Pre-Release Version

Case Study

Blind Beliefs in Bali:

A Cautionary Tale for Change Agents

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This case study was written by J. Stephen Lansing, Visiting Scholar at the Hoffmann Global Institute for Business and Society, and Phanish Puranam, Professor of Strategy and the Roland Berger Chaired Professor of Strategy and Organisation Design at INSEAD. It is intended to be used as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Agents of change – social reformers, management consultants, policymakers, leaders – are glamorous figures in contemporary society. Their heroic actions (or more realistically, the actions they inspire) are celebrated for bringing about large-scale changes in social systems. The difficulty of accomplishing what they do is widely recognized, making their success at producing change all that more worthy of celebration.

But some such successes may also be dangerous, perhaps even catastrophic.

Rice Production in Bali[1]

In the 1970s, the Asian Development Bank (ADB) was attempting to boost rice production in Indonesia. The Bank's consultants learned that in Bali, groups of farmers synchronized their irrigation schedules through an elaborate set of religious rituals anchored around a network of "water temples".

These temples were located at the sites where water originated (e.g. lakes, springs – see Figure 1) and were dedicated to deities associated with fertility and growth, notably the "Goddess of the Lakes" and the "Rice Goddess" (Figure 2). The architectural symbolism of the temples identified each terraced hillock as a miniature replica of the central volcano in Bali which in turn is identified with the mythical mountain ("Meru") in Hindu and Buddhist mythology. Rituals performed in the temples highlighted this cosmic mountain symbolism by emphasizing the role of the volcano crater lakes as a symbolic origin of water with its life giving and purificatory powers.

All the farmers who benefited from a particular flow of water belonged to an institution known as a *subak*. These organizations have been in documented existence since the 11th century AD. *Subaks* elect their own leaders, and make and enforce their own rules. They also organize annual pilgrimages to the Goddess of the Crater Lake, bringing token gifts of the harvests made possible by her gift of water.

Members of a *subak* also share an obligation to provide offerings at the temple where their water originates. The temples also host regular monthly meetings held in the forecourts (Figure 3), where farmers compared information about harvests and pests and agreed upon schedules for planting and irrigation. The *subak* can also impose fines for stealing water or failing to participate in the maintenance of the irrigation system. This is also where they organized the schedules on which they planted and harvested their crops of rice (Figure 4).

In most regions, these ritually established schedules produced 2 rice harvests of native Balinese rice per year. The ADB consultants saw two ways of improving the harvest – yield and speed. The first was to encourage the farmers to grow higher yielding Green Revolution rice varieties. The second recommendation took advantage of the fact that the new rice grew more rapidly than native Balinese rice. Consequently, the farmers could plant more frequently.

The Ministry of Agriculture of Indonesia adopted both recommendations and competitions were created to reward the farmers who produced the best harvests. Synchronized planting of native Balinese rice through the schedules associated with water temple network were strongly discouraged. Instead farmers were instructed to plant Green Revolution rice as often as they could.

1 This section draws on chapter 5, Islands of Cooperation by J.S. Lansing and M.P. Cox (2019), Princeton University Press.

By 1977, 70% of the Southern Balinese rice bowl was planted with Green Revolution rice. Farmers stopped coordinating their irrigation schedules. At first rice harvests improved. But a year or two later Balinese agricultural and irrigation workers began to report "chaos in water scheduling" and "explosions of pest populations". At the time, planners and consultants dismissed these occurrences as coincidence. They urged the farmers to apply higher doses of pesticides while still competing to grow as much rice per year as possible. To their dismay, this intensified both the pest problem and the water shortages.

It was only when farmers spontaneously returned to synchronized planting schemes that harvests began to recover. The report from the final evaluation team from the Asian Development Bank noted that "substitution of the "high technology and bureaucratic solution" in the event proved counterproductive and was the major factor behind the yield and cropped area declines experience between 1982 and 1985".

What Happened Here?

Anthropological work conducted between 1983 and 1987 by J. Stephen Lansing and colleagues showed that the existing ritualized scheduling of planting was a finely tuned social institution featuring considerable complexity. It worked because it represented the result of a balance between factors unique to the Balinese context – in particular the availability of water and the incidence of pests. The water temples as a social institution provided coordination and enforcement to what would otherwise be a complex collective action problem. To understand this better, a simple game theoretic model can help.[2]

Imagine that there are only two farmers – one upstream and the other downstream. We assume that the upstream farmer (row player, denoted *u*) has first claim on any water in the system. Suppose that farmers must choose one of two possible dates on which to plant their crops – date A or date B. As in the Balinese ecosystem we assume that the water supply is adequate to accommodate the needs of a single farmer during any given planting but is insufficient if both decide to plant simultaneously (i.e. both pick A or B). Let δ $(0<\delta<1)$ represent the crop loss due to reduced water inputs experienced by the downstream farmer (column player, denoted δ) if he plants at the same time as the upstream farmer (i.e. both pick A or B as the date for planting). This represents the situation with respect to water.

Additionally, if the farmers pick different dates to plant, both fields will suffer pest damage because pests can migrate between them. Let ρ $(0<\rho<1)$ represent the crop loss to each farmer due to past migration between the fields under these conditions (we assume there is no damage if the crops are planted simultaneously). The payoffs to the upstream and downstream farmers for adopting dates A or B, for any given level of pest and water losses are given in Table 1. The first number is the payoff to the upstream farmer, the second number for the downstream farmer.

If the pest losses (ρ) are low, the downstream farmer will want to stagger cropping due to water considerations while the upstream farmer will want to plant simultaneously (since he is not affected by water scarcity). If however pest losses are high relative to water losses $(\rho>\delta)$ both farmers incentives are to coordinate on one of the two possible simultaneous cropping patterns (A,A or B,B). The meetings to schedule planting, held in the temple courtyards accomplished

2 Lansing, J. Stephen and John H. Miller. 2005. Cooperation Games and Ecological Feedback: Some Insights from Bali. Current Anthropology 46(2): 328-334.

this, as well as allowed informal agreements to share water (lowering δ for the downstream farmer) to emerge.

Given the proximity and low mobility of individual farmers within a given *subak*, individuals have long-term interactions with one another across a variety of social and economic roles ranging from agriculture to marriage. They live in a social context in which behaviour is easily observed by others. Moreover *subaks* have elaborate codified rules that enforce cooperation within the group once a decision has been taken, punishing those individuals who violate the rules with both informal and formal sanctions. It is said that “the voice of the *subak* is the voice of God.”

This combination of relatively high pest burden (compared to water burden), the possibility of stable informal arrangements for some water sharing between upstream and downstream, as well as coordination on planting time made possible by the *subak* and the water temple rituals and meetings, all came together to make the Balinese system what it was. In effect the system was finely tuned to balance pest and water losses through synchronized planting and harvesting. As Lansing and colleagues subsequently showed through computational and mathematical analysis[3], encouraging farmers to plant as often as possible would inevitably produce exactly the sort of pest explosions and water shortages that actually arose.

It is unclear if any individual farmer or priest at a water temple would have offered this analysis of the whole system (or identified the crucial role of the pests – true contenders perhaps for the title of “heroes of the story”). Even if they could, it is unlikely that the planners and consultants would have understood or taken seriously the explanation, as it would very likely have been couched in religious and mystical imagery.

It took years of effort for the anthropologists to piece the underlying story together, as well as overcome scepticism about the role of the water temples[4]. But it took just a few years for well-intentioned change agents, blindly confident in their proposed solutions, to bring this complex system crashing down. As the ADB eventually conceded in their final evaluation – *“The cost of the lack of appreciation of the merits of the traditional regime has been high”.*

Discussion Questions

Q1. Understanding the Balinese system: Why was synchronized planting so crucial to the traditional approach to Balinese rice cultivation? What might have happened in Bali if there were no pests?

Q2. When should “traditional knowledge” (of the sort that underlay the Balinese system) be preserved? What is it’s equivalent in other organizational contexts?

Q3. What could the consultants and planners have done differently in Bali? What are the lessons for change agents you draw from this account?

3 J. Stephen Lansing, Stefan Thurner, Ning Ning Chung, Aurelie Coudurier-Cuveur, Cagil Karakas, Kurt Feysenmyer and Lock Yue Chew (2017) Adaptive self-organization of Bali’s ancient rice terraces. *Proc Natl Acad Sci USA,* June 5 2017.
H. S. Sugiarto, J. S. Lansing, N. N. Chung, C. H. Lai, S. A. Cheong and L. Y. Chew. (2017). Social cooperation and disharmony in communities mediated through common pool resource exploitation. *Physical Review Letters* 118, 208301.

4 Lansing, J. Stephen and Thérèse A. de Vet. 2012. The Functional Significance of Balinese Water Temples: A Reply to Critics. Human Ecology. Volume 40, Number 3 (2012), 453-467.

Figure 1: Location of Water Temples within a Rainfall Catchment Area in Bali

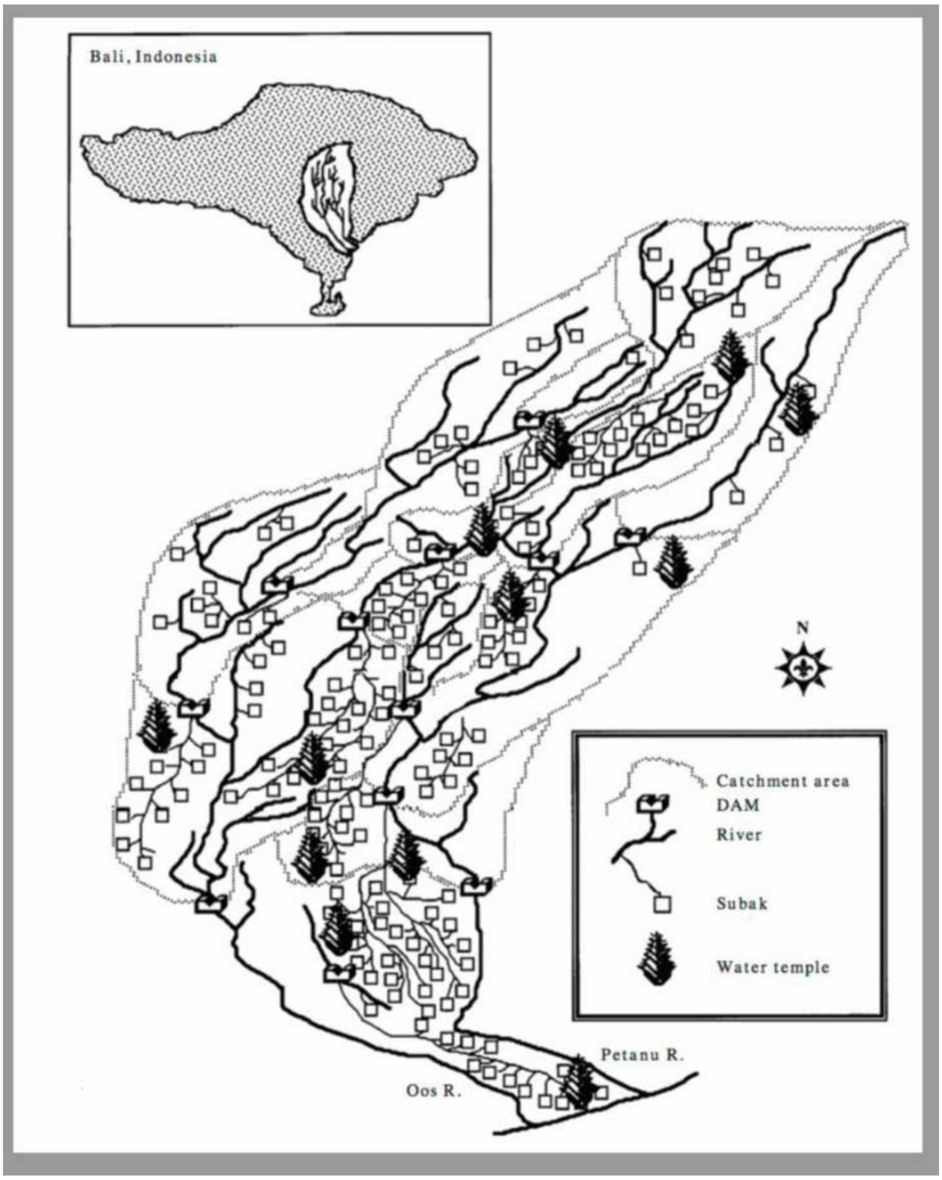

Figure 2: A Depiction of the "Rice goddess" in Balinese Culture

Figure 3: A *subak* Meeting in a Balinese Water Temple

Figure 4: A Traditional Planting Schedule

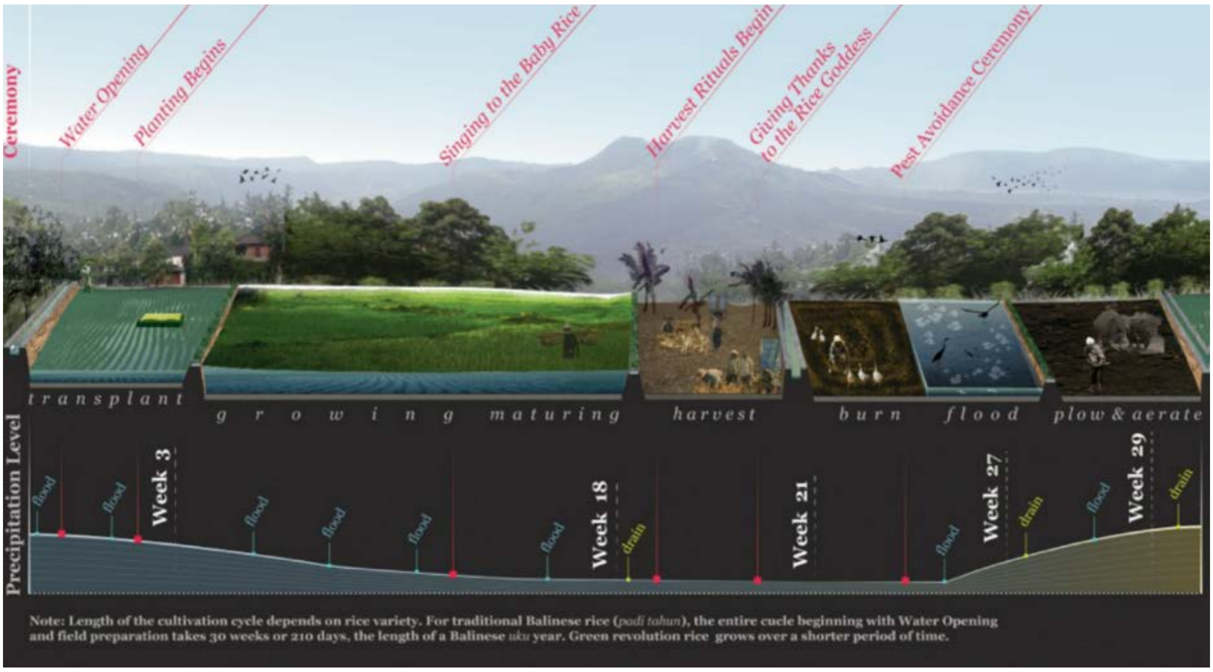

Table 1: Payoffs to Farmers (***u***pstream, ***d***ownstream) for Adopting Planting Dates A and B

	A*d*	**B*d***
A*u*	1, 1-δ	1-ρ,1−ρ
B*u*	1-ρ,1−ρ	1, 1-δ

δ represents water losses to downstream farmer, ρ the pest losses incurred by both farmers if they adopt different planting dates. The first number in each cell is payoff to upstream farmer, the second is for the downstream farmer.