

Balinese Cosmology and its Role in Agricultural Practices

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For thousands of years, generations of Balinese farmers have transformed their landscape to enable the growth of irrigated rice. Parallel to the physical system of rice terraces and irrigation, intricate networks of shrines and temples are dedicated to agricultural deities (Lansing & Kremer, 1993). John Steven Lansing is one of the only anthropologists to study agricultural practices in Bali. Through extensive research into Balinese culture, he discovered the cosmology behind much of daily life, including the organization of water irrigation systems. Balinese water temples are instrumental, both as religious markers and as aids to agricultural productivity. In light of recent disruption in these practices precipitated by political changes during the Green Revolution in the nineteen sixties, it is important to understand the interrelation between centuries of Balinese cosmology and the development of traditional highly effective agricultural practices.

The Goddess of the Lake and the Jero Gde

Traditional Balinese agricultural practices were based on rituals for the Goddess of the Lake, Dewi Danu, one of the two supreme deities of Bali. The top of Mount Batur has a vast freshwater crater lake that is considered a sacred cosmic map, or mandala, of waters (see image 1 below). This lake is the ultimate source providing irrigation for the whole of central Bali (Lansing, 1995). “The Balinese name for their religion is *agama tirta*, the religion of holy water. Water is revered for its power to make things grow, and to wash away impurities both physical and spiritual” (Lansing, 1987). This connection between religion and production is reflected in the significance of their organizational system in the form of water temples. These water temples reflect cosmological beliefs and organize a communal social system central to irrigation and agricultural practices. Bali’s main source of production is rice, and the irrigation practices that they have developed are extremely effective. Water temples organize community groups and maintain ecological productivity. More recently, the Green Revolution had a drastic disruptive effect on the use of water temples, and uprooted many years

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of carefully perfected coordination of water management and pest control.

In Balinese cosmology, the Goddess Dewi Danu resides at and rules the lake on the second-highest peak in Bali, Mount Batur. Her counterpart, the God of Mount Agung, rules the highest and is symbolically associated with kings and kingdoms. The Goddess has no such relationship with powerful beings on earth. Instead she rules over several hundred subaks, or associations of farmers who share water from a single source, who make pilgrimages to her temple called Pura Ulun Danu Batur, or the Temple of the Crater Lake. The goddess “is believed to be responsible for the gift of the waters that irrigate their fields” (Lansing, 1987), therefore farmers believe that, “those who do not follow her laws may not possess her rice terraces” (Lansing, 1995). There are twenty-four permanent priests, chosen in childhood to serve the goddess at her temple. In addition, there is a single high priest, Jero Gde, who is selected as a young child by a virgin priestess who, in a trance, allows the Goddess of the Lake to possess her voice to describe the boy she has chosen. For his entire life, he is connected to the goddess and is regarded as her earthly representative. He offers sacrifices to her from the members of subaks, and receives guidance from her in the form of dreams. No other priest is ever permanently identified with a deity. Gods can possess priests during certain rituals, but there is no life long connection. The Jero Gde has specific limited power, which extends only to the Temple of the Crater Lake and the waters that originate from it. Technically he is a mere temple priest, but he has special authority over irrigation water because of his connection with the goddess. He can make decisions about granting permission to certain subaks to take more water, or prevent them from doing so at the expense of others not having enough. His life-long connection with the water goddess shows the emphasized importance of water in the Balinese spiritual culture, and his control over water rights shows the importance of the agricultural system.

Water, Temples, and Shrines

The role of the water temples in ecosystem management makes sense only in the context of their ‘cosmological’ meaning (Lansing, 1995). Each time the water is diverted towards a farmer’s land, by a weir or diversionary dam, the local farmers build a temple or shrine as a place to show gratitude to the “Deity of the Weir” for making the

water flow into the canals. The canals eventually reach a block of terraces where there is another temple called “Head of the Rice Terraces Temple,” or Pura Ulun Swi. Here all of the farmers whose terrace benefits from the canal can make offerings to the “Deity of the Ulun Swi Temple” along with the Deity of the Weir and the Goddess of the Temple of the Crater Lake. The offerings acknowledge the dependence on water flow into terraces, weirs, and the original flow of the river (Lansing, 1995). The physical features of the landscape organize each social congregation, because the temples are always found upstream from all the water systems they control. Each farmer has a series of temples or shrines that he uses. This begins with a small sacred shrine located where the water first enters his field, where he makes offerings to the Rice Goddess. Upstream from this is the subak temple, where blocks of irrigated terraces have a common water source. Several of these make up a congregation of an Ulun Swi temple, where a large canal, and a weir or spring shrine is found. Several of the weirs’ subaks make up a masceti, or regional water temple. Next, each spring, lake, or river has a shrine or temple, leaving the largest temple to be farthest upstream: the Temple of the Crater Lake. Each of these temples is found upstream because they are associated with nourishing or life-giving effects that are a gift from the Goddess of the Lake. There is also a concept of downstream water that is cleansing, used to purify and wash away the pollution and impurities collected from the various villages and fields. Some masceti temples are found at the downstream edge of the last block of rice terraces before they reach the sea, where the human impurities are dissolved and the water is believed to return to a wild, elemental, natural state (Lansing, 1987). The positioning of these temples clearly reflects the importance the Balinese emphasis on special relations. “Kaja” means upstream or towards the summit, and “Kelod” means downstream or towards the sea. These also can refer to the human body, or objects in space, such as a house or bed. Things are orientated according to importance, with those more important facing the Kaja, such as ones’ head, the direction of a bed, the placement of rooms in a house, and in this case the water temples of higher deities (Lansing, 1995). This shows the intimate connection between cultural beliefs and the organization of the agricultural system.

Communal Life and Rice Cultivation

Rice cultivation in Bali is an extremely ancient process, and some terraces have been under continuous cultivation for more than a millennium (see images 2 and 3 below). Generally, most irrigated agriculture tends to experience a gradual decline in productivity due to salinization and loss of soil fertility, but traditional Balinese rice paddies are unique because they can produce large amounts of grain indefinitely with no diminution in yields (Lansing, 1995). This is due to the existence of complex systems that have arisen to compensate for natural obstacles such as wet and dry phases and pests. The oldest sites have extraordinarily complex systems that produce a maze of tunnels and canals, and often when the water volume is greatest, they can be interconnected so that unused water from one system can go on to a different block of terraces. The precision necessary for this to work is explained by the ecosystem of the rice paddies themselves. There is an organized alternation of wet and dry phases, or ‘pulses,’ that do many things to benefit the quality of the soil. General theory holds that “ecosystems characterized by steady, unchanging nutrient flows tend to be less productive than systems in which there are nutrient cycles” (Lansing, 1995). The Balinese practices illustrate the benefits of using nutrient cycles of soil pH, aerobic and anaerobic conditions, activity of microorganisms, mineral nutrients, and growth of nitrogen-fixing algae. Such pulses also exclude weeds, stabilize soil temperature, govern the formation of a plough pan that prevents nutrients from being leached into the sub-soil, and increase needed phosphorus (Lansing, 1987). Thus, the traditional Balinese system evolved as an ecosystem with nutrient cycles that maintain productivity and fertility, with its base in cosmological and communal beliefs.

The paddies produce mainly rice, but also animal protein such as eels, frogs, and fish (and dragonflies roasted by little boys). They support populations of ducks, which are carefully managed so as not to damage young plants, but also glean leftover grain and eat some insects that could become pests. The ducks are driven from field to field after the harvest to share the benefit. Traditional harvesting techniques remove only the seed-bearing tassel, leaving the rest of the stalk to decompose in the water, returning nutrients. After harvest, the farmer may decide to either dry and burn the field, losing some nutrients, or to flood it to allow the stalks to decompose under water, gaining nutrients. Both would result in a fallow period, killing pests,

but require extreme cooperation among all of the farmers in a block of terraces. Only if a large area decides to cooperate and synchronize its harvest and fallow period will the rodents, insects, bacterial, or viral diseases decrease (“Science Direct,” 2009). Like the resource pulses, there is a larger scale irrigation cycle that controls pest populations in this way. Masceti temples organize groups who collectively decide on planting schedules for the year. There are two festivals to honor the deities that bring them their water, during which farmers decide if they have too many pests to continue growth, or if there is enough water for everyone to plant rice. For example, if there are three groups, all three will plant rice in the rainy season, but in the dry season, there is a rotation. One group will plant rice, another group will plant vegetables, and the third either, depending on whether the amount of water is adequate for rice. The masceti temple sets the cropping pattern and irrigation schedule by optimizing water sharing and establishing widespread fallow periods to reduce pests (Lansing, 1987). “If each agent... always acts independently, they system as a whole behaves chaotically. Alternatively if each agent is linked to all the others, the system is stable” (Lansing & Kremer, 1993). Communal festivals worshiping the deity directly link to the organization of the population to cultivate rice.

The Green Revolution

The Green Revolution was an approach to agriculture that involved the use of science and large-scale government to control productivity via the use of new forms of crops. It had a profound effect on the practical use of water temples in Bali, disrupting the balanced cycles of cultivation. Temples were brushed off as religious institutions with no constructive role in boosting rice production. This resulted in an ecological crisis. The Green Revolution in Bali began in 1962, when the International Rice Research Institute (IRRI) developed a new high-yielding variety of rice called IR-8. They encouraged its use throughout Asia. The Indonesian government was enthusiastic because it was expected to increase rice production and was responsive to chemical fertilizers (Lansing, 1995). At the time, Indonesia was importing nearly a million tons of rice per year to feed its growing population. The government came up with plans to help farmers access the rice and fertilizers, by reducing cost and setting up loan programs.

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In 1974, 48 percent of Balinese terraces had the new rice, rising to 70 percent three years later. However, IR-8 was highly susceptible to the insect brown planthopper, which destroyed 2 million tons of rice in 1977. So the IRRI came up with a new variety, IR-36, which was resistant to the insects and matured very quickly. Its use was strongly encouraged and farmers were forbidden to plant their native varieties, which grow more slowly, don't respond to fertilizers, and produce less. Farmers had to abandon their carefully integrated and extensively developed cropping patterns and plant IR-36 as often as possible (Lansing, 1995).

In addition, there was a movement to reconstruct thirty-six weirs and their associated irrigation works, which would generate even more rice and produce enough money to repay banks from the earlier loan project. There was a further push to use short rotation rice varieties, leading to a temporary abandonment of the Balinese cropping calendar (Lansing, 1995). Farmers in the upper reaches of the rivers generally refused to change the temple schedules because they understood the coordination needed during the dry season. Downstream, however, there were threats of legal penalties if anyone failed to grow the new rice. The temple rituals no longer matched the stages of rice growth. During the dry season, the supply of water was unpredictable and district agricultural offices, not surprisingly, began to report "chaos in the water scheduling" and "explosions of pest populations" (Lansing, 1995). There was a constant struggle to keep up with the newest rice variety, and despite cash profits, many farmers wanted to return to water temple irrigation scheduling to reduce pests. Foreign consultants naively interpreted this as religious conservatism and resistance to change (Lansing, 1995). In a study that Lansing conducted evaluating rice growth through ecology simulation analysis, he showed that the temple networks led to higher average harvest yields and improved sustainability (Lansing & Kremer, 1993). Lansing looked at the different ways of organizing the cropping patterns and found that the original temple networks intrinsically managed the system better than the Green Revolution's uncoordinated planting ("every man for himself") and centralized government control (Lansing, 1995). Although the policy towards irrigation and water temples was still in a state of flux in 1995, Lansing declared that, "for the first time, the water temples have achieved recognition by state irrigation bureaucracies, and for now the temples have regained informal control of cropping patterns in most of Bali" (Lansing, 1995).

Insights

Most recently, the Nobel Prize in Economic Science for 2009 was awarded to American Elinor Ostrom for her work on the concept of “commons”. She proposed that local people who earn their living from a common natural resource have a stronger stake in preserving it, and are more likely to constructively monitor each other’s activities. Her work involved shared utilization of small forests in undeveloped countries. Perhaps similarly, through centuries of developed cosmology and custom, the Balinese have incorporated constructive sharing of their common resources (Klinkenborg, 2009).

Conclusion: Lessons from Bali

Countless centuries of clearly thought out irrigation schedules, intrinsically bound with Balinese religious cosmology, had coordinated a magnificent balance between water sharing and pest control. This system was undermined and infiltrated by naïve capitalistic policies in a matter of a decade. The water temples proved to be important by providing a spiritual connection with an important deity, along with an explanation for productivity, and a sociological organization. The water temples organized social groups to cooperate over matters of water sharing and pest control timing in a way that the “new and improved” policy did not even address. The original system covered all the basics and created generally harmonious communities that could productively combat their various irrigation struggles. The water temples clearly were instrumental, not just as religious markers, but as effective aids in the agricultural productivity of Bali.

References

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Insights



Image 1: Ulun Danu Batur Temple (Temple of the Crater Lake)
<http://adventurelogger.blogspot.com/2008/04/ulun-danu-bratan-temple-bali-indonesia.html>



Image 2: Rice paddy
<http://blog.baliwww.com/destination-and-resort/1454>

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Image 3: Balinese Rice Farmer

<http://7junipers.com/log/bali-rice-farmer/>