

Strengthening the Supporting Factors of Jatiluwih Subak for its Sustainability as World Cultural Heritage Bali, Indonesia

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Abstract

Jatiluwih Subak is located in Tabanan Regency, Bali Province, Indonesia and it is belong to the Subak Landscape of Catur Angga Batukaru. This Subak has naturally beautiful landscape, a unique culture and in agriculture operational based on *Tri Hita Karana* Philosophy. Jatiluwih Subak has been designated as World Cultural Heritage. To keep and maintain this prestige, subak has heavy responsibility. Subak must be able to keep the supporting factors which always can stand and protect the survive of the subak continuously. The purpose of this study is to determine the supporting factors, the faced problems and its solution. This study was conducted through observation, survey, directly observation to the subak area, group discussion with subak leader, subak staff, farmer and literature study. The result of the study show that the ideal supporting factors of the subak are the existence of land, enough water discharge and good quality, good irrigation facilities, easy to market product and prosperous farmer. Recently these factors are as the challenges of the subak. Subak is concerned about land use change, water shortage in dry season, decrease of water quality, cost for operation and maintenance irrigation facilities, difficult to sell agricultural product, poor farmer, and younger generation don't interest to be farmer. These problems can be overcome through integrated management system among farmer, subak and government. It needs to maintain the sustainability of the subak from upstream to downstream which include social and economic aspect, culture and ecology.

Keywords : Jatiluwih Subak, The Supporting Factors, Sustainability, World Cultural Heritage

Introduction

Subak is existing in Bali and it has been known since a long time ago. Based on research, subak has existed since 600 AD. Subak is known throughout the world and as an organization is deeply rooted in culture with its ideal foundation called *Tri Hita Karana* so that it can stand forever from all ages (Widodo, 1978). Subak has an important role for agricultural development and agrotourism. Subak produces rice and shows a beautiful and unique cultural landscape. Jatiluwih subak which belongs to the *Catur Angga Batukaru* area has been designated as world cultural heritage (UNESCO, 2012). This predicate must be maintained well sustainability and increased.

The development of subak from the beginning to tens of centuries lasted very good conditions because at first the population was still sparse, the land was fertile, water was abundantly available, there was

no known climate change, the natural condition was still sustainable. But as time goes by with the increase in population, the need for human life also increases. Slowly but surely housing, public facilities, industry, tourism and other developments developed. The development of these sectors is increasingly intensive and continues to grow. In the beginning nature was still able to compensate for this development, but in subsequent developments nature could not compensate, so that pollution arises, not only in soil, but also in water and air, and also climate change which is known as global warming

On the subak side, the vital factors that support the sustainability of subak with the rapid development are starting to be touched, including the Jatikuwih subak. There has been a change in land use and this incident continues to cause the subak area to decrease. The conversion of agricultural land in Bali is relatively high compared to other regions in Indonesia. In one year, land conversion on average reaches 700 ha (Wisnuardhana, 2020). In addition to land conversion, there is also competition for water use, decreased water discharge, polluted water quality and damage to other environmental factors, all of which can threaten the sustainability of subak. Therefore, the supporting factors for preserving subak need to be researched and improved to support the sustainability of subak and maintain the subak title as a World Cultural Heritage.

Research Objectives

The research objective are to study :

- a. Conditions of the ideal supporting factors for Jatiluwi Subak
- b. The problem of supporting factors of Jatiluwi Subak
- c. Strategy to anticipate the problem of supporting factors
- d. Cultural Landscape of Bali Province
- e. The World Heritage of Cultural Landscape of Bali Province

Methodology

This research was conducted in the Jatiluwi Subak, Penebel Sub-district, Tabanan Regency, Bali Province, Indonesia from August to October 2020. The materials and tools used were paddy field area, irrigation facilities, subak and irrigation area, a list of questions (questionnaire), laptop and stationary.

The research was carried out using a field observation method, survey to subak leader, subak staff, and farmers. Besides, also searching through internet and literature study. The data collected were Bali profile; subak characteristic which cover definition of subak, function of subak, *Tri Hita Karana*, and subak ritual; The Cultural Landscape of Bali Province; World Heritage of Cultural Landscape of Bali Province; The Subak landscape of Catur Angga Batukaru; The Jatiluwi subak which cover subak profile, water source and irrigation scheme, agriculture practice; The supporting factors for subak sustainability.

The collected data were tabulated and analysed descriptively. The determination to be an ideal supporting factors, by improving each factor to be a normal standard.

Data, Findings and Analysis

1. Bali Profile

Bali is one of the 34 provinces of Indonesia archipelago with total land area is 5.636,66 km² (0.29% of Indonesia). It is consist of 8 regencies and one city, 57 districts, 716 administrative villages, 1,471 customary villages, and 2,435 subaks (including *subak abian*). Bali Population is 4,362,000 people. Land use for paddy field: 78,626 ha (Statistic of Bali Province, 2018).

Geographic location of Bali is 08° 03' 40" - 08° 50' 48" south latitude and 114° 25' 53" - 115° 42' 40" east longitude. Bali has tropical climate with rainy season from October to March and dry season from April to September. The rainfall range between 900 and 2,600 mm/year depending on the elevation (Statistic of Bali Province, 2021).

2. Subak Characteristic

a. Definition of Subak

There are many definition of Subak. In a simple sense, subak is a group of farmers who managed irrigation water for paddy fields. Subak is a traditional irrigation management system in Bali which governs the distribution of irrigation water into paddy fields. According to Regulation of Bali Province No. 2 the year 1972, irrigation system of Subak, is defined as customary law society which has the characteristics of an agricultural-socio-religious, which is a gathering of farmers who manage their irrigation water in paddy fields in one irrigation area (Lanya *et al.*, 2017)

b. Function of the Subak

Subaks' system has important functions in supporting the rice farming development in Bali. Subak has philosophy of *tri hita karana* which is guidance of subak in irrigation management. The functions of subaks are distribution and allocation of irrigation water; mobilization of resources for operation and maintenance of irrigation facilities; fund raising, conflict management; and ritual activities. Through these functions, subak might support the rice farming development (Sedana, 2018)

c. Tri Hita Karana

Daily activities of subak are based on the philosophy of *Tri Hita Karana (THK)*. *Tri* mean three, *Hita* mean happiness, *Karana* mean causes. So Tri Hita Karana mean human to have live happily there must be a harmonious relationship between human and God, human and human, human and nature/the environment. General and detailed rules for implementing the THK are included in *awig-awig* and *perarem* (bylaws) of the subak

d. Subak Ritual

Ceremony or ritual in subak is divided into two levels, there are at farm level and subak level. At farmer level are Ngendagin, Ngewiwit, Memula, Neduh, Biukukung, Ngusaba, and Mantenin ceremony. At Subak level are Mapag toya, Mecaru, Ngusaba ceremony

3. The Cultural Landscape of Bali Province

Bali doesn't have natural resources that come from mining materials like other islands in Indonesia. For example, Sumatra island with its coal mine, Kalimantan island with its oil mine, Irian Jaya island with its gold mine and others. To improve the standard of living and welfare of Bali people, Bali tend

to rely on the wealth of natural and cultural resources. Those cover beauty nature, tradition, custom, cultural heritage and other uniqueness. These resources are used to increased income and welfare by developing tourism service. In this development each district has different potential and characteristic for tourist purposes.

The cultural landscape of Bali Province has been designated as world heritage by UNESCO on June 29, 2012 at the UNESCO meeting in Pitsburg, Rusia. The proposal proposed by Government was: Cultural Landscape of Bali Province, Subak as Manifestation of *Tri Hita Karana* Philosophy. The title of the proposal was determined, because the area proposed as World Heritage is an area that is closely related to the Subak Irrigation System in Bali (UNESCO, 2012).

4. The World Heritage of Cultural Landscape of Bali Province

In Bali there are four World Heritage of Cultural Landscape, it consist of:

- A. Supreme Water Temple Pura Ulun Danu Batur and Lake Batur (Bangli Regency)
- B. Subak Landscape of Pakerisan Watershed (Gianyar Regency)
- C. Subak Landscape of Catur Angga Batukaru (Tabanan Regency)
- D. Royal Water Temple Pura Taman Ayun (Badung Regency).

These Landscapes can be shown in Figure 1.

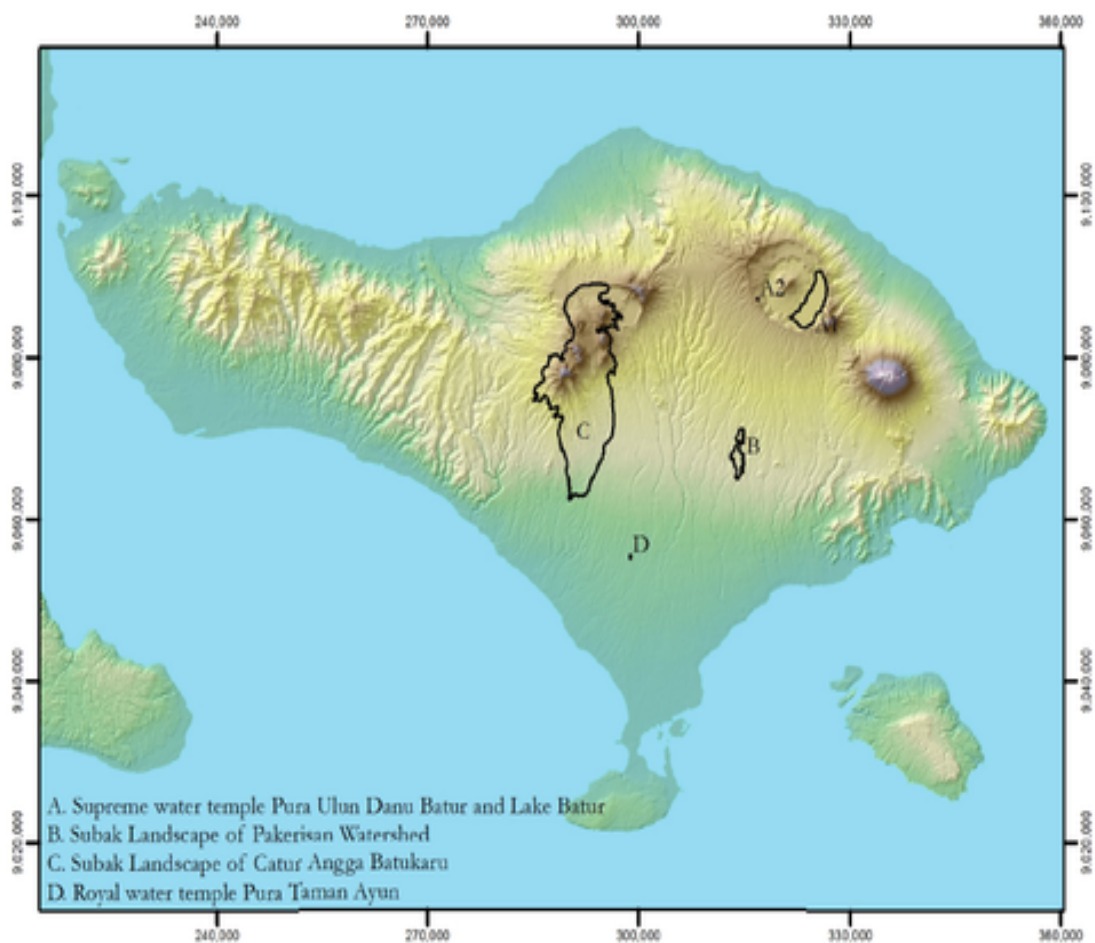


Figure 1: The sites of World Heritage of Cultural Landscape of Bali Province (whc.unesco.org)

The Coverage of World Heritage of the Cultural Landscape of Bali Province are The Subak System as a Manifestation of the Tri Hita Karana philosophy, the cultural landscape of Bali consist of five rice terraces and their water temples that cover 19,500 ha and the temples are focus of a cooperative water management system of canals and weirs, known as subak, that dates to the 9th century. Shortly it covers Subak (Farmer and Institution), Forest Spring and lake, Terraced rice field landscape, River area (watershed), Irrigation facilities (Irrigation Scheme), Rural residential area, Sacred area and Temple Area.

5. The Subak Landscape of Catur Angga Batukaru

In the Subak zone of Jatiluwih, there is enjoy view of the beautiful Bali valley, rice terraces and traditional houses built in the middle of rice paddy. This destination provides magnificent views of the unfolding rice paddy in the area of west Bali. Subak System is as manifestation of Tri Hita Karana Philosophy. Subak as unity of landscape, cultural value, organization community and a unique belief system. The Jatiluwih Cultural Heritage Area includes Lake Tamblingan, Buyan and the surrounding forest along with the Jatiluwih Area, Wangaya Gede and the surrounding subaks. Map of Subak Lanscape Catur Angga Batukaru is presented in Figure 2.

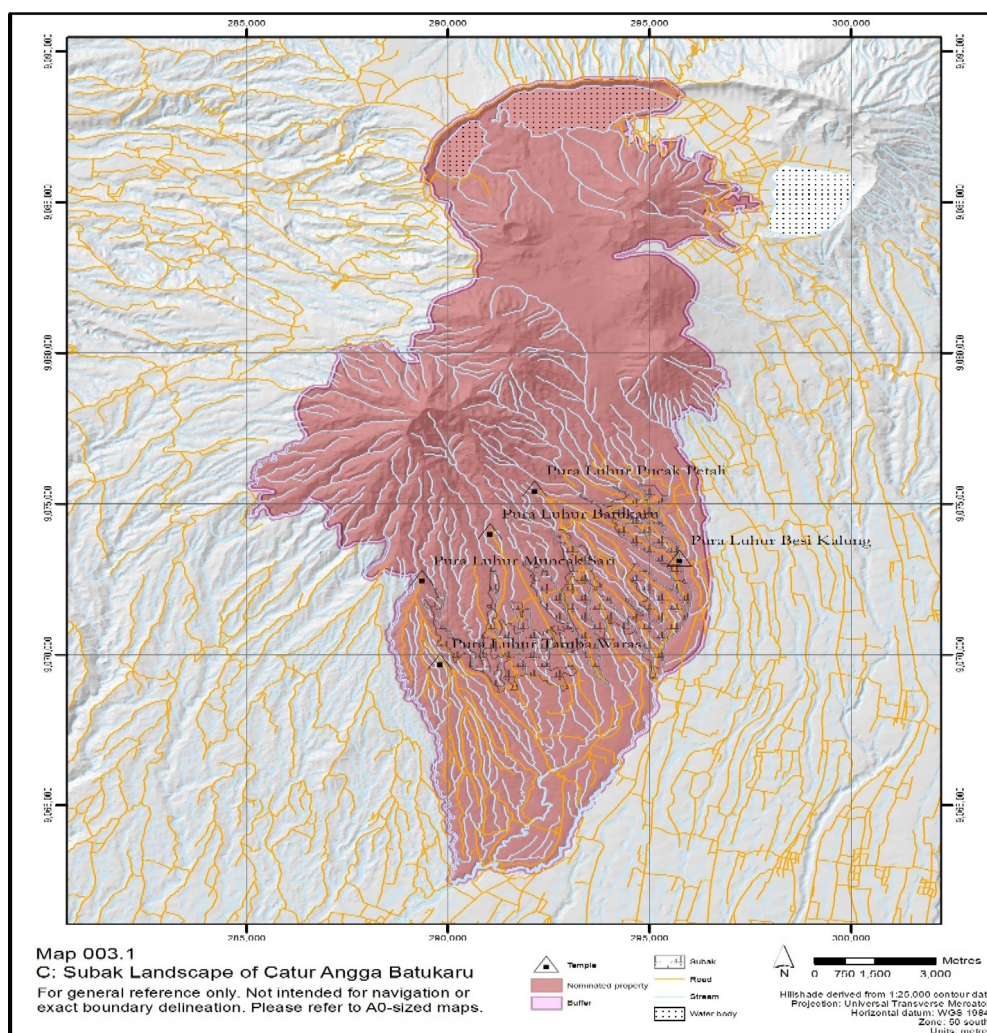


Figure 2: The Map of Subak Landscape of Catur Angga Batukaru (whc.unesco.org)

6. The Jatiluwih Subak

a. Profile of Jatiluwih Subak

The Jatiluwih Subak include to The Subak Landscape of Catur Angga Batu Karu. It is located in Jati Luwih Village, Penebel Sub-district and Penebel Regency. Jati Luwih Subak cover paddy field area 303 hectares. It consist of seven Tempeks namely : Tempek Besi Kalung, Tempek Telabah Gede, Tempek Kedamaian, Tempek Gunung Sari, Tempek Kesambih, Tempek Uma Kayu, Tempek Uma Duwi. The environment of Jatiluwih Subak there are Teracing Paddy Field, Plantation, Tracking and Cyling pathway.

b. Water Source and Irrigation

Jati Luwih Subak include to Yeh Ho Irrigation Area and it is located in the upstream area. Source of Water are From River irrigate 80 hectares and from Springs (Brombong Spring, Gangsang Spring and Riang Gede Spring) irrigate 223 hectares. Water discharge is enough in wet season and there is water shortage in dry season. Water distribution equally among members and based on “ *Tektek*”. One *Tektek* is measurement of water discharge. One *Tektek* is around four fingers (6-7 cm in width) and around two fingers (2-3 cm in height). Irrigation facilities consist of Weir, Tunnel, Channel and Box Structure.

c. Agriculture Practice (Rice)

The steps of agronomic in the field are land preparation, seedbed, planting, irrigation, fertilizing, weeding, control of pest and disease and harvesting. Kinds of crops cultivated are Local Rice, Palawija and Red rice. Cropping Pattern : Rice – Palawija – Rice. Planting time : January and August. In January must grow Local Rice and in August choice is free, where farmer can grow rice or Palawija (Garlich). Farmers in Jatiluwih subak never use inorganic fertilizer and pesticide.

7. The Supporting Factors for Subak Sustainability

There are some factors that required for Subak sustainability, but the key factors are the existence of subak paddy field, enough water supply. good water quality, good irrigation facilities maintenance, easy to sell agriculture product and farmer welfare.

Discussion

1. The Subak Landscape of Catur Angga Batukaru

Maintain the sustainability of the subak from upstream to downstream which includes social and economic aspects, Culture, and ecology. In the upstream area, it is necessary to conserve water sources and forest areas that have customary and cultural value ecosystem service functions. In the downstream area, a policy is needed to protect the conversion of land functions from other uses, maintaining the concept of traditional agriculture and customary settlement. Provide incentives for farmers that are focused on improving the welfare of rice farmers, increasing the added value of agricultural products and strengthening the supporting factors for rice farming.

It was found that irrigation management in South Korea has very important role and it has significant effect in increasing rice production. This reality was supported by increasing of safety paddy field area by year. The water potential developed and to be developed is higher than water use. Government

provided K Water (Korea Water Resources Cooperation) to handle everything in relation to water problem. Besides, the government also improves the welfare of farmers by providing health insurance, salaries and pensions for farmers who are no longer able to work (Santosa and Jaewoo, 2011).

Responding to the challenges of preserving the Cultural Landscape of Bali Province, it is necessary to do Integrated management that can cover all policies for the protection, utilization and sustainable development of subak. Integrated management involves all stakeholders with an interest in achieving 5 priority strategies, namely: (a) Protection and improvement of people's livelihoods; (b) Conservation and promotion of ecosystem services; (c) Conservation of cultural objects; (d) Targeted development of cultural tourism and education; (e) Improving infrastructure and facilities (UNESCO, 2012)

The subak system as a whole reflects the principles of the Balinese philosophy of *Tri Hita Karana*. The Subak system has extraordinary universal value, with the following criteria: The philosophical concept of the past, namely *Tri Hita Karana*, as a democratic and egalitarian system, and as a unique institution.

2. The Jatiluwih Subak

The Obstacles faced by Subak are land conversion, limited water supply, pollution of water resources, management of irrigation scheme by farmer, poor farmer and marketing of agricultural product. In general, these problems almost always appear in the subak area in Bali, but the intensity is different. For example in Subak Sempidi, which is located in Badung Regency, in a period of 24 years (1985 – 2009) there was a change in the function of paddy field covering an area of 36 hectares (Santosa *et al.* 2010). North Kuta Subdistrict experienced landuse change of 538.88 hectares over a period of 5 years from 2012 until 2017 (Lanya *et al.*, 2017). Regarding water supply, during the rainy season the supply is often abundant but there is often a shortage in dry season. In the subak area of Mengwi Sub-district, there is an area of 527.01 hectares of paddy field including the category of drought prone (Santosa *et al.* 2020). Regarding water pollution, this is usually related to the activities of residents who are close to water sources. Pollution usually occurs in the downstream of the Irrigation area. Based on research on the quality of irrigation water in the Subak Padang Legi rice field plot in the Medahan Gianyar irrigation area, it was found that the carbonate content (HCO_3^-) reached 36 me/l (not suitable for irrigation) (Santosa and Budiasa, 2022). There is a tendency that the water quality in the downstream is getting lower and lower due to accumulation (Santosa and Dharma, 2019). To Solve these problems as mentioned above an integrated management is needed.

For land conversion it is needed to make regulation to minimize or to stop land conversion, creating perennial paddy field for subak, applied low land tax. Limited water supply, Subak can do by turning irrigation, manage time of planting, grow resistance rice variety for drought. To maintain water quality in good standard, the perpetrators should not dispose of waste or carry out management before it is disposed into water bodies. It is necessary to conserve water resources to achieve sustainable water use (Santosa and Dharma, 2019). Maintenance irrigation facilities by collecting contribution, develop tourism sector and planting crops which have high economic value. The problem about young generations not interest to be farmer that can be anticipated by increasing prosperous farmer, integration agriculture sector with tourism sector, increase the selling price of agricultural production. For marketing of agricultural product, by growing crop which have market oriented, develop local

wisdom of plants such as brown rice, maintain and improve the quality of production. Subak need to have cooperation as business unit.

Conclusion and Recommendation

1. Conclusion

- a. The ideal supporting factors for sustainability of Jatiluwih subak cover perennial land, enough water discharge, good water quality, professional and prosperous farmer, good maintenance of irrigation facilities and easy to sell agricultural product.
- b. The problem of supporting factors are concern to land conversion, limited water supply, water pollution, cost of irrigation facilities, it is difficult to sell agriculture product and poor farmer.
- c. The strategies to solve the problem are to maintain the sustainability of the subak from upstream to downstream which includes social and economic aspects, culture and ecology.
- d. The cultural landscape of Bali Province cover beauty nature, tradition, custom, cultural heritage and other uniqueness.
- e. World heritage of cultural landscape of Bali Province are Supreme Water Temple Pura Ulun Danu Batur and Lake Batur, Subak Landscape of Pakerisan Watershed, Subak Landscape of Catur Angga Batukaru and Royal Water Temple Pura Taman Ayun.

2. Recommendation

- a. Subak need to be developed, maintained and preserved
- b. It is needed integrated management among farmer, subak and government for subak Sustainability
- c. It takes a lot of effort to maintain Subak as world cultural heritage
- d. Subak as world cultural heritage need to be expanded

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References

1. I. Lanya, I. N. Dibia, I. W. Diara, D. G. Suarjaya. 2017. Analysis of Subak Landuse Change Due to Tourism Accomodation Development in North Kuta Sub-district, Badung Regency, Indonesia. Faculty of Agriculture, Center for Spatial Data Infrastructure Development (PPIDS) Universitas Udayana, Bali, Indonesia. <https://iopscience.iop.org/article/10.1088/1755-1315/98/1/012024/pdf>
2. I. G. N. Santosa, I. W. Budiasa. 2022. Potential of Water Resources for development of Organic Agricultural System in the Downstream Area of Pakerisan Watershed. International Journal of Creative Research Thoughts (IJCRT) ,Vol 10, Issue 5, May 2022
3. I. G. N. Santosa, G. A. Gunadi, A. A. I. Kesumadewi. 2020. Strategies for Anticipating Drought and Flooding on Paddy Field to Maintain Food Security in Subak Area of Mengwi Sub-District, Badung Regency. International Journal of Creative Research Thoughts (IJCRT) Vol. 8, Issue 10, October 2020
4. I. G. N. Santosa, P. Dharma. 2019. The Suitability of Irrigation Water Quality for Rice Fields in the Mambal Irrigation Area. Agrotrop - Journal of Agricultural Science, Vol. 9, No. 1

5. I. G. N. Santosa, C. Jaewoo. 2011. The Role of Irrigation Management in Increasing Rice Production in South Korea. *Agrotrop – Journal of Agricultural Science*, Vol. 1, No. 1
6. I. G. N. Santosa, G. Menaka Adnyana, I. K. Kartha Dinata, I. G. A. Gunadi. 2010. Impact of the Conversion of Paddy field on the Use of Water Resources to Support Food Security. *Sustainable Earth. Journal of Environmental*, Vol 10, No. 2, Center for Environmental Research, Udayana University, Denpasar
7. G. Sedana. 2018. Function of Subak as Traditional Irrigation System. Faculty of Agriculture, Dwijendra University, Denpasar, Indonesia.
https://repository.undwi.ac.id/public//files/penelitian/0001126409_GedeSedana_UNDWI_Functions-of-Subak-as-Traditional-Irrigation-System_81719.pdf
8. Statistic of Bali Province. 2021. Bali Province in Figure. bali.bps.go.id
9. Statistic of Bali Province. 2018. Bali Province in Figure. bali.bps.go.id
10. United Nations Educational, Scientific and Cultural Organization (UNESCO). 2012. Cultural landscape of Bali Province: The subak system as manifestation of the Tri Hita Karana philosophy. Retrieved June 11, 2014 from <http://www.unesco.org/en/list/1194>
11. S. Widodo. 1978. Subak, A Traditional Organization of Peasant Farmers in Bali (With a case of Leput Subak). <https://doi.org/10.22146/agroekonomi.16874>
12. I. B. Wisnuardhana. 2020. The Conversion of Agricultural Land in Bali is 700 Hectares per year on average. <https://www.balipost.com/news/2020/01/17/99216>