Water Operation for Learning Rice Cultivation in Paddy fields

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บทคัดย่อ—การบริหารจัดการน้ำสำหรับการเพาะปลูกข้าวในประเทศไทยเป็นปัญหาที่สำคัญมากของการเกษตรกร การใช้เทคโนโลยีและองค์ความรู้เข้ามาช่วยในการตัดสินใจมีความจำเป็นอย่างยิ่ง การวิจัยครั้งนี้นำเสนอรูปแบบการเรียนรู้การบริหารจัดการน้ำในการปลูกข้าว โดยการใช้วิธีการเทคนิคพื้นที่นาแบบแห้งสลับแบบเปียกสำหรับการปลูกข้าว วิธีการดังกล่าวเป็นวิธีการลดการใช้น้ำในการปลูกข้าว การเปลี่ยนสถานะพื้นที่นาแบบแห้งหรือแบบเปียกจะขึ้นอยู่กับการเจริญเติบโตของต้นข้าวโดยแบ่งเป็นช่วงระยะเวลา แอพลิเคชันที่พัฒนาขึ้นจะช่วยในการเรียนรู้เทคนิค จำลองสถานการณ์เมื่อถึงระยะเวลาให้เลือกตัดสินใจในการกำหนดว่าจะเป็นสถานะแบบเปียกหรือแบบแห้งในแปลงนา การฝึกการเรียนรู้ด้วยเทคนิคนี้จะช่วยให้เกษตรกรนำไปปฏิบัติจริง จะสามารถลดการใช้น้ำของข้าวได้ทำให้ต้นข้าวมีความแข็งแรง เทคนิคการบริหารจัดการน้ำแบบเปียกสลับแบบแห้งในการเพาะปลูกข้าว มีการใช้น้ำปริมาณน้อยกว่าระบบปกติ ซึ่งสามารถต้านทานโรคของพืชและเพิ่มผลผลิตสูงกว่าการปลูกข้าวแบบปกติ

คำสำคัญ: การใช้น้ำการเพาะปลูกข้าว, เทคนิคเปียกสลับแห้ง, แอพลิเคชันการเรียนรู้

Abstract—Water management for rice cultivation in Thailand is a very important issue for farmers. The use of technology and knowledge in decision making is essential. This research presents the learning model of water management in rice cultivation. The techniques used in wet-dry rice cultivation for rice cultivation. This method is a process to reduce water consumption in rice cultivation. Changes in wet or dry wetland areas will depend on the growth of the rice crop, depending on the time period. The developed application helps in learning the technique. When the stage of rice was change, decide whether to wet or dry in the plots. The training application with this technique will help farmers to practice. It can reduce the use of water and the growth of rice is strong. The Wet-Dry water management technique for rice planting less water consumption than normal. It can withstand the disease of the plant and increase the yield than the normal rice.

Keywords-Water operation; rice cultivation; paddy field; learning

I. INTRODUCTION

Thailand farmer has a risk that impacts on water resources. Water shortage due to rainfall variability in many areas. Climate change will affect the amount of runoff and groundwater in the long term. The water demand for agriculture has many increased, cause unbalance of water management. The impact on life and disaster is more severe, because of the destruction of natural resources. As a result, agriculture is difficult to succeed. The problem of rice cultivation is high yield and low-cost production, information and technology applied to solve this problem. The young farmer maybe to more less experience of the rice cultivation such as seed quality, land preparation, nutrient management or crop health [1].

Therefore, the researcher has given importance to such issues to use information that is synthesized in various fields, such as soil, meteorological, agricultural and irrigation, etc. When the real situation increasing access to resources for farmers. Therefore, the ideas for building an application of rice cultivation. There are only rice seeds that are found in the north and the Northeast. Long grain rice found in the central and southern.

The Northeast has a rice area of 45% of the country's area. Mostly jasmine rice 105, which is the best quality rice in the world. The rice grown in this area is often planted for sale, followed by the Central and Northern regions with approximately 25%. Thailand is the world's largest producer of rice. It is the center of rice research.

In the next section, my introduce the related work. Next showed the proposed our model process. In section 3 is present proposed method. In section 4, conclusion and future study.

II. RELATED WORK

A. *Transplanted Rice Process*

The rice production process is consist of: seed quality and selection, land preparation, crop establishment, water use and management, nutrient management, crop health and harvest The rice seedlings, which are dormant in the wet soil, it is large enough to be removed. The seedlings are fertilized in wet soil, the seeds must be cleaned. It is a method of rice farming to seed in the prepared plots (seedling) to germinate. Then remove the seedlings to black in the prepared pan and maintain the product. The process is as follows [1],[2]: preparation of seedlings to get strong when it use to pakdum, it will grow fast and have a high yield. Strong seedlings require a constant growth and consistency, both with short leaves, very roots and large roots. The strong seedlings protected from the disease and insect destruction. Seed preparation must be a wholesome seed. The free of impurities high percentage of germination (not less than 80 percent).

Soil preparation for farming environmental considerations, such as water, climate, space characteristics. Soil preparation is split into 2 steps. (1) Sedimentation is the first plow to flip the weeds and dry the soil. (2) The second plow is plowed by rotary plow. Soil and weed, straw, weeds, etc. into the soil. Harvesting is weeding the soil is broken and it is ready to be black. This step is a taken from Step 1 and trapped for a while to have appropriate soil conditions in the rake. Rice field (Irrigation) caution in soil preparation, the soil to dry completely. If the soil is wet with water, do not dry. The accumulation of toxic substances such as hydrogen sulfide and organic acids, etc. If these substances are large, it will harm the rice roots. The straw should be fermented. Grass, including organic matter, to decompose completely about 2 weeks after plowing, to allow the soil to adapt to the growth conditions of the rice. It can release essential nutrients to the rice. Acid or acid soil, low pH (pH below 4.0) should be kept at least 1 month prior to planting.

Soaking and Seeding take the prepared grain into a container such as bamboo baskets. Sow the bag or bag to soak in clean water for 12-24 hours, then put the seed on the water surface is not locked and good ventilation. After soaking and covering, the seeds are ready to be sown. Seed should be placed in the shade, not direct sunlight and the size of the seed pile must not grow too large, avoid high heat in piles or rice bags. If the temperature is too high, the seed will die. If the temperature is right, the rice will grow faster and consistently throughout the pile. There are many ways to fall in, it depends on the environment and its purpose, such as wet seedling (hedgerows) and to be used with a black embroidery machine and require constant watering. No cumbersome maintenance and loss of rice germination. There are steps to follow.

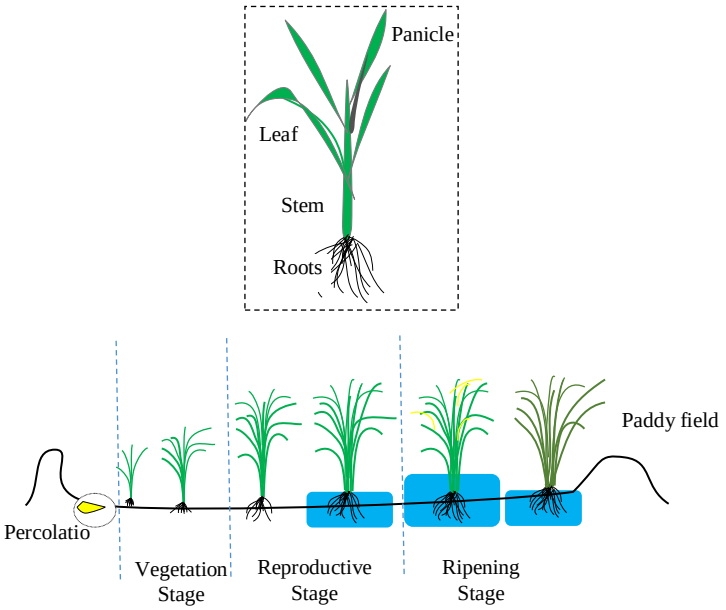


Figure 1. Transplanted rice growth duration.

- Soil preparation is the same as the black embryo conversion. A lot of meticulous in the collection of weeds and adjust the level smooth.
- Seedling: The steps of seed preparation, seed rates of 50-60 grams per square meter or about 80-90 kg per rai for about 15-20 rai.
- Sowing release the water to dry, make a flat smooth, seed germinated well to sow spread uniformly throughout the plot. Seeds should be sown in the afternoon or evening. To avoid the sun at noon, which is very hot, cause death of the grain.

If the water is not much, after sowing seeds one day. Splash water to spread around the plots about 3-5 days, dare enough to flood leave the water between 3-5 days when the seedlings are high, so flood and gradually increase the level. According to the height of the seedlings until flooding the surface throughout. To nourish it at a depth of about 5-10 cm until it is withdrawn.

Chemical fertilizer, If the plots have high fertility because it is too long, the leaves are soft, it is easy to remove and early to set up. If the soil is low fertility, use chemical fertilizers ammonium phosphate (16-20-0), about 25-40 kg per rai. After sowing seeds for about 7 days or when the water can be flooded. The use of insecticides against rice pests as necessary.

The indirect seeding variety is dependent on rice varieties :

- Rice is not sensitive, such as Suphan Buri1, Chainat1, Phitsanulok2, Sanpatong1 should be used between 20x20 cm. and 20x25 cm.

- Light-sensitive rice varieties or rice, such as LuangPatew123, White jasmine105, koaco15, koaco6 Pathumthani 60 should use a black spot 25x25 cm.

- Indirect seeding embryos 3-5 items of embroidered black 3-5 cm deep will make a new graft.

Deep grafting will slow down the rice and clump less. Should not cut the leaves because cutting the leaves will cause the wound leaves. The disease can be easily destroyed. It should be cut if necessary, such as the use of old seedlings, long leaves, high winds when the indirect seeding and then make the fall. Age of dare the rice is very fast and very high yield. The right bra for indirect seeding lace depending on the type and variety of rice.

- Rice is not sensitive to light or rice, such as Suphan Buri1, Chainat1, Phitsanulok2, should be used for durian about 20-25 days.
- Light-sensitive rice varieties or rice, such as Yellow Dendrobium123, White jasmine105, koaco15, koaco6, Pathum Thani 60, should be used for durian about 25-30 days.

The water level indirect seeding should have the lowest water level. Just cover the surface to prevent weeds and keep the rice to fall. Controlling the water level after the indirect seeding lace is very necessary. The depth of water will make the rice. This will result in lower yields. Control should be at a level of about 1 palm (10 cm.).

Alternate wet/dry irrigation (AWDI)[4][5][6]: The AWDI process for rice cultivation alternate wet and dry on the rice growing stage. The AWDI definition is non uniform and subsequently there is an irregularity in phrasing. The term AWDI was inclination to discontinuous water system, which could likewise apply to water system hones that water irregularly without essentially making dry conditions. Ordinarily utilized phrasing for AWDI was non flood, wet area, water saving and submerged rice irrigation.

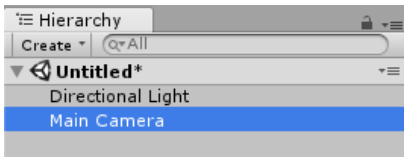
TABLE I. THE RELATION OF RICE EACH TIME AND STAGE WET/DRY STAGE FOR TRANPSLANTED RICE[8]

Phase	Time (day)	Stage
Land preparation	-	-
Vegetation Stage		
Transplanting	20	Wet
Tillering	15-20	Wet
Reproductive Stage		
Panicle initiation	15-20	Dry
Heading/Flowering	30	Wet
Ripening Stage		
Milky and Dough	30	Dry
Harvest Maturity		

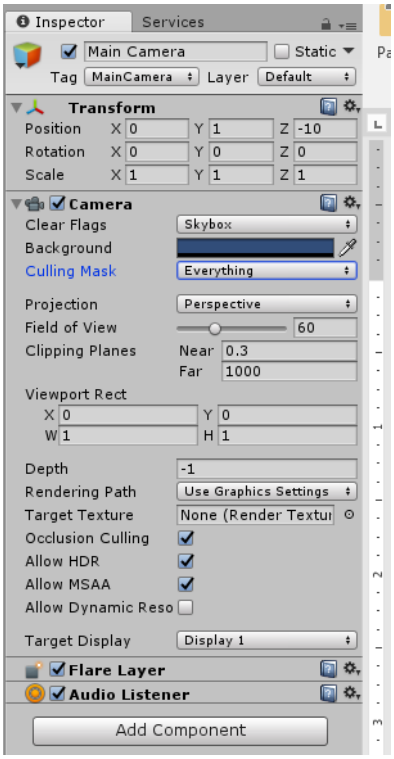
The wet/dry cycle technique[7], leave the rice at the right time for stimulate strong roots and stems. Direct effect on growth and productivity. The first step was to capture water at 5 cm deep plot in the post-transplant period, until the rice was in the flowering stage. It will increase the level. Then, the rice will be dehydrated at the first stage of growth in the stem or rice is about 35-45 days for 14 days or until the water level lower than the 10-15 cm. plot or soil in the cracked plots. Then came the water until the highest rice or rice is about 60-65 days, it will leave rice for the second time for 14 days detail as shown in Table 1.

B. The Unity 3D tool

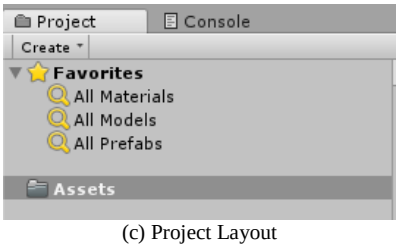
The unity 3D [9] is a game engine that creates 2D or 3D games. Works on many platforms: windows and OSX and export to many applications: Platforms like Windows, OSX, Androids, iOS (iPhone) and website. All object of Unity 3D is a game objects. All game objects have at least one component the transform component. Components come in various forms. Attach components to and object to add parts of the game engine to the component a physics component, or a script component. Assets is building blocks of all Unity projects graphics (textures), models, sound files. The files you use to create the scenario are stored in a folder called assets. Scenes are individual levels, areas of game content. Scenes can be loaded on demand.



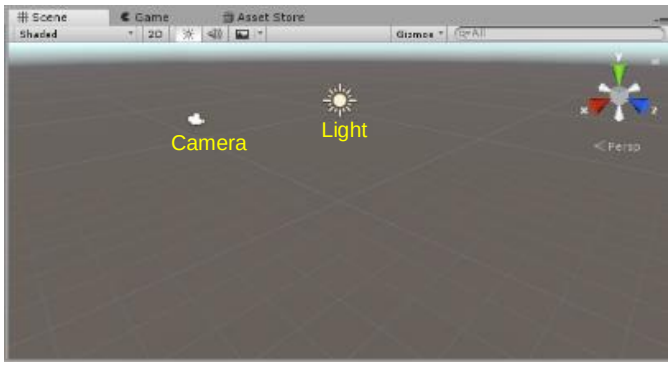
(a) Hierarchy Layout



(b) Inspector Layout



(c) Project Layout



(d) Scene Layout

Figure 2. Unity 3D tool layout.

Scripts components used to add, extend or modify behavior of game objects. Unity uses a behavior class to facilitate the use of custom behaviors. Prefabs is prefabricated game objects with stored associated components and configuration. Prefabs allow functional game objects to be reused in scenes (spawned) or imported into other projects as external assets. The detail of tool layout is shown in figure 2.

III. PROPOSED LEARNING WATER OPERATION FOR RICE CULTIVATION APPLICATION

In this section, showed my approaches for water for rice cultivation algorithm. The algorithm learning on wet/dry cycle technique, implement by the unity 3D software. Therefore, my application to learn the water management for rice transplant in padding field each state condition. The pseudo code of application shown in below:

Start
Time = 0 day, begin stage, water level = 10 cm.
Time = 20 day, Vegetation Stage:
Transplanting ,
***Wet**: water level = 10 cm.*
Time = 40 day, Vegetation Stage:
Tillering ,
***Wet**: water level = 10 cm.*
Time = 60 day, Reproductive stage:
Panicle initiation,
***Dry**: water level > -20 cm.*
Time = 90 day, Reproductive stage:
Heading/ Flowering,
***Wet**: water level = 10 cm.*
Time = 120 day, Ripening stage:
Milky and Dough Harvest Maturity,
***Dry**: water level > -20 cm.*
End

The steps for wet/dry stage for learning application:

Step1: Design : algorithm for rice cultivation application, design layout as shown in figure 3.

Step 2: Implementation: layout of application by the unity 3D : Use time function and start stage. Next show the stage to show data select condition of paddy field.

Step3: Maintenance: Testing application the answer are collected

Step 4: Evaluate the results, user to used rice cultivation application and collected the score.

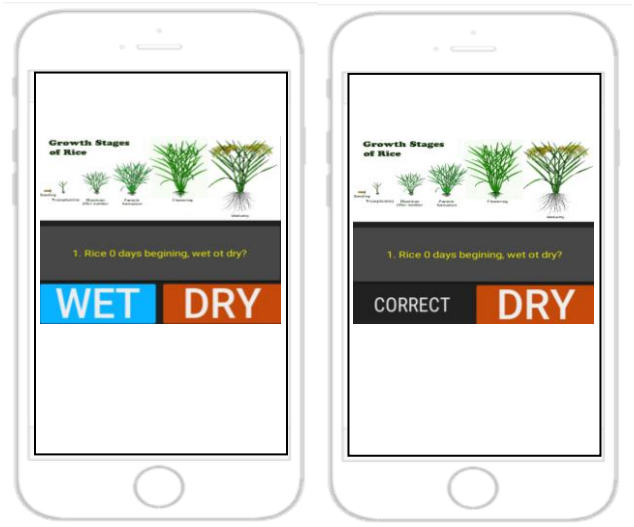


Figure 3. Layout application for select the paddy field stage.

IV. CONCLUSION

In this paper, presented the water operation for rice cultivation application, used wet/dry technique. The tools used the unity 3D software to create application. The water management on paddy fields can learn to operate the wet/dry stage for farming sites: the tillering stage and elongation/booting period uses the drying paddy fields.

For the future study, my interested in researching for developing the application connecting the geolocation base and rainfall data to simulation water management area.

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