

Renewable Irrigation System in the Land Rice Field of Subak in Bali

E. Dewi Yuliana

Universitas Hindu, INDONESIA.

dewi.yuliana1966@yahoo.co.id

ABSTRACT

Subak as Bali's traditional organization functions mainly in the distribution of irrigation water in paddy fields, have to reorganize the system of irrigation in rice fields (paddy). Distribution of irrigation water in paddy fields in Bali Subak be reorganized back in tune with the amount of irrigation water decreased, without having implications for the reduction of rice production per unit area. Thus the traditional irrigation system in Subak need to be reconstructed and adjusted for the increasingly limited availability of water, by applying a model of renewable in the irrigation system. In this context there is an interesting problem to be studied, as formulated in the following research questions. What forms of renewable irrigation system conducted by several subak in Bali? The conclusions of this study are as follows. Renewable forms of irrigation systems applied in both Subak, between Subak Wangaya Betan and Subak Gunungsari are growing rice in paddy fields with irrigation system is interrupted (intermittent irrigation). Rice plants are not aquatic plants, but it requires water, in this way grow rice in waterlogged soils or irrigation interrupted (intermittent irrigation), allow the soil to provide more oxygen when compared to the state flooded. So that was allegedly caused by the process of respiration and water absorption are in balance, then the roots can grow better, bigger and more powerful, so the implication is the sequel plants can absorb nutrients properly, eventually plant growth and development has also improved.

Keywords: Degradation, Quality and Quantity, Water, Irrigation Systems, Subak

INTRODUCTION

At this time there is a tendency preservation Subak declining, this is caused by several factors, including a very low interest of young people to work in the agricultural sector, the narrowing of the rice acreage due to land use change, the modernization and technological change fairly high hit many aspects of community life, as well as decreasing the quantity and quality of irrigation water. If these problems are not addressed, Bali is not only a possibility to lose one's unique culture, but also will have a wide impact on the environment on the island of Bali (Surata, 1999; Lansing et al., 2001).

The same thing also expressed by Sedana (1999) that the quantity and quality of irrigation water is currently decreasing. At first farmers subak members never questioned the state of irrigation water because the numbers are still abundant, and its use is not so complex. However, along with the development of both rural and urban areas, the need for water is increasing and then the water is initially almost used only for agricultural purposes, is now being utilized for non-agricultural purposes. These conditions resulted in farmers feel the low quality of irrigation water due to industrial waste disposal that could no longer be tolerated, and the amount of irrigation water they get from the river became less and less for farming purposes.

In connection with this, Subak as Bali's traditional organization functions mainly in the distribution of irrigation water, which has long made important paddy crop cultivation in paddy fields, had to reorganize the system of irrigation in rice fields (paddy). Distribution of irrigation water in paddy fields in Bali Subak be reorganized back in tune with the amount of irrigation water decreased. Thus the traditional irrigation system in Subak need to be reconstructed and adjusted for the increasingly limited availability of water, by applying a model of renewable in the irrigation system.

From the results of preliminary observations in the field directly by Yuliana (2012), there are some Subak like Subak Wangaya Betan, Subak Gunung Sari and Subak Belulang, has implemented a system of renewable water in farming. Some of Subak in the pattern of farming has been to strive for the preservation of water resources can be sustainable and well maintained by regulating the pattern of distribution of irrigation water to the rice fields as efficiently as possible. Associated with the so requires a model that is able to provide information and can be used as an alternative policy or decisions regarding the use of irrigation water resources, towards a more efficient use of land, especially paddy rice plants in Bali Subak. In this context there is an interesting problem to be studied, as formulated in the following research questions. What forms of renewable irrigation system conducted by several Subak in Bali?

RESEARCH METHODS

The approach used in this study is a qualitative research, with respect to the research, the emphasis is not on measurement but on a descriptive analysis of the viscous (Bungin, 2006). The study was conducted in Subak Gunungsari Jatiluwih village, and Subak Wangaya Betan, Mengesta village, Tabanan, Bali Province. Chosen Subak Gunungsari and Subak Wangaya Betan as a test site, not in spite of the uniqueness has happened to conserve water. Types of data collected in this study is qualitative data supported by quantitative data as supporting data. The data collected in this study were derived from field data and document. Data was analyzed using qualitative analysis, through a three-stage process: data reduction, data presentation and conclusion.

RESULTS AND DISCUSSION

Currently farmers in Subak Gunungsari and in Subak Wangaya Betan have implemented renewable irrigation system in the rice field rice cultivation techniques to perform irrigation system is interrupted (intermittent irrigation). Such as those expressed by the chairman of the Subak Wangaya Betan. Mr. Nyoman Nadri (62 years old) who stated as follows.

"... To conserve water use in rice due to the availability of water planting increasingly limited, so we have been implementing in Subak irrigation system disconnected or also called intermittent irrigation system. We feel that the water supply is cut off, we can save the use, how many, we do not know, which is obviously the case of irrigation water savings, without reducing yields. This method is very well implemented in all Subak, because now as it is known, is very difficult to obtain abundant water as before ... "(Interview, May 2014).

What was expressed by informants at the top is a very interesting thing to be reviewed. Setting the provision of irrigation water to the fields can save water use in rice cultivation, without reducing the production per unit area, so that it can prevent farmers from conflicts over water. The water supply is cut off technique (intermittent irrigation), such as those

expressed by Mr. Pan Gede (53 years old), former chairman Subak Gunungsari Jatiluwih village are as follows:

1. When the rice reaches the age of 1 to 8 days after planting (DAP) circumstances in soil water is "macak-macak" (humid).
2. When the rice reaches the age of 9-10 DAP, back flooded with water up to a height of 1-2 cm for 1 night, this is done to facilitate weeding the first stage.
3. Upon completion weeded plants, dried up rice paddy back reaches the age of 18 DAP (Figure 3.1 and 3.2).
4. At the age of 19-20 DAP, re-flooded rice paddies with water height of 2-3 cm to facilitate weeding second stage.
5. Next paddy dried again until time weeding for the third time, at the time will be weeded, paddy be drowned back on for one night with the water level 1-2 cm, the same as the first and second weeding. Weeding third stage only when farmers grow local varieties of rice (rice Mansour and red rice with the harvest of six months, whereas for high yielding varieties (C4, Sangkareang) farmers did weeding third stage, because the relatively short harvest period is only 4 months.
6. Furthermore, after flowering rice, irrigated rice fields back as high as 1-2 cm and this condition is maintained until the rice "masak susu" (approximately up to 15-20 days before harvest).
7. Next paddy dried again until harvest (Figure 3.3).



Figure 3.1. Watering Disconnected (Intermittent Irrigation) in the Rice Plant (Rice Field in Dry Condition) with the Investment Model Spreads (Photo Documentation E. Dewi Yuliana, May 2014).



Figure 3.2. Watering Disconnected (Intermittent Irrigation) in the Rice Plant (Rice in Dry Condition) with Legowo Investment Model (Photo Documentation E. Dewi Yuliana, May 2014).

Planting rice crops using irrigation techniques are disconnected (intermittent irrigation), with no reducing land productivity broad unity, indicating that the rice plants are not water plants, but the growth is the need of water (Yuliana, 2010). Rice plants is that the growth of land plants need water, but not rice plants grown in a stagnant state, such as conventional rice cultivation techniques (traditional). Furthermore Yuliana (2010) also states that grow rice in waterlogged soils (intermittent irrigation), allowing the soil to provide more oxygen than in the stagnant state. Increasing the availability of oxygen in the soil, allowing the plant can absorb more oxygen with optimal in respiration process. In addition, allegedly due to respiration process run by the absorption of water, the rice plants were grown in a state that is not flooded, causing the roots can grow better, bigger and stronger, so that the subsequent implications are plants can absorb as many nutrients (well).



Figure 3.3. Watering Disconnected (Intermittent Irrigation) in the Rice Plant (Rice in Dry Condition) on When Rice After “*masak susu*” (Photo Documentation E. Dewi Yuliana, June 2014).

Rice plants are not water plants, but it requires water, therefore, the provision of water in rice through irrigation systems must be done at the right time, ie when the rice plants need water in large amounts (flowering period until the *masak susu* grain).). Provision of water at the wrong time result in less favorable for rice crop because respiration events (breathing), the plant will be disrupted. On the other hand the presence of stagnant water left in the paddy plots become less useful and wasted, either through seepage, infiltration, evaporation, especially cannot be used by other farmers who need water at the same time. While water resources in the past decade due to increasingly scarce deforestation arbitrary, global climate warming, the use of water which drain the water of the river from its source, the number of wells drilled to drain utilization and lower the ground water level and water appliances competition both for tourism , farms, and the other, so that the water is getting expensive. Water use, should be done sparingly and efficiently as possible, including in rice cultivation. Therefore, all parties should be able to use water properly, meaning that the water must be used with timely, precise quantity, and the right quality.

In order to produce a solid rod, it is necessary that the roots can grow freely to support the growth of the stem above the ground. For those reasons, the root growth also requires soil conditions, oxygen, water, temperature, nutrients and growing space optimal. Roots also require the results of photosynthate produced by the leaves (and stems as well when the stem has a chlorophyll) and distributed by the stem to root, so in this case the roots and stems dependent (occurring symbiotic mutualism). When conditions in a state of optimum plant growth, there is a positive relationship between the number of stems per plant, number of stems that produce (panicle), and the number of grains per plant, so production with intermittent irrigation system can be increased by means worries land productivity per unit area decreases not occurs (Results Interview with Extension BPTP Bali Province, May 2014).

Furthermore, based on interviews with a field extension of BPTP Bali Province expressed as follows.

"... The growth of rice plants grown with intermittent irrigation system, in the early growth seems small, thin, so the plants look a bit in the fields (rarely), for a month or more after transplantation (weeding plants). After the first month and a second month, the plants begin to grow the stem, so that in the third month rice fields seem to "explode" with a very rapid stem growth coupled with the growth of plants that also "explode". In order to understand this, it is necessary to note phyllochrons concept, a concept that is applied to the grass family, including grain crops such as rice, wheat and barley. Phyllochrons not an object, but the period of time between the appearance of the Phytomer (a set of stems, leaves, and roots that emerge from the base of the plant) and subsequent germination. Phyllochrons size, is determined primarily by the temperature, and is influenced by other factors such as day length, humidity, soil quality, in contact with water, light, and nutrient availability "(Interview, June 2014).

In respect to this research team Faculty of Agricultural Technology, Gadjah Mada University (UGM), along with hundreds of farmers from four districts in Yogyakarta (DIY), develop agricultural cultivation techniques are able to offer water-saving, seed and fertilizer to rice cultivation model of System of Rice Intensification. This method of rice cultivation, rice cultivation is a new breakthrough by changing the management of plants, soil, and water (Anonim, 2009).

Furthermore Veco (2007) stated that the paddy rice cultivation techniques with intermittent irrigation water management, integrated with the development of rice cultivation model of the System of Rice Intensification, was able to save the use of irrigation water. Given the growing day supply of water for rice farmers decreased, then the application of renewable irrigation system with irrigation system is disconnected (intermittent irrigation) on paddy rice cultivation is appropriate.

CONCLUSIONS

The form of renewable irrigation system applied in both Subak, Subak Gunungsari and Subak Wangaya Betan in growing rice paddy fields with irrigation system is interrupted (intermittent irrigation). Rice plants are not water plants, but it requires water, this way grow rice in waterlogged soils or irrigation interrupted (intermittent irrigation), allowing the soil to provide more oxygen than in the stagnant state.

SUGGESTIONS

There are some suggestions that can be presented in this paper is as follows:

1. It is recommended for all parties in the use of water, should be done sparingly and efficiently as possible, including in rice cultivation. Therefore, all parties should be able to use water properly, meaning that the water must be used with timely, precise quantity, and the right quality.
2. Given the growing day supply of water for rice farmers decreased, then the application of renewable irrigation system with irrigation system is disconnected (intermittent irrigation) on paddy rice cultivation is appropriate.

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