

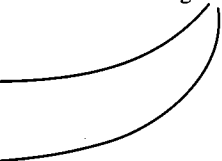
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4 / The Goddess and the Green Revolution

INTRODUCTION

The village of Sukawati lies between two rivers, the Oos and the Petanu. Between the village and the sea, there is a large block of about five hundred hectares of rice terraces that keeps over a thousand Sukawati farmers busy, wet rice being the world's most labor-intensive crop. On the last little knoll before the beach, where the rice terraces end, there is a magnificent old temple called the Masceti Er Jeruk. I became interested in this temple during my fieldwork in Sukawati in 1975. But while I wanted to learn about the legendary history of the temple, the local farmers were more interested in talking about its current problems. I learned that in the old days the temple had set an irrigation schedule for all the rice terraces in its vicinity. But as a result of a new agricultural policy called the Green Revolution, the temple had lost control of the irrigation schedule, and everyone was planting rice as often as they could, without regard for the temple's irrigation schedules.

The term "Green Revolution" refers to the replacement of native rice with specially bred high-yielding varieties (HYVs), which require the use of chemical fertilizers and pesticides. The Green Revolution began in the laboratories of the International Rice Research Institute in the Philippines in the 1960s, and spread swiftly across Asia, gaining a firm foothold in Indonesia by the early 1970s. In Bali, the Green Revolution was accompanied by new government agricultural policies, which promoted continuous cropping of the new HYV rice in an effort to boost rice production. With a fast-growing population, government planners were eager to find new ways to increase agricultural yields, and farmers were encouraged to plant HYVs as often as possible. But in Bali, the immediate gains in rice yields soon began to be offset by water shortages and unprecedented outbreaks of rice pests and diseases. In Sukawati, the farmers were required to grow HYV rice continuously, which provided an uninterrupted source of food for all the local rice pests.

In 1979, I returned to Bali for two short trips connected with the making of a documentary film. I spent several weeks in Sukawati, and learned that the old temple had managed to regain control of the irrigation schedules. The farmers had decided that the policy of continuous rice cropping had failed to increase harvests, because it made the water supply too unpredictable and led to increasing losses from pests. But policy makers were still pushing the Green Revolution, and there was a political struggle going on between "conservative" farmers who preferred to return to the old

system of irrigation management by temples, and those who wanted to grow rice as often as possible.

In 1983 I returned with my family for a year to study the role of temples like Er Jeruk in the ecology of rice production. It seemed to me that there was an urgent need for a better understanding of how the traditional Balinese system worked, before it was too late. Some rice terraces in Bali are at least a thousand years old, and have produced one or two crops every year, year after year, century after century. In fact, rice terraces are the most ecologically stable and productive agricultural system ever invented, capable of supporting a large population indefinitely. Were modern development planners right to think that the water temples had outlived their usefulness?

We lived in a sort of bungalow in the rice paddies near the village of Kedewatan. The house belonged to the head of a *subak*, or farmer's association, named Wayan. Subaks are associations of farmers who share the water from a single source, like a spring or an irrigation canal. They have both practical and religious functions pertaining to water management and rice cultivation. Wayan's subak encompassed 133 hectares of terraces, owned by about double that number of farmers. The house we rented from Wayan was located not in the village but in the midst of his fields, making it easy to observe both rice-field rituals and farming activities. It was also conveniently located to observe seasonal changes in the insect population of the paddies: my wife's open-air kitchen always had a fair selection. Another good indicator of the pest populations in the rice paddies was the number of bats that turned up at sundown to catch airborne insects.

My research strategy was quite simple: I spent hours with Wayan, trying to observe every detail of what went on in his fields, asking endless questions about what I saw, and following him on his errands connected with both the "practical" and the "religious" aspects of rice production. In the evenings, my wife and I compared my observations with those of several other scholars: a German named Paul Wirz, who published a superb study of Balinese agriculture and the "rice cult" in 1927; the Dutch colonial administrators V. E. Korn, F. A. Lieftrinck, and Charles Grader; the more recent work of an American anthropologist, Clifford Geertz; and a thoughtful critique of Geertz's ideas by an English anthropologist, Mark Hobart. I mention the names of these scholars here because their work was the starting point for my project. The basic issue was the relationship between the practical role of the subak in rice-terrace ecology and the rituals of the "rice cult." As subak head, Wayan had to organize both activities for the members of his subak: the intricate series of rituals of the "rice cult," which were carried out in the fields and local temples; and the actual physical work in the paddies, from field preparation to harvest. Earlier, Clifford Geertz had proposed an elegant model of the relationship between these two tasks, showing that the timing of the ceremonies of the rice cult is "symbolically linked to cultivation in a way that locks the pace of that cultivation into a firm, explicit rhythm." The "water-opening ceremony," for example, actually marks the beginning of the irrigation schedule, just as the harvest ceremonies mark its end. The rituals of the rice cult thus provide a way for the farmers to time the flow of water and the phases of agricultural labor. In Bali, Geertz wrote, "a complex ecological order was both reflected in and shaped by an equally complex ritual order, which at once grew out of it and was imposed upon it."⁴⁹

But another anthropologist, Mark Hobart, found that the actual sequence of rituals is often badly synchronized with what is happening in the fields. He criticized Geertz for creating an idealized picture of the match between rituals and rice growth, and suggested that the real picture was far more complex.

Fortunately for me, the subak head I was working with became quite interested in this controversy. Wayan had already served as subak head for twenty-odd years, and was very knowledgeable about the workings of the subaks in his area. While he saw Geertz's point, he also believed that subak rituals served more important purposes than timekeeping. Wayan was also curious about the reasons for differences in the ritual cycles between subaks in different regions of Bali. We both suspected that they might be related to variations in ecological conditions. Wayan willingly agreed to visit other subaks with me, so we could compare the details of their ritual cycles with his. These journeys took us to many subaks and water temples, but the real turning point in the research came when I accompanied Wayan and a small delegation of farmers up to the Temple of the Crater Lake for an annual temple festival that draws together more than two hundred subaks.

I am going to begin the water temple story there, at the Temple of the Crater Lake, rather than with my first journeys with Wayan. It took quite a long time to make sense of the water temple system, and we don't have time here to retrace the whole story. Instead, by skipping ahead to the Temple and the Goddess of the Lake, we can begin this chapter in a more Balinese way, at the center of yet another "cosmological map."

THE GODDESS OF THE LAKE AND HER TEMPLE

From anywhere in central Bali, a farmer need only glance up to the clouds around Mount Batur to be reminded of the ultimate origin of the water flowing into his fields. In the crater of the volcano, at an elevation well above the height at which rice may be grown, there is an immense fresh-water lake, stretching over 4,240 acres.⁵⁰ The lake is regarded by the farmers and temple priests as the ultimate source of water for the rivers and springs that provide irrigation water for the whole of central Bali. Priests describe the mountain lake as a sacred mandala, or cosmic map of waters, fed by springs lying at each of the wind directions, high above the irrigated lands. The steam from the caldera of Mount Batur represents the zenith of the mandala, while the nadir is found in the depths of the lake. Each of the springs around the lake is regarded as the origin of waters for a particular hydrological region of central Bali.

The entire mandala of the lake forms the center of a much larger mandala, consisting of the island of Bali and the seas that surround it. Priests sometimes speak of the lake as a freshwater ocean, filled with life-giving water, which contrasts with the salt ocean that encircles it, far below. The lake is the home of one of the two supreme deities of Bali, the "Goddess of the Lake," Dewi Danu. Her relationship to the farmers of central Bali is succinctly defined in a manuscript kept in her temple:

"... because the Goddess makes the waters flow, those who do not follow her laws may not possess her rice terraces."⁵¹

According to legend, the goddess and her male counterpart, the God of Mount Agung, emerged from an erupting volcano in the year 231 (on our calendar). Together with other, lesser gods, they took possession of the land and waters of Bali. The goddess rules the lake and Mount Batur, the second-highest peak in Bali, while the god rules Mount Agung. As the male and female deities of the two highest mountains, they form a complementary pair, the supreme gods of the island. The male god of Mount Agung is worshipped at the temple of Besakih, high on Mount Agung, and is symbolically associated with the king of Klungkung, who claims supremacy over all other Balinese kings. But the Goddess of the Lake has no special relationship to any king or kingdom. Her principal congregation consists of several hundred subaks, which make annual pilgrimages to her mountain-top temple called Pura Ulun Danu Batur, the Temple of the Crater Lake.

When I began my research, the Temple of the Crater Lake's relationship to the subaks was not described in the literature on Balinese religion or water management. Yet the importance of the temple for the farmers can be detected in some of the earliest descriptions of Bali by foreign visitors. For example, in 1830 a missionary traveler was sent to Bali by the Singapore Christian Union to explore the prospects for "extending the benefits of Education and the knowledge of Christianity" to the Balinese. At that time, very little was known about Balinese culture. The missionary's report begins with a brief list of the principal Balinese courts, after which he turns his attention to the "riches of Bali":

Bali has several inland lakes or reservoirs of water situated near the tops of high mountains, several thousand feet above the level of the sea. These lakes all contain fresh water, whose rise and fall corresponds to the sea. Their depths are great, but irregular: in some parts bottom has been found at forty or fifty fathoms and in other parts it is said no bottom can be got at the depth of several hundred fathoms. Some of them are long, and others round, the largest about four miles across, and twelve in circumference; at any rate, they contain water enough to irrigate the inhabited parts of the island with little trouble and expense; and however much water is taken from them, they never seem to decrease. These lakes form the riches of Bali; in a country where there are no great rivers, and where the inhabitants have to depend for subsistence entirely on the irrigation of their rice fields, these lakes are indispensable, and without them it appears evident that so great a population could not be maintained. The scarcity of waters elsewhere is so great, and all the rivers so insignificant, that persons traveling in the dry season are obliged to carry water with them, but by means of these lakes the diligent husbandman is enabled to obtain water enough for all his wants, and consequently two crops of rice are taken annually . . .⁵²

Interestingly, the missionary got his facts wrong, but in such a way as to confirm the myth. The lakes do not have tides, of course, nor do they have river outlets. But in temple rituals the crater lake is described as an ocean, a metaphysical idea that the missionary evidently took literally. It is also part of the mythology of the temple that the lakes are connected to the rivers by underground tunnels. The water in the lakes is thought to pour out continuously through these tunnels, yet "however much water is taken from them, they never seem to decrease." This belief in underground tunnels from the crater lakes as the source of irrigation waters was also mentioned in a report by a Dutch colonial officer in 1887:

There are temples by the shore of every lake in Bali, for it is believed that the streams are fed from the lakes by underground tributaries. Yearly pilgrimages must be made to these sanctuaries . . .⁵³

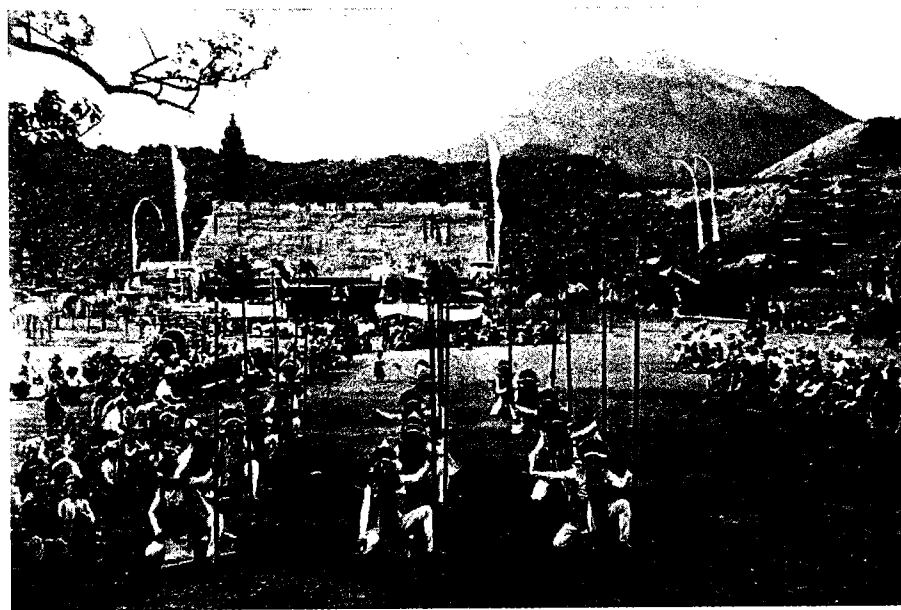
At the time of my fieldwork, a hundred years later, these yearly pilgrimages continued, as thousands of farmers brought offerings to the Goddess of the Lake in appreciation for her gift of water.

The temple used to be located down in the crater, between the still-active caldera and the lake. A volcanic eruption brought a towering river of lava to within a few feet of the temple's gate, as can be seen in a photograph taken a few years later. A Dutch architect who visited the temple in 1918 was amazed, writing that

The fame of holiness, coming from this temple, has risen after the last eruption of Batoer in 1905 even more by the miraculous way by which it was then saved from total destruction. The glowing lava stream was stopped just at the main entrance in an inexplicable way!⁵⁴

But in August 1926, the old temple was not so lucky. The Dutch officer in charge of the district reported what happened:

On the third of August 1926, at 1 A.M., Mount Batur began to erupt. Along the north-western slope a long crevice appeared with a lot of noise and thunder, from which fires and many lava fountains spewed forth. I was informed of this and went to Kintamani, and descended to the village of Batur. It was impossible to get an overview of the situation: the inhabitants were not worried, and trusted in the power and will of the gods, and in the temple which already once before had stopped the lava-stream. From above you



Baris Gde (warrior) dancers in front of the Temple of the Crater Lake (Pura Ulun Danu Batur) before the 1917 earthquake. Note the wall of lava that stopped just outside the gate. Archives of the KITLV, Leiden.

could see that the lava-stream was not moving towards the village. However, it seemed to me that the continuous eruptions would eventually fill the hollow in which the village was nestled. In the afternoon of the first day a new source of lava came into being at about 1,200 meters distance from the village. With the sound of a diesel engine, it regularly emitted large waves of blood-red glowing lava. A lava stream started to move towards the village . . .⁵⁵

The village and the temple were quickly abandoned, as the inhabitants raced for safety. A new temple was soon constructed on the rim of the crater, looking down on the great lake and the still-active caldera.

I first visited the temple in the company of Wayan and half a dozen farmers from his subak, in February 1984. We arrived in two small trucks and unloaded the subak's offerings: a live pig, half a truckload of coconuts, some live chickens, and many baskets of unhulled rice. These were hauled away to pens and storerooms behind the kitchens, while we were given a meal. I learned that unlike other Balinese temples, the Temple of the Crater Lake is always manned by a small staff of priests and elders, who are always available to welcome visitors (usually subaks experiencing problems with water shortages or rice pests). A few days later, I returned to the temple with a much larger delegation consisting of about forty people from Wayan's subak. They brought their own individual offerings to the goddess, which they placed before the altars in the inner sanctum of the temple. Priests guided them in prayers, sprinkled everyone with holy water from the lake, and presented the leaders of the subak with a bamboo tube filled with holy water. This water was taken home to the subak's main temple, there to be mixed with more holy water and distributed to every family to sprinkle on their fields. Meanwhile, the temple's ancient Great Orchestra (*Gong Gde*) played as dozens more subaks arrived. After making their offerings and receiving their holy water, most subaks exited via the kitchens, where all the farmers were given a cooked meal by the temple staff. The ingredients for these meals came from the temple's storerooms, from offerings like those Wayan's subak had brought up a few weeks earlier. With an active congregation of more than two hundred subaks, the temple is able to feed thousands of people during major festivals.

The Temple of the Crater Lake was clearly key to understanding the water temple system, and in the past ten years I have spent many months at the temple or on journeys with its priests. My vantage point on the subaks gradually shifted from my wife's kitchen overlooking Wayan's fields to the kitchens adjoining the temple's storerooms. This proved to be an ideal place to learn about how subaks handle problems or disputes. The temple kitchens are continuously manned on a regular schedule by teams of priests and elders. When a subak delegation arrives, they are first led into the kitchens, where they are offered food and drink, and given a chance to describe the reason for their visit to the temple. I could listen in, ask questions, and try to follow up the most interesting cases, often with the help of temple priests.

There are twenty-four permanent priests of the temple, who are chosen in childhood as lifelong servants of the goddess. This priesthood is organized in a hierarchy, and at its summit there is a single high priest who is believed to be the earthly representative of the Goddess of the Lake. This priest is called the *Jero Gde*. He is also known as *Sanglingan*, "Lightning-struck," because he is selected in childhood by a virgin priestess⁵⁶ of the temple, after the death of his predecessor. On these occasions, the priestess goes into trance to allow the Goddess of the Lake to possess her

voice and describe the boy whom she has chosen to become the new Jero Gde. From the moment of his selection until the day of his death, the Jero Gde is regarded as the earthly representative of the Goddess of the Lake. By day he offers sacrifices to her on behalf of the hundreds of subaks that make up the temple's principal congregation. By night, he may receive guidance from her in dreams. He is always dressed in white, the color of purity, and wears his hair long. Although he is of commoner caste, his permanent identification with the Goddess of the Lake sets him apart from all other Balinese priests.

It is true that other priests are sometimes believed to be possessed by a deity. For example, at the climax of the ritual for creating holy water, Brahmana high priests⁵⁷ are thought to incarnate the god Siwa. Similarly, trance mediums (*balian*) are regularly "possessed" by unseen spirits. But in these cases, when the ritual or trance is finished, the link between priests and deities is broken. In contrast, the magical identification of the Jero Gde with the Goddess of the Lake continues for his lifetime. In the case of the current Jero Gde, it is said that signs of his special relationship with the goddess were detected even before he was chosen. As he explained to me:

"... Before I was chosen, I had a feeling—a strangeness in myself. I mean, often when I went home, I was given a name alluding to the presence of a god."

Once, I asked him what it was like for an eleven-year-old boy to suddenly take on the responsibilities of a Jero Gde. His answer stressed the guiding role of the goddess:

"... the Deity chose me through the trance of the Virgin Priestess. Then I immediately went through the ceremonies of 'installation'—I was purified, to become the Jero Gde. At that time I was still eleven years old... But because I was selected by an imperial Deity (Ida Sasuunan), there were no problems. I simply went along, just as I do now. I had become the Jero Gde, even if I was still a child."

While ordinary Balinese priests are not identified in this way with deities, kings are. According to Balinese religious belief, the Goddess of the Lake and the God of Mount Agung share dominion over the island, a concept that is taken literally by the inhabitants of the mountains, who point to the side of the lake where the power of the goddess stops and the dominion of the god begins. In the time before the Dutch, when Bali was ruled by kings, the king of Bali was symbolically identified with the male God of Mount Agung and Besakih temple. But while the powers of the king of Bali derived from his descent, those of the Jero Gde originate in the logic of the water temple system. Unlike the king, who claimed symbolic dominion over the whole of Bali, the authority of the Jero Gde is strictly limited. As the living representative of the Goddess of the Lake, his powers extend to the Temple of the Crater Lake and the waters believed to originate from the lake. Essentially, he is a temple priest, but his relationship to the Goddess of the Lake gives him a special authority over irrigation water. As he himself remarked,

"... it is only the Goddess of the Lake who can properly give water. She already embodies, incarnates water, which she gives to her subaks, from the lake..."

But did the symbolic identification of the Jero Gde with his goddess endow him with real control over water rights? Or was his position purely symbolic? One afternoon I put this question to a subak head. This was his response:

SUBAK HEAD: It's like this. Everything that concerns the subaks is interconnected. The word is *anugraha* ("grant" or "gift"). So that—as with the fifteen subaks located at our Masceti temple—the flow from the spring has been calculated. It produces enough for so many hectares. Now if, for example, there was a request for more water, obviously the Jero Gde must lower his hand, give a decision. So it won't happen that those who have received the "grant"—from the Masceti temple and the Batur temple—don't get enough water. Because they have the right, from earlier times. Because these things are usually written in the records at the Temple of the Crater Lake.

This answer appeared to affirm the authority of the Jero Gde over the allocation of water rights. But I wondered whether the priest merely gave his blessing to whatever decision had been taken by the farmers. Had he ever refused a request for irrigation water?

SUBAK HEAD: Earlier, there was a request to open new terraces here—a request that went straight to the Temple of the Crater Lake. But, well, maybe because the Jero Gde was concerned about the people of my village, anyway he didn't give permission. If he had, there would have been a lot of twists and turns! So it was dropped. Up till now, it hasn't happened. The water can't be taken.

We, too, once had a desire to open new lands, convert some dry fields to rice terraces. We asked permission from the Temple of the Crater Lake, so that our water would be sufficient for the new terraces. But the Jero Gde declined.

LANSING: Where . . . ?

SUBAK HEAD: Just upstream from the Bayad weir, we wanted to use that water. There is a spring there; we wanted to use it. We weren't going to build a new weir on the river, just use that spring. But if we did, the Bayad weir would have been affected (i.e., there would be a reduction in the flow reaching the Bayad weir). So we had to abandon the idea.

LANSING: Where does the authority of the Jero Gde come from?

SUBAK HEAD: Belief . . . overflowing belief. Concerning Batur temple—really that is the center, the origin of waters, you see. At this moment, the Jero Gde holds all this in his hands. At the Temple of Lake Batur.

This answer was in accord with the image of the role of the Jero Gde and the mandala of waters described by the temple priests. Evidently, the subaks acknowledged the right of the Jero Gde to decide upon water allocations, in the name of the goddess. But to truly resolve the question of the extent of the temple's authority over water rights, I sought out cases that involved real disputes. I soon found a good one: a case in which a subak tore apart the dam belonging to their upstream neighbors.

A QUARREL BETWEEN SUBAKS

The village of Pengalu lies at high elevation, and began growing rice on irrigated terraces only ten years ago. Formerly they relied on rainfall to grow dry rice and vegetable crops. In 1986, the village sent a messenger to urgently request a visit from the Jero Gde. In response, the Jero Gde sent a temple messenger to inquire into the case. I spoke to the messenger, who described the problem as follows:

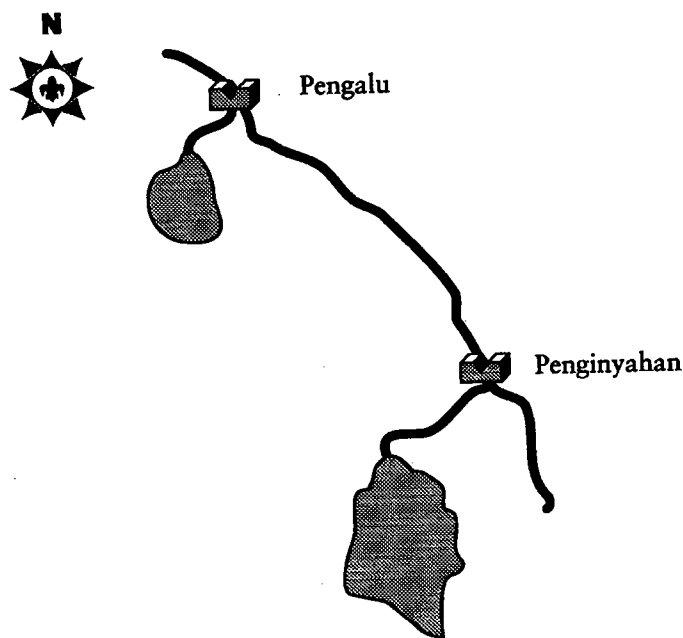


Figure 12 The amount of water available to Penginyahan is strongly affected by the release flow from Pengalu.

TEMPLE MESSENGER: It had to do with water. The source was a little to the north of the village of Pengalu, to the northwest. The water was taken by Pengalu, and brought down. Earlier, there was enough. But now, in the dry season, there wasn't enough for Penginyahan (the village immediately downstream from Pengalu). So this became a problem. The water for Pengalu—the new subak—was taken back by Penginyahan.

On the appointed date, I drove to the village with the Jero Gde and a delegation from the temple. By observing what he said and did, I hoped to be able to gauge the extent of his real powers over irrigation. We were accompanied by two temple messengers who are responsible for this region of central Bali, and two of the regular priests of the Temple of the Crater Lake.

When we arrived at the village of Pengalu, the entire subak was seated in their village meeting hall, awaiting our arrival. We were led to seats on an elevated platform, where four village leaders joined us facing the subak. I requested permission to tape the meeting, and the Jero Gde nodded his acknowledgment. Rather nervously, the village leaders agreed. After brief welcoming remarks, the head of the subak explained the problem:

SUBAK HEAD: . . . so we built a weir on the Telaga Genteg stream. The weir was built by the whole community. The idea was to raise the waters to irrigate terraces for the hamlets of Kerta and Mawang. . . . A little while ago, if I'm not mistaken, on the 21st and 22nd of January, our subak was demolished by subak Penginyahan. Why the people of Penginyahan

wrecked our weir,⁵⁸ we don't know. So since the 22nd of January, 1986, we of subak Pengalu haven't had water. No water at all enters subak Pengalu. There were about two hundred people from Penginyahan, led by the heads of their subak and village. The government—the police, *kabupaten* and *kecamatan*⁵⁹—have taken this in hand, but nothing has been done. So that you may know, Jero Gde, that this is how things are for subak Pengalu. Our subak is ten years old, we have harvested rice for ten years, and we have joined the congregation of the Temple of Batur. Now Penginyahan has engaged in destruction. So subak Pengalu up to now hasn't planted rice. Our fields are empty. . . .

JERO GDE: In these things, if we find a path the way we do in Bali, there is only one (way), which is the direction upstream, to the origins. Isn't it so? Who is the owner of these waters? In truth, when matters develop into a big confrontation, everyone's wishes are bad, then everything turns bad. And the effect is, the water is not used. Water that is needed. So it is. So this new problem, first I must take it up to the regent (*bupati*). Such things, every aspect must be taken up or they can't be concluded. Now apparently this forest area is only producing about a hundred liters of water, right?⁶⁰ If things don't work out, that water is definitely wasted. Lost, useless. My concern is, I don't promise, but let us together make strenuous efforts, force things into the very best path, then perhaps we can obtain the opportunity to fix this situation of ours, our dam at Pengalu. May the village easily receive this path, which is my decree, so that the path you've begun with the *bupati* can be followed to the end. Together!

After these remarks, the Jero Gde asked to visit the site of the damaged weir. The entire structure had been washed away, and the river was flowing freely in the direction of Penginyahan, a few kilometers downstream. After looking the situation over, the Jero Gde asked the subak to gather around him, and addressed them:

JERO GDE: I am ready to add to my former words. As I asked earlier, who owns these waters? Clearly it is only the Deities who prevent this spring from drying up, is it not so? What about downstream? Now you of Pengalu already have the right to use some of this water. And for those below (i.e., the Penginyahan irrigation system) there was no shortage, formerly? For Pengalu here, just how many hectares were in use before the dam was destroyed?

SUBAK HEAD: About thirty hectares.

JERO GDE: So now, my wishes are, remember the Goddess! Things are not good now, so the medicine must be applied quickly. As for me, I feel very sad. Together, then, let's begin.

THE COSMOLOGICAL ROLE OF WATER TEMPLES

The Temple of the Crater Lake sits high on the rim of the crater above Lake Batur. Symbolically, it is situated at the center of a mandala, or cosmic map, that encompasses the whole of the island of Bali. This cosmological map has a meaningful structure, based on the idea that the Goddess of the Lake brings life to the fields and villages by causing the rivers and springs to flow down the sides of the volcano. Wherever a group of farmers divert some of the waters of the goddess into their fields, they construct a temple or a shrine where they can show their gratitude with prayers and offerings. The larger temples also provide a place for farmers to meet and talk over practical problems, such as irrigation schedules. However, the practical

role of the water temples in ecosystem management makes sense only in the context of their "cosmological" meaning.

Each of the hundreds of small-scale irrigation systems along Balinese rivers begins with a spring or, more often, a weir (diversionary dam) in a river, which diverts all or part of the flow into an irrigation canal. Beside each weir or spring there is always a small shrine or temple, where the farmers who benefit from this particular flow of water can make offerings to the Goddess of the Lake and the "Deity of the Weir" (*Bhatara Empelan*), who are thought to make the waters flow into the canal.

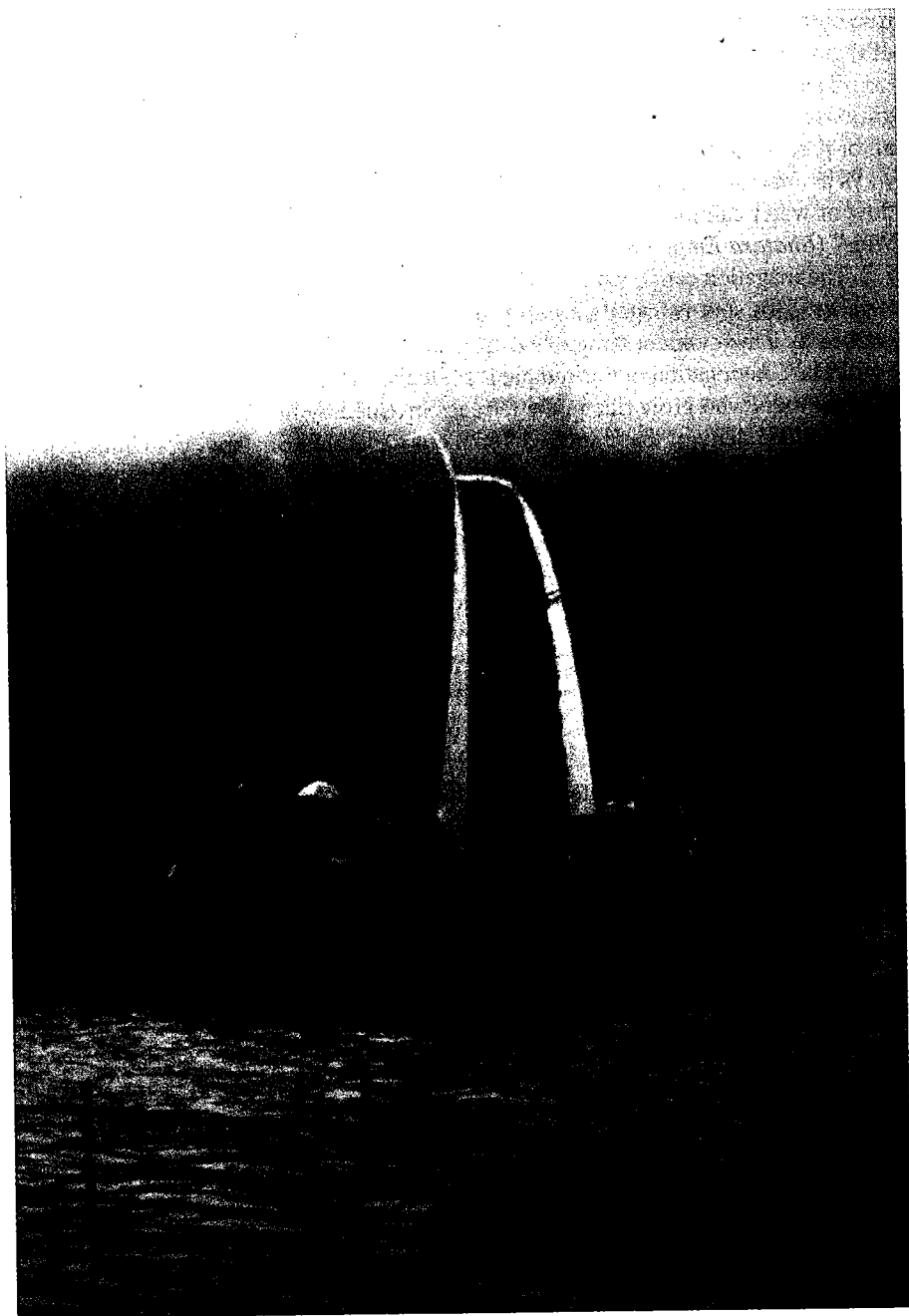
The irrigation canal, which takes off from the weir, eventually reaches a block of terraces. This spot is usually a kilometer or more downstream from the weir and is marked by a major water temple, the "Head of the Rice Terraces Temple" (Pura Ulun Swi). The congregation of this temple is the same as that of the weir shrine: it consists of all farmers who grow rice in the terraces irrigated by this particular canal system. The principal deity of the Ulun Swi Temple is called *Ida Bhatara Pura Ulun Swi*, the "Deity of the Ulun Swi Temple," whose influence extends to all of the terraces watered by the canal. The temple itself is simply a walled courtyard containing a shrine where farmers can make offerings to this deity. Additional shrines provide a place for offerings to other gods and goddesses such as the Deity of the Weir and the Goddess of the Temple of the Crater Lake. These offerings at the Ulun Swi temple acknowledge the dependency of farmers on the flow of waters into their terraces, which in turn depends upon the flow at the weir, and ultimately upon the flow in the river.

Other water temples and shrines follow a similar logic. All water temples are physically located at the upstream edge of whatever water system they purport to control. Chains of water temples articulate the hydro-logic of each irrigation system. Temples and shrines are situated in such a way as to exert influence over each of the major physical components of the terrace ecosystems, including lakes, springs, rivers, weirs, major canals, blocks of irrigated terraces, subaks, and individual fields. The temples link these physical features of the landscape to social units according to a simple logic of production: the congregation of each temple consists of the farmers who obtain water from the irrigation component "controlled" by the temple's god.

Looking at the system from the bottom up, each farmer has a small shrine (*bedugul*) located at the spot where irrigation water first enters his fields. This "upstream" corner of his fields is considered sacred; it is here that he makes offerings to the Rice Goddess incarnate in his crop. At harvest time, the rice that grows closest to the water inlet is used to create a sacred image of the Rice Goddess herself, which is not eaten but carried to the rice barn and given offerings.

Upstream from the farmer's field shrine, the next water temple is usually the subak temple, representing a block of irrigated terraces with a common water source. Several subaks make up the congregation of an Ulun Swi temple, associated with a large canal, and a weir or spring shrine. Several weirs' subaks typically form the congregation of a *Masceti*, a regional water temple. Finally, each spring, lake, and the headwaters of each river have shrines or temples. The largest water temple is farthest upstream: the Temple of the Crater Lake, associated with Lake Batur, which is considered to be the source of all irrigation waters within its river boundaries.⁶¹

There are also important temples located at the downstream terminus of irrigation systems, which are classified as *Masceti* regional water temples. Upstream and



A water temple located in Lake Bratan

downstream temples have very different functions, associated with two different symbolic properties of water. Upstream water is associated with the nourishing or life-giving effects of water, and is regarded as a gift from the Goddess of the Lake. In contrast, downstream water is cleansing water: water used to purify, to wash away pollution. It is not collected in sacred vessels, like upstream water, but left running in the rivers. Impurities such as the ashes from sacrifices are thrown directly into the rivers, which bear them to the sea. This is the basis of a powerful symbolic contrast: while the waters high above in the crater lake represent the mystery of water as life-giver, the waters of the sea are associated with the equally potent mysteries of dissolution and regeneration. "Downstream" *masceti* temples are located at the downstream edge of the last block of rice terraces irrigated by major rivers, along the sea coast. By the time they reach the sea, the rivers are considered to be brimming with impurities: the ashes of burnt sacrifices, the discharge from villages and fields. The sea dissolves them all, removing their human content as impurities, and returning them to a wild, elemental, natural state.

ECOLOGY OF THE RICE TERRACES

But what is the relationship between the symbolic logic of water temple rituals and the actual practical ecology of the rice terraces? To answer this question, we need to understand something about the ecology of rice paddies.

There is no question that the rice terraces of Bali are quite ancient. One of the earliest known writings in the Balinese language, a royal edict from the eighth century A.D., refers not only to rice harvests but to irrigation-tunnel builders.⁶² The oldest human settlements in Bali are concentrated in the best rice-growing areas, where it appears that some terraces have been under continuous cultivation for a millennium or more. Traditional rice paddies are unique in that they are able to produce large amounts of grain indefinitely, with no diminution in yields. By contrast, all other systems of irrigated agriculture are subject to a gradual decline in productivity as a consequence of salinization and loss of soil fertility.

As we have seen, most Balinese irrigation systems begin at a weir (diversionary dam) across a river, which diverts part of the flow into a tunnel. The tunnel may emerge as much as a kilometer or more downstream, at a lower elevation, where the water is routed through a system of canals and aqueducts to the summit of a terraced hillside. In the regions where rice cultivation is oldest in Bali, irrigation systems can be extraordinarily complex, with a maze of tunnels and canals shunting water through blocks of rice terraces. Since the volume of water in the rivers during the wet season can be ten times greater than the dry-season flow, the irrigation system has to cope with conditions ranging from a trickle to flash floods. Irrigation systems originating at different weirs are often interconnected, so that unused water from the tail end of one irrigation system may be shunted into a different block of terraces, or returned to a neighboring stream.

To appreciate the level of precision required for the system to work, it is necessary to understand something about the basic dynamics of the paddy ecosystem. In essence, the flow of water—the planned alternation of wet and dry phases—governs

