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Abstract

This paper presents a web-based training system in eAgriculture for agricultural college in Thailand. The eAgriculture contents consist of introduction to information and communication technology (ICT) for agriculture, information technology in agriculture, agricultural management information system and precision farming. The research shows that the majority users are highly satisfied with the developed web-based training system. The users favoured four factors of the system including the content of the website; technical media production; the designing and the formatting of the website; and benefits of its uses.

Keywords: Web-based training, eAgriculture, agricultural college, vocational education

Introduction

The Ministry of Information and Communication Technology (MICT) (2014), Thailand has developed the ICT 2020 policy framework for 10 years from 2011 to 2020. While drafting the framework, some important inputs have been considered that include: the previous policy framework, the current situations of the use of ICT and limitations of ICT development of the country (National Electronics and Computer Technology Center, 2011). The five strategies including; e-government, e-Education, e-Commerce, e-Industry, and e-Society involved in the concept of smart Thailand 2020. The aim of the smart Thailand 2020 is a stronger economy, social equality and environmental friendly in several services such as government, healthcare, education, agriculture as show in Figure 1.

eAgriculture is one of the policies contained in the master plan called “Smart Agriculture” (Dhuwasatakul, 2011). Smart agriculture was introduced to improve the use of the application of ICT in agricultural crops including rice, palm tree, and rubber in Thailand (Iwata, 2010). MICT identified the role of national policy and regulatory framework to stimulate business investment in telecommunication and ICT infrastructure; therefore, both the private and public providers are encouraged to continuously invest into alternative technologies to build

connectivity and last-mile network with a goal to expand ICT services into rural areas for providing services to all citizens (Thepmani, 2011).

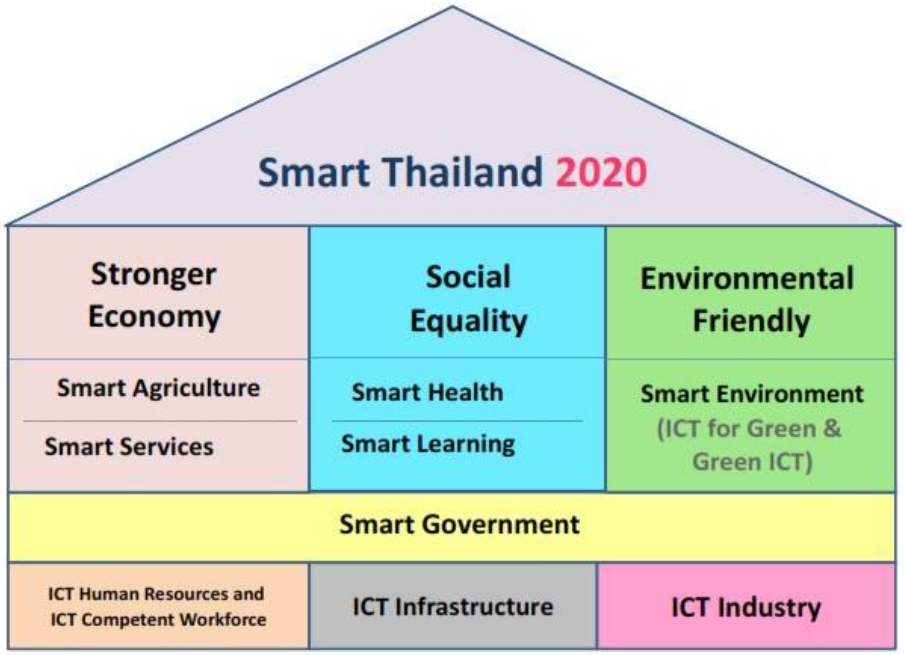

Fig. 1 Framework of Smart Thailand 2020 (Dhuwasatakul, 2011)

Since eAgriculture is one of the major components of "Smart agriculture" in Smart Thailand system, the next section presents descriptions of eAgriculture and its components.

Components of eAgriculture

The term eAgriculture has been coined to describe the enhancement of agriculture and rural development through improved information exchange, communication and learning processes (e-Agriculture, 2014). eAgriculture has also been defined as "An emerging field, which combines agricultural informatics, agricultural development and entrepreneurship"(Sylvester, 2014). The Food and Agriculture Organization of the United Nations (2002) emphasized the importance of information dissemination to farmers by stating that "information and knowledge play a key role in ensuring food security and sustainable development". Consequently, eAgriculture involves the interaction between ICT and agriculture for the purpose of enhancing agriculture and food security via exchange and access to the knowledge. Miller, Saroja, and Linder (2013) stated that the introduction of the cost effective ubiquity of ICT, such as mobile phones and internet, provides a global platform to farmers, fishers, small traders and business people to share critical information.

According to Mangstl (2008), the use of internet and mobile telephone is remarkably success in terms of accessing market prices, weather information and other agriculture related advices. These ICT mediums are relatively easy to access and also can be utilized by marginalized people in remote rural areas. The author further exemplified the growth of production due to the use of the mixed approaches in which the traditional communication media such as neighbors, family, local news and announcement boards are simultaneously used with the modern communication media that includes internet and mobile phones. Moreover, Stone

(2011) investigated on the effect of eAgriculture in the marginal farmers in Andra Pradesh, India. The introduction of e-Sagu, cultivation is known as Sagu in Telugu, not only increased the yielding of crops but also reduced the suicidal tendencies in the community. E-Sagu which was originated with the concept of using wireless communication for farmers eventually became a commercial agent of delivering agricultural advice and information. There are many factors that influence eAgriculture; however, Figure 2 depicts the main stakeholders that directly influence or contribute the effectiveness of eAgriculture that include: government, research organizations, non-profit government organizations (NGO), industries and public sectors.

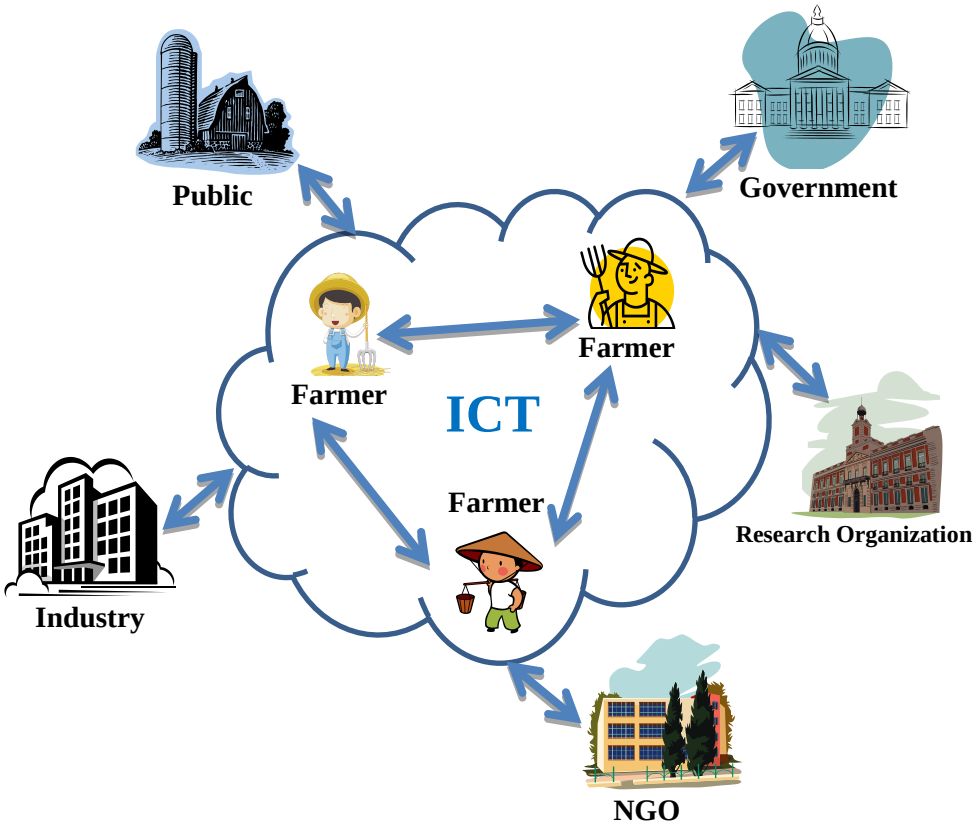

Fig. 2 Main stakeholders of eAgriculture

e-Agriculture Working Group (2007) presented five categories to define eAgricuture including (a) information-related process, (b) ICT tools, (c) information types, (d) benefitted stakeholders, and (e) agricultural areas. There are many examples of the use of ICT in agriculture industries (Gobbett and Bramley 2014, Agricultural Production Systems Simulator 2014). However, further research is required in the use of ICT tools to improve the quality of sensor networks, accuracy of decision support system, capability of wireless sensor network, and training in eAgriculture. This paper focuses on a specific topic of using training in eAgriculture.

Training in eAgriculture is an important aspect to stakeholders such as vocational teachers, farmers, and researchers. Specifically, the challenges in developing a web-based training in Thailand are considered as a case study in this research. The challenges in teaching through the

web-based training and factors in designing web-based system are discussed in the next section.

Web-based training

Recent studies show that Thailand adopted web-based training technology for many years. Thai Cyber University was established since 2006 (Sombuntham, 2008). However web-based training is still limited in the university level. Bonk (2002) claimed that college faculties are also interested in utilizing web-based training. The author suggested that some organizations have utilized a wide range of tools in web-based training. However, most available web-based trainings lack of pedagogical tools. There are many factors influence the quality of training in teaching through web-based training such as support structure, obstacles, assessment methods, instructional approaches, and tool preferences (Bonk, 2002).

Homklin, Takahashi, and Techakanont (2014) studied the social and organizational factors that influence the transmission of the training. Specifically, the relationship between the acquired knowledge and its transformation by trainees in Thailand is explored. Participants were selected from various groups worked in an automotive industry. The study revealed that the influencing factor of successful transformation of training is the cooperation between workers rather than providing support from supervisors and organization.

Hallinger and Lee (2013) explained that school principals are important as leaders in reformation Thailand education development. The developing quality of school principals is needed to ensure that schools' leaders should possess with the knowledge, skills and motivation to support changes in teaching and learning. The authors mentioned three dimensions of instructional leadership for principals in Thailand schools including, development of the school learning climate program, management of the instructional program, and defining the school mission. The results show that the training should focus more on developing leadership capacity in the education system.

Developing a web-based training in teaching eAgriculture topics is a challenge topic. This study aims to assists vocational teachers learning new content and updating their knowledge especially new technology in agriculture. The vocational teachers will learn new knowledge of using ICT in an agriculture sector. The detail research objective of this paper is presented next.

Research objectives

1. To develop web-based training in eAgriculture for vocational teachers in the college of agriculture and technology under the Office of Vocational Education Commisssion (2012) (OVEC), Thailand
2. To evaluate learners satisfaction for training through web-based training in eAgriculture for vocational teachers in the college of agriculture and technology under the Office of Vocational Education Commisssion (2012), Thailand.

Contents of web-based training

The web-based training contains four major categories which are depicted in Figure 3 namely introduction to agriculture, ICT for agriculture, information system, and precision farming. The website information can be accessed through the uniform resource locator address, http://www.e-trainingvec.org.

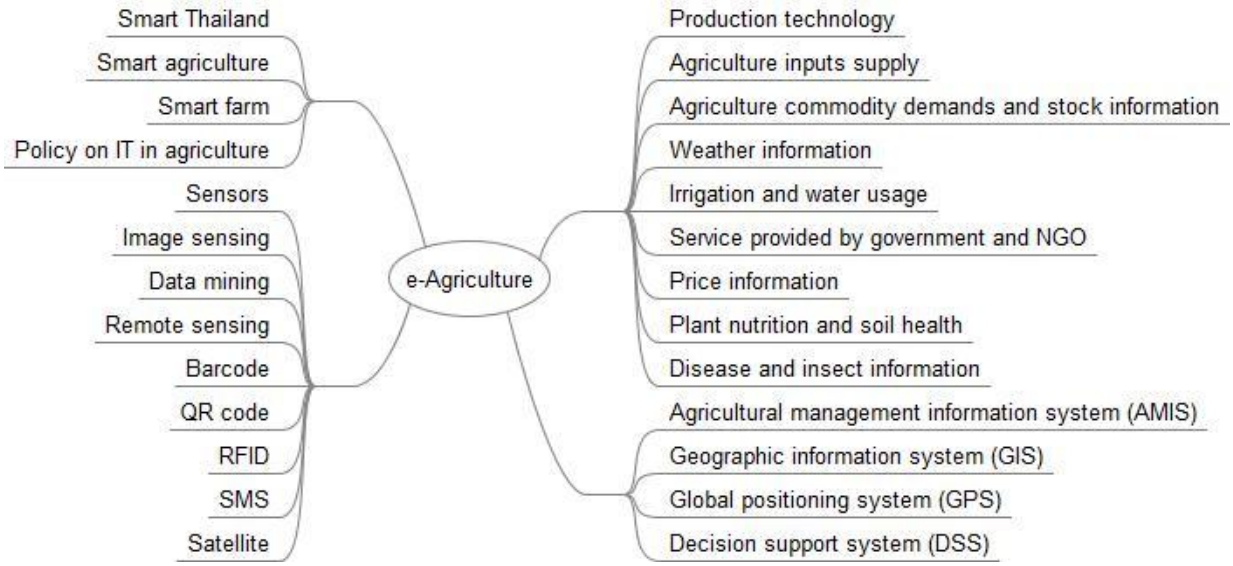

Fig. 3 e-Agriculture contents in e-Training

1. Introduction to agriculture: this category includes factors such as the production technology, agriculture commodity demands and stock information, weather information, irrigation and water usage, service provided by government and NGO, price information, plant nutrition and soil health, diseases and insect information.
2. ICT for agriculture: in this category newly emerged concept such as smart Thailand, smart agriculture, smart farm, policy on information technology in agriculture are included.
3. Information system: this group consists of the agricultural management information system (AMIS), geographic information system (GIS), global positioning system (GPS), decision support system (DSS).
4. Precision farming: this category includes sensors, image sensing, data mining, remote sensing, barcode, QR code, radio frequency identification (RFID), short message services (SMS), satellite.

The trainees can study in the system anywhere, anytime with no enrollment fee. The content of the training are amalgamated from the various organisations' websites that publishes information to the public. The system possess with multiple chapters. Each chapter consists of information in the form of documentations, video files and PowerPoint presentation files. All units have provided exercises for trainees to test themselves. Additionally, each chapter consists of an exercise that contains a number of questions. The first chapter, introduction to ICT for agriculture, consists of 5 questions. The second chapter, information technology in

agriculture, consists of 10 questions. The third chapter, agricultural management information system, consists of 5 questions. The last chapter, precision farming, consists of 10 questions. Trainees should attend a final exam to evaluate their knowledge and also to complete the course. In addition, trainees have to pass the following conditions during training with web-based training system.

1. Trainees should train through web-based training the periods between Septembers to November 2013.
2. Trainees should pass online exercise obtaining at least 60% in each chapter. Trainees should give 3 correct answers from the first chapter, 6 correct answers for the second chapter, 3 correct answers for the third chapter, and 6 correct answers from the last chapter. Conclusively, trainees should obtain at least 60% of 30 questions in the final online examine.

Trainees are allowed to practice the exercises several times. However, the final exam should be completed in a single sit. The duration of the exam is 40 minutes. Subsequently, the exams will be closed and the answer will be submitted to the system. The result of the exercises and final examine will be published on the website as soon as trainees completed the examination. If trainees score a pass mark, they will receive a certificate from OVEC and KMUTNB. Participants in this study are vocational education teachers in the college of agriculture and technology under the Office of Vocation Commission, Thailand. Twenty participants volunteer for the training in eAgriculture and other courses through web-based training system.

Research Method

This research aims to develop an online training course for vocational teachers in agriculture division under OVEC, Ministry of Education. The online training has developed base on the concept of the use ICT for development Thailand in the Smart Thailand policy and Smart Agriculture framework. The vocational teachers will learn a new knowledge in applying ICT. The vocational teachers can transfer their knowledge to agricultural students who are studying in the college of agriculture and technology that has 40 colleges located nationwide in Thailand.

Results and Discussion

Majority participants in this study found that the contents in the web-based training system are useful. It is noted that all participants passed the exam. The trainees' response is presented in Table 1, Table 2, Table 3, Table 4 and Table 5. Mean value of 4.14 with a standard deviation 0.22 in Table 1 indicates that the overall satisfaction of trainees in using the web-based training in eAgriculture is high.

Fig. 4 e-Training on e-Agriculture in Thailand (Source: http://www.e-trainingvec.org)

Table 1 Trainees' satisfaction of each aspect for web-based training in eAgriculture

Trainees' positive response in each category	N = 20		Level
	Mean	S.D.	
1 Content	4.14	0.31	High
2 Technical media production	4.21	0.41	High
3 Design and formatting of website	4.38	0.50	High
4 Benefits from learning	4.23	0.38	High
Overall score of satisfaction	**4.14**	**0.22**	**High**

Likewise, the trainees' response to the content of the web-based training in eAgriculture is also highly positive with the mean value of 4.14 with the standard deviation value of 0.31. According to the response, trainees are the highly positive about the understanding of the online course contents. Subsequently, being able to read and understand content by themselves (Mean = 4.30, S.D. = 0.66) is their second preferred selection and the third favored section was an appropriate use of font size, font colour and background colour (Mean = 4.30, S.D. = 0.47).

Table 2 Trainees' satisfaction in content for web-based training in eAgriculture

Content	N = 20		Level
	Mean	S.D.	
1.1 Trainees understand content in the online courses	4.55	0.51	Very high
1.2 Trainees can read and understand by myself	4.30	0.66	High
1.3 Language used in the course are appropriate	4.25	0.55	High
1.4 The appropriate of font size, font colour and background colour	4.30	0.47	High
1.5 The number of exercises and exams are appropriate with content	4.10	0.55	High
Overall score of satisfaction in the content	**4.14**	**0.31**	**High**

In regard to the technical media production, the means value of 4.21 with standard deviation 0.41 in Table 3 indicate that the users are comfortable with the technical part of the web-based training in eAgriculture. Category 2.2, consistency between the content and the images and video used, are mostly preferred by the users. Likewise, category 2.3 is equally favored by users as category 2.2.

Table 3 Trainees' satisfaction in technical media production for web-based training in eAgriculture

Technical media production	N = 20		Level
	Mean	S.D.	
2.1 The appropriate of time in present content	4.20	0.77	High
2.2 Images and video in the course consistent with the content	4.40	0.60	High
2.3 Narration consistent with the content	4.40	0.75	High
2.4 Speed in load content	3.85	0.74	High
Overall score of satisfaction in technical media production	**4.21**	**0.41**	High

The satisfaction in the design and formatting of website for web-based training in eAgriculture has high level as shown in table 4 (Mean = 4.38, S.D. = 0.50). When considering in each criteria, the Formatting the site easier to read and use has highest level (Mean = 4.70, S.D. = 0.47). The second high level is speed in access content (Mean = 4.40, S.D. = 0.75).

Table 4 Trainees' satisfaction in design and formatting of website for web-based training in eAgriculture

Design and formatting of website	N = 20		Level
	Mean	S.D.	
3.1 Home page has good looking, appropriate and attractive.	4.30	0.73	High
3.2 Formatting the site easier to read and use.	4.70	0.47	Very high
3.3 Speed in access content	4.40	0.75	High
3.4 The stability of the web sites in access the lessons.	4.10	0.79	High
Overall score of satisfaction in design and formatting of website	**4.38**	**0.50**	**High**

The mean value of the benefits from learning category is 4.23 with standard deviation 0.38. The specific category, the lessons are interesting and attraction, is mostly favoured by users with the highest mean value of 4.30. The second preferred category is, the use lessons are easy, convenience and no obstruction (Mean= 4.25, S.D. = 0.44).

Table 5 Trainees' satisfaction in benefits from learning of website for web-based training in eAgriculture

Benefits from learning	N = 20		Level
	Mean	S.D.	
4.1 Lessons are interesting and attraction	4.30	0.66	High
4.2 The use lessons are easy, convenience and no obstruction	4.25	0.44	High
4.3 After complete the lesson, the trainees have the knowledge, understanding of design techniques to improve student learning.	4.15	0.75	High
Overall score of satisfaction in benefits from learning	**4.23**	**0.38**	**High**

Researchers have synthesis the eAgriculture contents that appropriate for training agricultural vocational lecturers in Thailand. The contents consist of the introduction to ICT for agriculture, information technology in agriculture, agricultural management information system and precision farming. The research reveals that overall satisfaction with technology for training through web-based training system is at a high level. Participants in this study satisfied in web-based training system in four aspects: the content, technical media production, the design and the formatting of the web site, and benefits from learning. The web-based training in eAgriculture can be extended to training farmers. The system is important for farmers in applying ICT in agriculture. The government sector should take advantages of mobile communication devices especially technology disseminate information to farmers through to the website. Communication devices such as mobile phones is a weakness that many governments no action (Siraj, 2012). ICT technology can support the manufacturing sector to be self-reliant and promote competitive globally, particularly in the agricultural sector based on Smart Agriculture Framework that encourages government policy fully effective (Dhuwasatakul, 2011).

Conclusion

There is a significant impact of the training on the vocational teachers in enhancing their knowledge associated with the use of technology in agriculture. Their experience of online training using eAgriculture contents was positive and with trainees satisfied in learning through web-base training. Further work is required to assess the online web system with other agricultural vocational teachers and the influence on other factors such as teacher experience. This research demonstrated the possibility of implementing such content through web-base training in Thailand in the future.

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