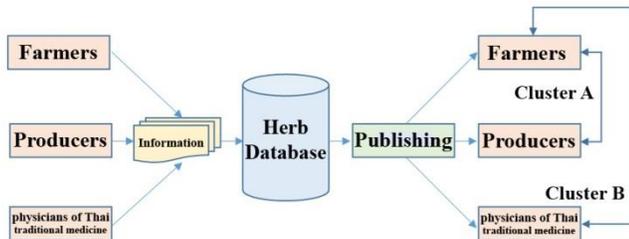


Figure 4: Herbal Clusters in Uttaradit Province

**4.4 After publishing herbs database** in Uttaradit Province by passing on knowledge to physicians of Thai traditional medicine, herbal drugstore owners, herbs processing factories, and farmers in Uttaradit Province, it was found that database system was able to support production activity in supply chain because information database system created Data Independence that was the most important benefit leading to information exchange among related person groups [8]-[10] including herbs farmers, producers or processors, and physicians of Thai traditional medicine. This led to exchange from information level to become the network of herbs called Herbs Clusters of Uttaradit Province. Assembly of these clusters was in the form of raw materials sharing consisted of 2 clusters as shown in Figure 4, i.e., cluster between farmers, producers, or physicians of Thai traditional medicine. The target areas of these two clusters were: (1 Jintana Herbs Factory located in Rong Samor Sub-District, Lublae District; (2) Wat Kungtapao Herbal Garden located in Kungtapao Sub-District, Mueang Uttaradit District, ; and (3) Pichai Hospital located in Pichai District, Uttaradit Province. These three target areas were ranked as the first three areas with the highest level of herbs growing according to data collection and record of information system. Moreover, these clusters also improved efficiency and effectiveness on herbs production and processing and it was also considered as improvement of innovative ability of information system leading to information and knowledge exchange of related persons. This also improved their abilities and potential on herbs market competition in Uttaradit Province increasingly [11].

**4.5 Based on the results,** it was found that there were 2 clusters consisted of 15 farmers, 3 herbal drugstore entrepreneurs, 20 physicians of Thai traditional medicine, 4 academics of hospitals, and 5 herbs processing factories, whereas, Jintana Herbs factory that was one of those herbs processing factories was able to reduce its cost of raw materials by 12.91% as shown in Table 1. In addition, farmers were able to increase their sales volume of herbs by 18.45% due to the assembly of cluster between farmers and processors.

Table1 : Example of Herbal Materials Price Comparison (Per 1 Kilogram)

Order	List of Herbs	Type	Quantity	Former Price (Baht)	New Price (Baht)	Percentage of Price Adjustment
1	Turmeric	Fresh	1 Kilogram	50	40	20.00
2	Kaempferia parviflora	Fresh	1 Kilogram	120	94	21.67
3	Wan Chak Mot Luk	Fresh	1 Kilogram	50	42	16.00
4	Andrographis paniculata	Dried	1 Kilogram	250	230	8.00
5	Bora Phet	Fresh	1 Kilogram	50	40	20.00
6	Butea superba Roxb.	Fresh	1 Kilogram	150	136	9.33
7	Sea holly	Dried	1 Kilogram	250	230	8.00
8	Cinnamon	Dried	1 Kilogram	200	188	6.00
9	Curcuma zedoria	Fresh	1 Kilogram	80	68	15.00
10	Roselle	Dried	1 Kilogram	390	370	5.13
Average Adjustment of Overall Materials Price						12.91

Remarks: Sample Price of 10 Types of Herbs with the Highest Level of Selling and Purchasing in Uttaradit Province

**4.6 Based on the results of User Interface** test of database system [12] conducted with 20 users who were volunteers participating in database system test in order to analyze information and interpret the test results by using Satisfaction Assessment From as shown in Table 2.

Table 2: Results of Users' Satisfaction Assessment towards System

Order	List of Assessment	$\bar{x}$	SD	Assessment Level
1	Simplicity and Difficulty of Operation	4.72	0.51	Very Good
2	Correctness of Information	4.55	0.52	Very Good
3	Explicitly of Classification	4.35	0.47	Good
4	Completeness of Information	4.69	0.55	Very Good
5	Appropriateness of Colors and Letters of Pictures	4.24	0.70	Good
6	Appropriateness of Letter Size on Screen	4.45	0.49	Good
7	Convenience for Users to Check Information in Each page	4.38	0.32	Good
8	Convenience for Users to Back to Homepage	4.70	0.48	Very Good
Average		4.51	0.50	Very Good

According to Table2 , it was found that simplicity and difficulty of operation had the highest mean at 4.72 followed by convenience for users to back to homepage at 4.70, and completeness of information at 4.69, respectively. Overall satisfaction of users towards system was 4.51 averagely that was considered as high level.

## 5. DISCUSSION

The main reason which encourage myself to development this research is to gather the information about herbs in Uttaradit. There are lots of the information which no one has not collected the data before. After the research has done, it will be the herb database which store the knowledge and will be useful not only for agriculturists but also herbal drugstore entrepreneurs, physicians of Thai traditional medicine, academics of hospitals and herbs processing factories in Uttaradit Province.

This research will improve the innovative ability of information system and lead to information and knowledge transfer to interested people. Last, it will be also improve their abilities and expand the herbs market and increase more competitors in Uttaradit Province increasingly.

According to the results of the research on Database System Development for Creating Clusters of Information Exchange on

Raw Materials and Herbs Processing in Uttaradit Province, there were some interesting findings for discussion as follows:

**5.1 The study on information,** characteristics, and properties of Thai herbs in Uttaradit Province was conducted to analyze and design database for sharing information. Combining information technology as a part of supply chain management supported executives or related persons in supply chain. According to this research, it was found that related persons were divided into 3 types including farmers, herbs processors, and physicians of Thai traditional medicine. They were able to build the relationship in new formats and they were considered as the beneficiaries in creating new society with improvement of the flow of information and knowledge [13] on herbs in Uttaradit Province. Consequently, clusters of herbs business were established with business operation in the nearby areas under mutual cooperation, connection, and promotion, for example, cooperation on raw materials or development of herbal forms. This was consistent with the results of the research conducted by Satit Paniangthong (2006) (on Strategic Supply Chain Management on Combining Information Technology as a Part of Supply Chain. Such research showed that organizations in supply chain applying information system created consistency of producers, distributors, and retailers. Information on supply and demand was utilized for mutual management [14].

**5.2 For design and development of database system** in building knowledge network on Thai herbs in Uttaradit Province, it was found that herbs information system led to clusters supporting production activity of persons related in supply chain of herbs business in Uttaradit Province helping to improve efficiency and effectiveness of herbs production and processing. This originated information and knowledge exchange among related persons leading to ability of cheap herbal materials purchasing and providing as well as expansion of business and trade while improving competitive abilities and potential of business. This was consistent with the concept of Professor Michael E. Porter, the specialist on competitive abilities development stated that related and assembled business groups will cooperate among one another to support, connect, and promoting among one another as well as to achieve the same goals, i.e., improving overall products of clusters [15]. In addition, the results of this research were also consistent with the research conducted by Teeravut Suthiprabha (2012) who studied on clusters and sustainable improvement of competitive ability: case study of gem and jewelry clusters in Chanthaburi. The results of such research showed that the important tool for building competitive advantage was clusters that were considered as the factors driving or hindering success of operation. As a result, if clusters created by persons related in supply chain of herbs business in Uttaradit Province were able to be developed and strengthened and innovation of groups considered as a tool of clusters was created, competitive ability would be improved sustainably in regional and national levels.

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## 6. ACKNOWLEDGMENTS

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