Subak Pulagan, a Traditional Balinese Irrigation System, and its Relation to Tri Hita Karana

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Abstract

Subak, a traditional irrigation system in Bali based on the philosophy of Tri Hita Karana-three aspects of harmony that encompasses the relations of humans with the Creator (Parahyangan), with other humans (Pawongan), and with the surrounding environment (Palemahan). Subak Pulagan, one of the oldest Subaks recognised as a World Cultural Heritage Site, is located in Tampaksiring village, Gianyar Regency, Bali. The implementation of Parahyangan in this Subak is not much different from other Subaks, but the typical characteristic of Subak Pulagan is the existence of two main Pura (temples), namely, Pura Dalem Tambug and Pura Ulun Suwi which are located in the Subak area, and related to the history and ancestor of Tampaksiring Royals. In addition, the eels, snails, and rice specifically from Subak Pulagan are a prerequisite for any religious ceremonies. The implementation of Pawongan is regulated by traditional awig-awig system which consists of activities of the Pekaseh (Subak's Leader), Prajuru (administrators), and Krama (members). The implementation of Palemahan covers planting period, water management, and maintenance of existing water canals and other water work structures. Water distribution is carried out and supervised by the Deputy Pekaseh, called Pangliman. There is a plan to introduce Subak Pulagan as a World Cultural Heritage Site to both domestic and foreign tourists.

Subak, a traditional irrigation system in Bali assumed to have existed before the 9th Century CE, inscribed as "humah", meaning rice fields (Purwita, 1993). The underpinning philosophy of Subak in carrying out various activities is based on the local genius of the traditional Hindu cultures of villages in Bali, namely, Tri Hita Karana which means three causes of happiness or harmony. Tri Hita Karana encompasses the harmony of human relations: first relationship of humans with God/Creator called Parahyangan; second, relationship between humans called Pawongan; and third, relationship of humans with natural environment called Palemahan- (Norken et al., 2015a,b; Norken et al., 2017; Yeki et al., 2017).
Subak, a traditional irrigation system in Bali assumed to have existed before the 9th Century CE, inscribed as "huma", meaning rice fields. The underpinning philosophy of Subak in carrying out various activities is based on the local genius of the traditional Hindu cultures of villages in Bali, namely, Tri Hita Karana which means three causes of happiness or harmony. Tri Hita Karana encompasses the harmony of human relations: first relationship of humans with God/Creator called Parahyangan; second, relationship between humans called Pawongan; and third, relationship of humans with natural environment called Palemahan.

UNESCO recognized Subak as a World Cultural Heritage on 29th June 2012 (Ukirsari, 2012), and is officially titled “Cultural Landscape of Bali Province: the Subak System as a Manifestation of the Tri Hita Karana”. The area covers five regencies, namely, Gianyar, Badung, Buleleng, Bangli, and Tabanan. The location includes the Ulun Danu Batur and Lake Batur, the Pakerisan River Basin, the Catur Angga Batukaru, and the Taman Ayun Temple site, with a total of 19,500 ha.

This study examined the implementation of Tri Hita Karana conducted at Subak Pulagan located in the upper part of the Pakerisan Watershed. Subak Pulagan is one of the Subaks named as a World Cultural Heritage Site (Sarita et al., 2013) (Fig. 1). Subak Pulagan receives irrigation-water from a spring in the Tirta Empul Temple area, one of the tourist attractions located adjacent to the statues of the Gunung Kawi Cliff, the ancient royal heritage of the Warmadewa Dynasty (Darmanta et al., 2013).

Methodology

This was a descriptive qualitative study using a combined method of in-depth interview, observation, and literature study. The in-depth interviews were conducted on the 5th and 10th of September 2016 with the Pekaseh (Subak leader) and the Penyarikan (Secretary) of Subak Pulagan who were also rice field farmers.

Data were obtained on three aspects: the characteristics and physical conditions of Subak, the history of Subak Pulagan, and the implementation of Tri Hita Karana (Parahyangan, Palemahan and Pawongan). Observations recorded aligned with the rice planting period and the temple ceremonies related to aspects of Tri Hita Karana were implemented in association with the different stages of rice growth. Observations were taken three times, first on the 25th September 2016, second on the 10th December 2016, and third on the 6th January 2017. The data collected comprised of the condition of the irrigation network, the physical conditions
of the paddy fields, and the levels of various implementation of Tri Hita Karana (Parahyangan, Palemahan, and Pawongan). The document study was carried out by assessing the publication and documentation to gather data regarding the characteristic, history and the implementation of Tri Hita Karana in Subak Pulagan. Data gathered during interview, observation and documentation were compared and analyzed to understand their linkages and support in proper implementation of various aspects of Tri Hita Karana holistically in Subak Pulagan.
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Results and discussion

Description of Subak Pulagan

Subak Pulagan is located in Tampaksiring village, Tampaksiring Subdistrict, Gianyar Regency, about 17 km north of Gianyar city and about 1 km from the Tampaksiring Subdistrict Office. The Subak Pulagan area is in the Pasedahan (a number Subak areas) of Tukad Pakerisan Ulu with the boundaries of Sareseda Subak in north, River/Tukad Pakerisan in east, River/Tukad Kesah in south, and Kumba Subak in west. Rice fields in Subak Pulagan are terraced with relatively low to fairly steep slopes. The area of Subak Pulagan is 110 ha with a total of 205 farmers or ayahan/kecoran. One kecoran or tektek is equivalent to the amount of water given to about 0.4 ha of rice field. Each Subak consists of 150 krama (members) of Subak ayah (a farm owner who directly works as a farmer) and as many as 55 people as krama pengampel (a farm owner who does not work the land for such reasons as old age). Subak Pulagan uses water from the Tirta Empul spring located in Manukaya Village, about 2.5 kilometers upstream (north) of the Subak area. Subak Pulagan is one of the two Subaks incorporated in a big subak (Subak Gede). Pulagan-Kumba (Subak Pulagan and Subak Kumba) with a total area of 200 ha, which uses the same water source, the Tirta Empul Spring from Tukad (river) Pakerisan stream. Subak Pulagan is divided into three tempek (Subak sub-areas), Tempek Pulagan at Geria Sub-village (banjar), Tempek Tambug at Penaka Sub-village, and Tempek Penukadan at Buruan Sub-village.

History of Subak Pulagan

The history of the existence of the Subak Pulagan is very difficult to trace. According to the records in the Manukaya inscription which dates back to 960 CE, King Chandrabhayangsha Wermadewa repaired the embankment in the spring of Tirta Empul. It is not clear whether the repair of the embankment was carried out for irrigation purposes or other uses. However, it should be noted that springs from Tirta Empul have long been used for irrigation water sources for Subak Pulagan and Subak Kumba located in Tampaksiring village. The description of the Manukaya inscription does not clearly
provide an overview of the history and existence of the Subak Pulagan (Dit. PCBM, 2015), although between the Subak Pulagan area and the Tirta Empul water source there are relics from the Warmadewa Dynasty, such as a temple in Mangening Temple, and the Cliff Statue on Gunung Kawi. However, Antara (2017) explains that Subak Pulagan is estimated to have been built during the reign of Warmadewa Dynasty of King Udayana Warmadewa who ruled in the 10th Century CE. This implies that Subak Pulagan has existed since the 10th Century CE and is the oldest Subak in Bali, and was located in the center of the administration of the Ancient Kingdom of the Warmadewa Dynasty centered in the Pakerisan River basin.

The Pekaseh (Leader) of Subak Pulagan, Sang Nyoman Astika explained that the history of Subak Pulagan was inseparable from the existence of Pura Dalem Tambug (Dalem Tambug Temple) which is Penyungsung Temple (located at the southern end of the Subak area) and Pura Pulagan (Pulagan Temple located in the middle of the Subak region), which is currently known as Pura Ulun Suwi (Ulun Suwi Temple) of Subak Pulagan. Pura Dalem Tambug is a discussion place of the descendants of the Pemayun Dynasty assumed to be from Puri Pejeng (Pejeng Royals) who chose the present area of Subak Pulagan and then built a temple known as Pura Ulun Suwi or Pura Pulagan. From the location of Pura Pulagan, the king moved to Pengejaran (south of Tirta Empul spring) and then to Puri Tampaksiring. The area around Pura Pulagan and Pura Dalem Tambug was further developed into irrigation areas, thus Pura Pulagan and Pura Dalem Tambug were also worshipped by members (krāma) of Subak. In addition, Subak Pulagan Temple also called Pura Bedugul is located apart from the Subak area and close to Tirta Empul Temple. It is estimated that the existence of Ulun Suwi Temple of Subak Pulagan became known by the influence of Majapahit in Bali (after the 14th Century CE). This is because the Pemayun Dynasty is a descendant of the Dynasty based in Puri Pejeng, a relative of Dalem Tarukan in Pejeng Village still associated with the Majapahit Kingdom (c.16-17th Century CE), and located in the south of Tampaksiring Village.

Implementing _Tri Hita Karana_

*Parahyangan aspect*

Parahyangan (harmonious relationship between humans and God/Creator) in
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Subak Pulagan contained in the Eka Elikita Book (about Subak Pulagan) and Eedan Pengaci Book (on series of ceremonies) of Subak Pulagan was implemented in 2011. In the beginning (Pemahbah) of Eedan Pengaci the religious ritual ceremony is performed at the following temples: Bedugul Temple, also called Ulun Empelan Temple, which is located near the weir (a low dam); Pura Pulagan as the Ulun Suwi Temple; Pura Dalem Tambug as Penyungsungan (worship) of Subak Pulagan, and Ulun Carik Temple in the upper reaches of the respective rice fields.

In addition, rituals are also held at Pura Nataran Saresidi, Pura Sakenan, Pura Tirta Empul, and Pura Masceti, which are located outside of the Subak Pulagan area, but are still related to the Subak temple in Gianyar Regency (Artiya, 2011c; Artiya, 2011d).

The series of ceremonies carried out include:

- Muwat Emping or Ngembak Toya (start channeling water from the weir/river into the channel, also called Mapag Toya) and ngendagin (start the flow from the canal to the rice fields). Muwat Emping was carried out at Ulun Suwi Temple, followed by Ngembak or Mapag Toya at Pura Begugul jointly by the management and all the Subak members and continued with the ngendagin ceremony at Ulun Carik Temple (located in the rice field intake) of each Subak member. The recent ceremony of nuwat emping and ngembak toya at Ulun Suwi Temple (Fig. 2).

Figure 2. Ritual at Ulun Suwi temple.
- *Ngurit* or *mevinich* (spreading rice seeds) is carried out at Ulun Carik Temple (which is located in the intake of rice field) of each member of the *Subak*.

- *Nuasen* or *Nandur* (starting to plant rice on an auspicious day) at Ulun Carik Temple by each Subak member.

- *Mecaru* is carried out at Tembuku Aya (Water Division Structure/Primary Box), and is carried out by each *Subak* member.

- *Nangluk Merana* is carried out by all *Subak* members at Pura Ulun Suwi of *Subak* Pulagan, Pura Nataraan Saresidi, Pura Sakenan, Tirta Empul Temple, and Pura Masceli as well as in the Ulun Carik Temple by each *Subak* member.

- *Nyungsung* is carried out by by all the *Subak* members at Pura Dalem Tambug followed in the Ulun Carik Temple by each *Subak* member.

- *Pisang Kukung* or *Mabiu Kukung* is carried out at Ulun Carik Temple, two months after the rice planting. The ceremony starts from the rice field owned by the Puri (The Royals of Tampaksiring) and followed by each member of the *Subak*.

- *Ngaturin Sarin Taun* is held at Ulun Suwi Temple of *Subak* Pulagan when the rice crop begins yellowing and done jointly by all the *Subak* members.

- *Ngadegan Dewa Nini* or *Bethari Sri Nini* or *Nyootin* (Nyangket) is done during harvesting of rice crop by each member of the *Subak* in their respective fields.

- *Ngodalin Dewa Nini* or *Mantenin* when the harvested rice is stored in the barn of each *Subak* member.

In principle, the implementation of the *Parahyangan* in *Subak* Pulagan in general is not much different from the other *Subaks* in Bali, but the typical thing in *Subak* Pulagan is the existence of *Pura* Dalem Tambug as a temple that serves as a place of worship for all the *krama* and *prajuru* of *Subak* Pulagan. In addition, Ulun Suwi of *Subak* Pulagan Temple is in the middle of *Subak* Pulagan and is not related to water sources that irrigate *Subak*, but relates to a history of a King's journey. Another unique aspect of the *Subak* Pulagan is its source of water, which is the spring of Tirta Empul, the existence of which has been known and utilized since the reign of King Chandrabhayangsingha Warmmadewa from the Warmadewa Dynasty in the 10th Century CE. In addition, white rice, *lindung* (eels) and snails from the Pulagan *Subak* are used in these series of ceremonies and others throughout Bali but it is unclear why they are considered especially sacred.

**Pawongan aspect**

*Subak* management or *Prajuru* *Subak* Pulagan is chaired by *Kelian* (*Pekaseh*) and assisted by Deputy *Pekaseh* who also serves as *Pangliman* (water supervisor and regulator), Secretary, and Treasurer. *Prajuru Subak* Pulagan is also
accompanied by representatives of Subak from Tempek (a group of Subak members) representatives, called Petajuh consisting of one person Petajuh of Tempek Pulagan, two of Petajuh of Tempek Tambug and one of Petajuh of Tempek Penukadan (Artiya, 2011a).

The implementation of the Pawongan (harmonious relationship between humans) of Tri Hita Karana is regulated in Awig-Awig, which was recently agreed by leaders (prajuru) and krama (members) of Subak Pulagan, and was formally documented in 2011. The arrangements relating to Pawongan are regulated in Trityas Sargah (Chapter III) which is divided into six sections/Palet (Artiya, 2011a) relating to members (krama), management (prajuru), meeting (paruman) (Fig. 3), ketongan (kulkul), assets (pedrean), and danger (bhaya).

Until now, the members (krama) of Subak have obeyed awig-awig rules and all the functions have run in an orderly manner, and thus there has been no conflict between Subak members to date. In case of damage to the channel, Prajuru and the Subak members together carry out repairs with mutual cooperation (Fig. 4). Pekaseh and prajuru receive very high respect from Subak members. In order to get more water-use rights for Subak members—Pekaseh gets special government incentives in the form of cash of Rp. 300,000 (USD 25/- every month). While earning from farming does not provide sufficient income, most farmers have off-farm jobs such as traders, civil servants, craftsmen, breeders, etc. For the World Cultural Heritage to work well, the current Subak Pulagan needs improvement in coordination among various parties outside the Subak organizations, both from government and non-government.

**Palemahan aspect**

The implementation of the Palemahan in Subak Pulagan is regulated in awig-awig Subak precisely at Pancamas Sargah (Chapter V) concerning Sukerta Tata Pasubakan/rules related to the physical aspects on Subak system (Artiya, 2011b) including:

*Figure 3. Meeting (Paruman) of Subak members.*

*Figure 4. Subak members cooperatively (ngayah) repairing a water channel.*
• Relating to Palemahan (Indik Palemahan), which contains the boundary of rice fields, ownership of plants on the roads within the Subak area, and regulating/prohibiting annual crops (tanem tuwuh) related to the rice fields. In case of a violation, a fine is imposed in accordance with the agreement followed by a cleansing ceremony (mrayascita).

• Relating to water (indik toya), it relates to the place for obtaining water/water structures such as: empelan (weir), tembuku aya (primary diversion structures) and water intake for each subak member (tembuku pengalapan). The cost of waterworks construction (empelan/weir, telabah/channel, aungan/tunnel, etc.) is provided by Subak members and from outside assistance, while maintenance is carried out by Subak members. Prohibition of damage to the channel and water distribution structures and closing water/waterwork structures of other members is regulated. Incase of a damage, the defaulting member is fined according to agreement. Similarly, water shortages are regulated by carrying out a rotation supervised by Prajuru Subak; if members do not get water, they are obliged to plant palawija (non-staple food crops).

• With regard to plants (indik tetanduran), it includes cropping patterns according to rainy season and ngegadon (dry season) (Fig. 5); rice crop planted include del paddy (log-duration rice), cicih (short-duration rice) and superior seeds; how to grow, maintain and fertilize rice; make sunari (whistling tall bamboo pole), propellers and kentogan (log drum/kulkul) in rice fields, efficient harvesting of rice, types of plants that can be planted, and plants that cannot be planted.

• Regarding breeding (indik wewalungan), it includes types of livestock that may be kept and prohibited to release (nglumbar) on the land of other Subak members. If they violate the rule, the defaults are fined according to the agreement (perarem) (Artiya, 2011b).

Figure 5. Rice planting activities.
• Relating to pests (indik merana), it includes types of pests, control of pests in a sekala (physical) such as eradicating rats, driving birds away, eradicating rice that has been affected by pests, and use of pest control. In niskala (spiritual) way, it is done with ceremonies/rituals such as neduh (for inviting rains), nangluk merana (for controlling pests), ngaben (for mice cremation), and penyepian (having a silent day).

• In relation to prohibitions (indik patikawenang), it includes prohibition after planting of rice and before its maturity, of herding ducks, chickens and cattle, of gathering snails and vegetables in the neighboring fields, or looking for eels. In case of violations, fees and fines are imposed on the defaulters in accordance with the agreement.

All the rules stated in awig-awig are carried out wholeheartedly by Subak members. Water distribution rotation is carried out in an orderly manner by the Deputy Pekaseh (Pangliman) when fields are being ploughed so that the active farmers will receive priority in channeled flows. Rotations are generally every two hours during the day. Until now, no disputes have been noticed among Subak members. In connection with the maintenance of waterwork structures, Pulagan Subak receives different kinds of assistances from outside parties, although presently there are still some issues related to channel conditions such as water leakage from poor condition of tertiary canals. In some cases, garbage may also block channels. There are now plans to make a path surrounding the Subak area, which is expected to be a Subak tourist attraction that can introduce Subak to both domestic and foreign tourists to this World Cultural Heritage Site. For this reason, some traditional water distribution (made of wood) or belagbag (water flow taken in the primary channel through a hole size of 1×2 cm²) needs to be maintained as a characteristic of the Subak cultural heritage that has been in existence for a long time. In addition, the Subak area always needs to be guarded against the land-use conversion.

**Conclusion**

Subak Pulagan is one of the oldest Subak systems in Bali that has been recognized as a World Cultural Heritage Site located in conjunction with the Pakerisan River Basin, which holds many Balinese historical sites. Subak Pulagan and other Subaks in Bali continue to implement the Tri Hita Karana principle which is executed through awig-awig. In addition, irrigation systems that have proved sustainable in the long-term have existed across Southeast Asia, with that of the Muang Fai system in northern Thailand (Falvey, 2001) perhaps being the most documented after the Balinese system. In case of Thailand, the irrigation systems have not been maintained in the traditional form, notwithstanding the inclusion of ancient water management titles in the name of the present-day Kings. On that
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basis, the ongoing operation of the Balinese system can be considered as unique. It is, therefore concluded that the continuity of the traditional irrigation system including its religious and ethical rituals as enshrined in regulations constitutes an asset worthy of preservation by assigning the World Heritage status.

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