Organic Paddy Farming Practice to Learning Application

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ABSTRACT

Knowledge sharing and transfer through information and communication technology applications is alternative and popular medium in this era. This paper aim to describe how the knowledge about organic paddy practices are used in learning prototype, call as *SiPadi*. The objective of learning prototype is to increase awareness and to promote sustainable practices in organic paddy farming. The real-life practices of sustainable paddy farming have been adapted in the design of the prototype. The findings of this study indicate that the prototype is beneficial in creating sustainability awareness among the students. For future applications, the learning prototype for the sustainability awareness program can be extended to other sustainability related issues.

Keywords: Organic paddy farming, non-immersive VR desktop, knowledge transfer

I INTRODUCTION

Sustainability is now becoming both an important concept and practice for social, economic and environmental governance (Goodland 1995; Ismail, 2006; Kajikawa, *et al*., 2007). Sustainability in agriculture refers to farmer's ability to maintain sustainable yield while preserving natural environment, promoting social development, creating economic opportunities and being a commercially good competitor in the fast changing environment (Ismail, 2006). Furthermore, sustainable agriculture encompasses both the aspects of production and preserving environment.

II CREATING AWARENESS IN SUSTAINABLE

The public awareness of sustainable agriculture in Malaysia is considered to be rather low (Berita Harian, 2010). According to the National Green Technology Policy Malaysia, effective promotion and public awareness are two of the main factors that would affect the success of sustainable development through the Green Technology agenda. This is particularly significant as such adoption requires a change of mindset of the public through various approaches which includes the effective dissemination of education and information to increase public awareness of sustainable agriculture and on ways to conserve the environment. As a solution, introducing the use of virtual reality through learning as a tool to promote sustainability awareness in paddy farming practices in order to increase public awareness is among promising alternatives available

Many researchers found that virtual reality offers many benefits that can support learning such as revealed by Pereira (2006), Kuo *et al*. (2004, 2007); Ha and Woo (2006); and Buntod *et al.* (2010) in their work. Among the benefits stipulated include the acquisition of meaningful learning, as well as easy and better understanding of the learning contents.

The focus of sustainable agriculture in this paper is how information and communication technology (ICT) as a transfer medium to promote and provide exposure for sustainable agriculture in organic paddy farming activity.

III METHODOLOGY

The documentation required for this study was acquired from observation, interview, pamphlets, brochures, annual reports, department collections, books and journals collected. The observations and interviews were done from 28 June 2008 until 12 November 2009. The respondents were farmers, researchers and agricultural officers.

Some of respondents allowed the interviews to be recorded by videotape. However, all the interviews were noted by the researcher in her notebook. During the observations and field work, the phone was also used to obtain clarity of information from the respondents.

The focus location of the case study is Tanjung Karang. However some overviews of currently paddy practice at Sabak Bernam, Kahang, Bandar Baru Tunjong / Salor and Muda Agricultural Development Authority (MADA) was included in learning prototype. It is value added to existing farmer in easy understanding of information and to avoid culture shock. The user can see the similarities and differences of paddy farming practices. The reason for selecting the Tanjung

Karang, Kahang and Bandar Baru Tunjong locations was that both these locations adopt fully sustainable practices in organic paddy farming. The MADA granary area was selected because it is the largest paddy farming area in Malaysia, while the Sabak Bernam granary area was selected because it has the most productive paddy fields with 5,465 average yields or 102,354 metric tonne production in main season 2008/2009 (Othman & Muhammad, 2010).

The methodologies used for the prototype design and development of this study is adapted from the model for design and development created by Alessi and Trollip (2001) and the development process of a non-immersive VR desktop (Kalawsky, 2001).

In this research, the learning outcome of a prototype is to persuade society to enhance its sustainable awareness in paddy farming practices. There are three persuasive principles that have been applied in this study. They are the principle of cause and effect, the principles of praise and the principle of social learning (Othman & Muhammad, 2011_1).

In this simulated learning environment, the experience at all selected location paddy farming practices was shown in video clip, image and virtual environment. Using this technique, users can view several real practices of paddy farming. In addition, the narrative of paddy practices games provides entertainment in understanding of the real practices of organic paddy farming.

IV PRACTICE IN ORGANIC FARMING

The practice in Tanjung Karang can be categories in six steps. It begins with preparing the soil, then selection of seeds and planting, management of water, use of fertilizers, pest control and harvesting. The summarize of organic paddy farming practice in Tanjung Karang is carried out in the following manner:

A. Preparation of the Soil

The first step is soil preparation. The paddy straw and weeds need to be cleared and the paddy straw is spun together with the soil in a dry condition, once or twice. Then, wet hoeing is done twice with tractors. The soil is twisted until a depth of 10 cm – 15 cm. Before planting the seedlings, the soil is well-meshed. The surface of the paddy field must be flat. The difference of soil levels between the lowest and highest level is less than 5 cm. Then, a work lane is built at a distance of 10 feet between them.

Each plot of paddy has a water entry and exit channel. The entry channel functions to bring water to the planting area, whereas, the exit channel let's out unwanted water, especially during the process of drying up the paddy fields. Finally, before the planting process, organic fertilizer or compost is scattered at a rate of seven tonnes per hectare.

B. Selecting Seeds and Planting

The second step is the selection of seeds. The best quality seeds used are from official sources such as MR219 and UKMR2 (previously known as UKM 7). To ensure that the best seeds are used, the seeds are soaked in salt water with a viscosity of 10%. The salt content of the salt water is tested by placing a chicken egg into it. When the egg emerges upwards from the salt water mixture, this means that the salt water is ready for use. Then, the egg is taken out. After that, the paddy seeds are poured into the salt water. Seeds that float are a lesser quality and are, thus, not used. Then, the seeds are planted at the dry nursery. It is ensured that the soil is constantly damp, but not the extent of being saturated. Subsequently, between the 8 to the 12 days, the paddy seedlings will be transferred or transplanted to the paddy field.

The seedling is planted at a depth of one to two cm in the soil. The distance between the seedlings is usually at 30 cm times 30 cm, which are 11 plants per square meter. The distance between the plants seedling is to provide ample room for ventilation, lighting and soil nutrients, while also helping the weeding process.

C. Management of Water

The third stage is water management. Water is obtained from sources from the Irrigation Department. The *Parit Kilik* (trenches) are built along the paddy field boundaries to accelerate the drainage and irrigation of water. The water depth in the plots is up to 2 cm in the beginning stages of growth. Water is released gradually to the field when the grass and weed are being removed. After the paddy plants begin to mature, the soil can be left to dry until it cracks up a bit to facilitate the growth of the roots. At the initial stage of the formation of the stalks or better known as early paddy insemination, the water is to be a level of 2 – 4 cm. Then, 20 days before harvesting is carried out, the soil gradually dries out.

D. **Use of Fertilisers**

The fourth step is applying fertilizers. Organic Fertilizer, that can be bought in the market or self processed is used. In Sabak Bernam, the fertiliser is self processed and among the main ingredient is rice water. The fertiliser is scattered onto the soil and sprayed onto the leaves, beginning from day ten, after planting the seedlings. Following this, the fertilizer will be sprayed on the paddy seedlings on days, 18, 28, 38, 48, 58 and 70.

E. *Pest Control*

The fifth step is control of pests, which can be in the form of weeds, pests and paddy diseases. The growth of grass and weeds is controlled by discarding it with weeding equipment or a twist hoe. The grass and weed will plough onto the soil at least four times in a single planting season, namely on days, 18, 28, 38 and 48. After the 48th day, there is no need for weeding.

With the occurrence of attacks from insects, such as leaf folding caterpillars and stem borer maggots/caterpillars, the natural method is used in controlling these insects, and among the natural methods utilised is to spray tobacco water together with neem seeds.

F. *Harvesting*

Paddy is harvested when it is 85 percent ripe. The yield for Tanjung Karang stood at about 4 tons per ha for both varieties (MR219 and UKMR2). The Tanjung Karang yields are higher than the national average by about 3 tons per ha obtained from organic irrigated rice and matches or exceeds the national average of about 4 tons per ha. from conventional irrigated rice.

To sum up, Table 1 shows a summary of paddy farming by day at Tanjung Karang. Then, the information is used in the design of the prototype.

Table 1: A Summary of Organic Paddy Farming by Day

Day (D)	Note	Activity
D1-D14	Preparation of soil	Ploughing by tractor
D10		Release water into the paddy field
D11		Ploughing by small tractor *(kabota*)
D13		Third cycle, making lanes
D14		Scattering of organic fertiliser
D24	Planting	Soak seeds for planting

Day After Planting (DAP)	Activity
DAP 8 - 12	Paddy seedlings are transferred to the paddy fields
DAP 90	Drain out the water
DAP 110 -115	Harvesting

- Fertiliser is scattered out on the following days: DAP 18, 28, 38, 48, 58 and 70.
- Weeding and ploughing of the soil is carried out on the following days: DAP 18, 28, 38 and 48.

V DESIGN PROCESS IN KNOWLEDGE TRANSFER

The knowledge on organic paddy farming was transfer to design learning prototype (figure 1). It information are used in creating of Flowcharts and Storyboards.

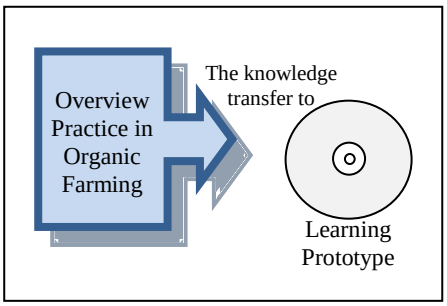

Figure 1: Knowledge Transfer to Design Learning Prototype

Flowcharts are a way to lay out the big picture of the content, showing the structure and sequence of the programme. Whereas storyboards show the details of what learners see and fill in the visual details. The organisation chart of prototype is illustrated in Figure 2. The gray color table in the organisation chart shows the focus of the prototype. It is about virtual environment organic paddy farming at Tanjung

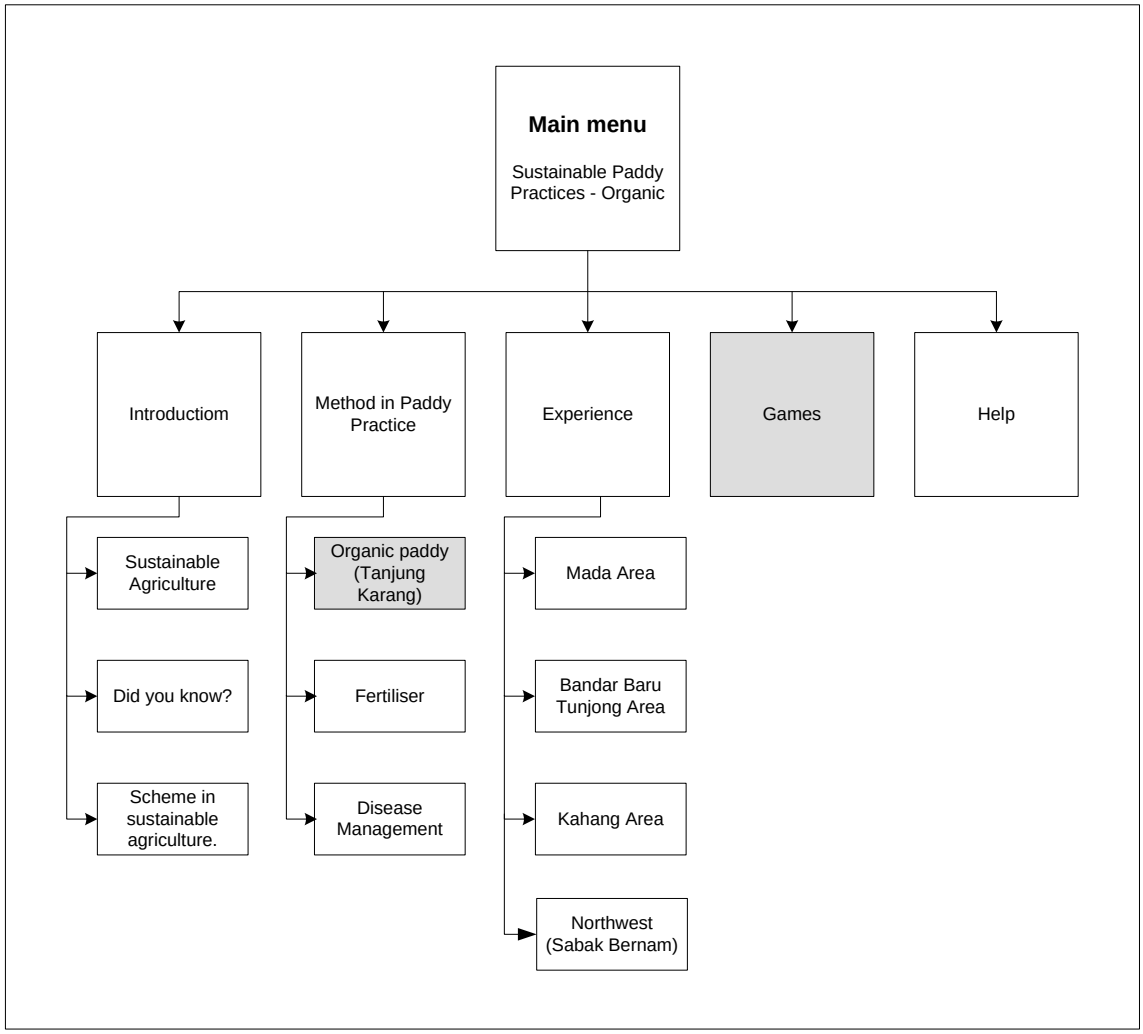

Figure 2. Organisational chart of Prototype

Karang, included simple games to reinforce understanding of paddy farming practices. Figure 3 show the prototype interface.

Figure 3. The Prototype Interface

Table 2 illustrates the steps in virtual environment game based on real practices of paddy farming (MR

215 variety) as discussed before. The steps based on the selected days cover all major activities in organic paddy farming in Tanjung Karang.

Table 2: Design Paddy Farming Flow to Games Environment

Day (D) in Games	Note	Activity
D 01	Land Preparation	Ploughing (dry soil) by tractor
D 10		Release water into the paddy field
D 17		Ploughing by tractor
D 18	Seeding	Sowing of seeds at the nursery site
D 24		Ploughing by 'kabota'
D 25		Scattering of organic fertiliser
D 26	Planting	Paddy seedlings are

		transferred to the paddy field (age the paddy is 8 days)
Day (D) in Games	**Age paddy**	**Activity**
D 26	D 08	Paddy seedlings are transferred to the paddy field
D 36	D 18	Weed management
D 37	D 19	Fertilizer
D 38	D 20	Pest control (snail)
D 46	D 28	Weed management
D 53	D 35	Pest control (worm)
D 56	D 38	Weed management
D 58	D 40	Fertilizer
D 63	D 45	Pest control (rat)
D 66	D 48	Weed management
D 73	D 55	Fertilizer
D 123	D 105	Harvesting

VI FINDING

The usability results reveal that the prototype *SiPadi* has the potential to be a learning innovation, particularly to be used in promoting awareness regarding sustainable farming issues. There are two evaluation of this prototype, first evaluation on 8th of April 2010, namely Lab Experiment 1. A total of 56 students from the Department of Biological and Agricultural Engineering, Faculty of Engineering were selected randomly to answer the usability and awareness (knowledge and understanding) questionnaire. Out of the 56 responses received, six questionnaires were discarded because of missing and invalid answers. The second evaluation or namely Lab Experiment 2 was conducted on the 5th of October 2010 and 13 of students were selected randomly.

At the beginning of the survey, it was found that 32% of the Lab Experiment 1 respondents were not aware of organic practices as being part and parcel of sustainable agriculture. However, after the respondents had used this prototype, 90% of them agreed that organic practice is a part of sustainable agriculture. The results of Lab Experiment 1 also indicated that 94% of the respondents agreed that this system (*SiPadi*) provided better understanding of organic paddy farming and 96% also stated the prototype has been successful in creating awareness among them. The feedback from Lab Experiment 2 was also similar to those obtained in Lab Experiment 1 (Othman & Muhammad, 2011_2).

For the descriptive user interface satisfaction analysis, the combination of Lab Experiment 1 and Lab Experiment 2 results as shown in table 3 reveal that the highest item scores at a mean of 4.40 and the lowest mean is overall system capabilities.

Table 3: Mean of User Interface Satisfaction

Dimension	**Mean (Scale 5)**
Overall Reaction to the Software	4.25
Screen	4.40
Terminology and Sytem Information	4.27
Learning	4.35
System capabilites	4.16

V CONCLUSION

In brief, knowledge and information have become the medium to generate and disseminate organic paddy practices. From the study, it has been shown that using Information and Communication Technology tools as a medium in the sharing organic paddy practices to the public. However, other factors such as interactive and cooperation between farmers; government bodies, research institutions; and policy-makers are important factors in achieving sustainability in agriculture (Murad *et al*, 2008; Sharghi *et al*, 2010). For future study, more research on potential used of interaction media and learning environment in the sustainable agriculture issues can be carried out.

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