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May 2, 2001  
Time in Globalization

## **Looking into the Past to Restore the Future: Raised-bed Agriculture in Aymara Communities of Bolivia and Balinese Water Temple Systems**

*Thus time becomes the medium through which societies define themselves, and nature the visible record of historical development. Like his contemporaries, what Marx saw in nature was evolution—a continuous linear process of growth. For Marx, the evolutionary progress of society was scientific reality, which could be read from the social landscape...Society was to be explained, not as the product of a fixed and unchanging human nature but as the end-product of a sequence of historical phases...(Lansing 1991: 11).*

The unidirectional, ‘forward-moving’ characteristics of most Western notions of ‘progress’ are not indicative of the necessary perspectives needed for ecological ‘improvement’ or restoration. Furthermore, the temporal qualities inferred in these concepts of ‘progress’ are both considered linear and irreversible. This delineation between past and present in our concepts of western time are incongruent with the cyclical nature of ecological systems. In this paper I show how looking both into the past and beyond ‘modernity’ leads to greater understandings of the possible synchronization of human and environmental interactions. I do this through an analysis of the restoration of ancient methods of raised-bed agriculture in the Aymara communities of Bolivia near Lake Titicaca and the subsequent comparison of these systems with the Balinese Water Temple Systems.

Ancient raised-bed system of agriculture are now being reinstated in the upper altitude regions of the Bolivian Andes, inhabited by the Aymara Indians, provide numerous microclimates that enable plants to avoid the frost scares of the cold nights and to recycle nutrients throughout the system. By creating these new ecological niches,

locals are recreating the ecological cycles of their ancestors. Additionally, the example of the Tiwanaku site and the application of the ‘techniques of the ancient’ show the historically complex understanding of human/environment interactions.

This phenomenon of irrigation-based societies and the correlations of water control, agricultural production and nutrient cycling are not isolated to the high plateaus of the Bolivian Andes. In this paper, I compare and contrast them with some of the ecological roles being dealt with, coupled with the temporospatial perspectives, of the Balinese water systems discussed in Lansing’s book, *Priests and Programmers*. The complex system of Balinese water temples are examples of the interdependency of irrigation and water systems and how they are given symbolic expression by ritual ties between deities and weirs. Water temples bring together concepts of natural ecosystems and culturally based, molded human systems. The intricacies of both irrigation systems discussed are significant markers of the attempt at spatial and temporal control of ecological cycles. In this paper, I investigate these systems and see how they may serve as means to organize and elucidate greater understandings of spatial and temporal understandings within the local community.

In the first section of this paper, I outline the Tiwanaku site and the techniques of land-use and agriculture associated with raised-field agriculture. In this section I continue with the comparison of this system to that of Balinese Water Temples. In the second section, I take a closer look at some of the natural cycles directly affected by these structured hydro-agricultural systems and show how local rituals play a key role in the functioning and the ultimate success of these agricultural systems. In this sense, I explore the interactions between the environmental cycles and temporal ‘cycles’ while

attempting to emphasize the important implications of indigenous, historical knowledge to the 'modern' landscape. Furthermore, I discuss how the Aymara and Balinese spatio-temporal perspectives have direct influences on the ways these communities see and interact with the local landscape.

Traditionally, resources are drawn from the earth, are used by society and are quickly transformed into waste. As I will show in the following sections, in Balinese and Aymara communities, systems of relationships and understanding are cyclical processes. As most Western ideas focus on short-term goals of a linear system, Balinese focus on long-term continuous change. Systems like the Balinese irrigation water temples emulate natural models of water flow and integrate culture, nature and religion into one.

### **Raised Fields and Water Temples**

*...Indigenous raised fields in the Andean altiplano are essentially large planting platforms elevated above the surrounding natural landscape. The planting platforms alternate with systems of canals to form distinct and rather complex hydrological units. (Kolata 1996: 203).*

For many years, the old ways were forgotten and the Aymaran Indians ploughed along the very steep slopes of the Andes Mountains and along the lakebed of Lake Titicaca. However, erosion due to the steep sloping mountains led to nutrient depletion of the soil and poor productivity. Additionally, the soil along the lakebed, which is very high in salinity, was harsh on the crops and unpredictable. Through archaeological explorations in the region, ancient methods of high-plateau agriculture were discovered and are now being reinstated into the everyday lives of the Aymara.

The raised-field agriculture of the Lake Titicaca region of Peru and Bolivia are restorations of ancestral concepts of agro-hydrological systems. The fields are located in

the upper plateaus, where crops are exposed to rising heats during the days and below-freezing temperatures at night. However, the raised-bed system incorporates irrigational canals between the beds, which create micro ecosystems good for green manure, frost protection, and increased food production. The canals derive their water from local fluvial networks, natural springs and groundwater. Additionally, the canals contribute to the recycling of nutrients and the prevention of root rot. (Kolata 1996: 203). What contributes most to the effectiveness and success of the restoration of this methodology is that it combines a mix of ecology and place, where the techniques of raised-bed agriculture used are place specific and local grounded by nature. In addition to this, the increased intensity of labor needed to sustain the beds fit nicely into the Aymaran local work patterns, while both increasing labor potential thereby decreasing migration out of the community and decreasing the need for extended fallow periods thereby increasing productivity substantially.

The water temple systems of Bali are surprisingly similar in structure and in agricultural significance to that of the Bolivian raised-field methodology.

*Balinese farmers labor on terraces and irrigation works inherited from their predecessors. In the vocabulary of Marxist theory, these engineered structures do not represent "nature" but the "congealed labor" of prior generations of farmers. Each new year is not identical to the last, for over the course of many generations the primeval landscape of forested hillsides has been transformed into a productive system of terraces, tunnels, and irrigation systems. Further, the requirements of managing this engineered landscape shape social relationships for each new generation...the need for effective cooperation in the management of water links thousands of farmers in hierarchies of productive relationships that span entire watersheds. (Lansing 1991: 13).*

The complexities of both the Balinese Water Temple systems and the ancient raised-bed agriculture of Tiwanaku are representative of intricate social structure, communications and environmental understanding in both societies.

*But a nonindustrial society that depends for its very existence on managing the natural productivity of the landscape might be expected to have quite a different view of nature. For the Balinese, virtually the whole of nature is a perpetual resource, not merely a museum of the past. The productivity of nature, not industry, is the basic social resource. In such a world, the relationship between society and nature is not stratigraphic but interdependent. Although Balinese society depends upon the productivity of the rice terraces, the reverse is also true: the terraces are a social creation, an artificially constructed ecosystem, sustained by continuous human management. (Lansing 1991: 12).*

Bali, like many other countries in Asia, has been subject to and a culprit for colonization and ‘Western development.’ With the colonization of the Dutch and the overthrow of the Balinese government, it was up to a western country to interpret the ‘ritual’ roles of water temples. Because agricultural exports were crucial in the Dutch economic interest in Bali, they paid close attention to the agricultural practices, but the biological significance of the temple system was misinterpreted and categorized as religious. The deities of the temples are representative of the relationship between the host temples and the temples of the gods they represent. There are many ritual ceremonies in which members of the *subaks* will make journeys to their representative weir or the highest temples at the Temple of Crater Lake. The movement of the water flow is from the source (Crater Lake) down through a system of canals and aqueducts to the summit of a terraced hillside. Here is where water will meet the weirs which then distribute the water throughout the land of the *subak*. (Lansing 1991: 100). The ‘holy water’ moves from temple to temple creating a hierarchy of temples, providing strictly

allocated amounts of water to agricultural, terraced fields, and link the entire system to one main origin. The canals and terraces of the Balinese water temple systems, much like the canals of the raised-field agricultural methods, provide micro ecosystems for fertilization of fields and provide for the coordination of agricultural labor.

In this section, I have outlined the structures of both the raised bed agriculture of the Aymara Indians and of the Balinese Water Temple Systems. In the following section, I will show how ritual and natural cycles are intersecting within these complex agricultural systems.

### **Time and the Restoration and Conservation of Ritual within Natural Cycles**

*Place, time and memory, and the tangled cognitive associations among them, are essential elements of the Aymaran worldview. From their perspective, space and time are inseparable and, in some sense, indistinguishable. They have a single word for this space-time convergence: pacha. (Kolata 1996: 11).*

*Time in a sense means change. But in the Balinese case, this argument does not hold, for time itself is thought to impose and order on the world. Balinese calendars define time not as a linear flow but as a structure composed of many interlocking cycles, based on the rhythms of growth of the natural and social worlds. The flow of time defines abstract patterns of order, which add a further dimension of meaning to the ritual system (Lansing 1991: 64).*

The religion of Bali is called “the holy water religion” and focuses on the concept of rebirth and natural integration. As religion infiltrates every aspect of life, so do the concepts of reciprocity and balance. The symbolic parallel between the ritual and the biological in irrigational water temples exemplifies the synthesis of knowledge into complex models. The concept of time, which is reflected in the water temple system, is

one of many repeating cycles representing the rhythms of growth in the natural world. Temples mark the flow of time and influence major physical components of the terrace ecosystems, including lakes, springs, rivers, weirs, major canals, blocks of irrigated terraces, *subaks* and individual fields. (Lansing 1991: 53). The lack of separation of biological and natural ecosystems from religious systems of sacrifice and hierarchy delineates the underlying philosophies of integration and cycling behind Balinese irrigational techniques.

*The Balinese have devised several mathematically sophisticated systems of time-reckoning that involve several different calendars that track both social and natural cycles. But what appears to be missing from the Balinese representation of time is the Marxist (or modernist) conception of society as undergoing linear progressive growth. Instead, Balinese time-reckoning systems provide tools to record the duration of natural cycles, such as the lunar synodic period of the growth of a rice plant from germination to flowering. The Balinese, one might say, have a biological view of time, in contrast to an industrial one. (Lansing 1991: 12).*

As stated above, the water temples serve as ‘markers of time’, which incorporate ritual movement with the recording of biological cycles including the growth of crops. In *Priests and Programmers* Lansing discusses the important roles of ritual and folklore in the Balinese concepts of hydrological systems and their approach to agriculture and water management. There, the Water Goddess is representative of the island’s water sources, which not only shows and acknowledgement of the importance of these resources, but also indicates a greater understanding of the world around them. Upstream water is associated with life-giving effects of water and is regarded as a gift from the Goddess of the Lake. The downstream water is cleansing water, which is used to wash away pollution. This water is allowed to flow into the rivers, representatives of the outlet of pollution. Physical impurities are thrown into the rivers, creating a paralleled distinction

between spiritual impurity and ecological impurity. The wastewater and run-off from agricultural use, human waste and industrial use thereby flow downstream and become increasingly concentrated towards the mouth of the river (Lansing 1991:54).

For the Balinese farmers, it is important that the individual subaks of the irrigation fields return ‘holy water’ back to the Crater Lake at regular intervals. Ritualistically, the members of the subak will return holy water to the Temple of Crater Lake to appease the deities of water and often to ensure for future prosperity in the fields. The return of holy water reflects the rebirth of holiness in the religious sense, which represents the seedlings of the next crops after the fallow season. The cyclical relationship, which results from a pattern of downward flow and an upward return to purification, may represent the Balinese idea of rebirth and purification and reflects the environmental capture of knowledge and the synthesis of ideas.

As Lansing points out, the role of the water temple rituals and intricate belief systems are crucial to the success of water irrigation methods in Bali. In this way, Lansing is attempting to point out the relevance of spirituality in the realms of nature—what is often viewed as the “scientific world.” However, through his model-based, computer-aided approach to the conservation of these rituals Lansing is acknowledging and supporting the idea that the only way to validate these rituals is through the use of ‘Western science’, or computer modeling systems.

Similar to the Balinese Water Temple Systems of irrigation, there are many ritual associations with the raised-bed fields of the Aymara. By restoring this heritage from the past, the Aymara are, in a sense, merging the past and the present into promises for the

unknown future. The Aymara perspective of time and sequence is reflective of the significance of this synthesis of ideas.

*For us, the past is usually imagined and described as something behind us: events that have come, gone and now recedes from our consciousness. The future metaphorically stretches out in front of us. But for the Aymara, the place of time is inverted. It is the past that is in front of us, visible, knowable, graven in the physical world and in memory. The Aymara word for eyes, nayra, is the same as the word for ancient: what is ancient, what is past, can be seen with one's eyes. The past and the present merge in the Aymara mind. The future, on the other hand, lies behind, invisible and knowable only through ritual specialists trained in the arts of prognostication.*

*If we think about it, this Aymara sense of time is an eminently logical, modern proposition. We know from scientific cosmology that when we look into the night sky we are looking deep into the past, back to the time when the universe was born. Our expanding universe and its ancient past are, in fact, visible in front of us. But unlike us, the Aymara apply this breathtaking insight to their personal, concrete experiences and not merely to an abstract notion of the physical universe. To the Aymara, events, both ancient and personal, are encoded in the landscape to which they orient themselves. The achachilas infused in the steep scarps and tortuous folds of the mountains remind them daily that they are part of a living, eternal history. (Kolata 1996: 12).*

As one can see when reading Kolata's interpretation of the time-sense of the Aymara, the success of the restoration of raised-bed agriculture not only blends in well with the ecological cycles of the altiplano, it also agrees with the local concepts of temporospatial perspectives and the subsequent movement of knowledge from the 'knowing past' to the unforeseeable future. Through the remnants of ancestral agriculture in the area, the rituals of harvesting, feasting and celebration are again being restored to the Aymara due to increased productivity of the once-considered barren fields.

*In return for the offering of the muxsa misa, the spirits of the earth, the sky, and the water ward off frosts, cause hail to fall on other lands, protect and care for the fields to be planted in the new season. The Aymara's relationship to the land is subtle, but not at all ambiguous. They say: "We feed the mountains, and the mountains feed us." (Kolata 1996: 24).*

Both the Aymara raised-field beds and the Balinese Water Temple Systems are examples of ‘manmade systems’ that integrate ritual with natural ecological cycles. As the examples in this section show, these systems also serve as representations of, if not *sources* of local concepts of temporal and spatial organization.

In this paper I have both outlined two different ancient agricultural systems that are reflective of both water allocation needs and the local communities ancestral relationships with the surrounding landscapes. Furthermore, I have shown how these systems are not only intricately balanced with ecological cycles; they are also directly associated with local ritual and offering ceremonies. I would argue that both the rituals and the systems themselves are equally as valid sources for the analysis of social life and the local environment. Accordingly, Lansing remarks, “...agricultural work is not merely a sequence of technical tasks; it is a meaningful series of interactions between social groups and the natural world. The field rituals that accompany each stage of agricultural labor form a kind of commentary on the productive process....To the extent that the agricultural cycle of rites becomes the master calendar of social life, the analysis of one is equivalent to the analysis of the other.” (Lansing 1991: 6).

In addition to the importance of ritual within these agricultural systems, I have shown how a community’s sense of time and space directly influence the types of relationships they have with the environment. By understanding the underlying philosophies behind the formation of and response to complex natural systems such as those in Bali and in Bolivia, we are able to better understand the complexities of the associated dynamic landscapes. Through this process of understanding, we will continue

to synthesize, create and transform our social systems with a, hopefully, greater respect for nature and will reach a more sustainable, reciprocal way of being.

### **Annotated Bibliography:**

Biesboer, David D., Blinford, Michael W., and Kolata, Alan. "Nitrogen Fixation in Soils and Canals of Rehabilitated Raised-Fields of the Bolivian Altiplan", from *Biotropica*: 313(2), June 1999. pgs 255-267.

This article is a detailed, scientific analysis of the raised-field agricultural systems that were extensively used by pre-Columbian Andean civilizations and now are used by contemporary Bolivian and Peruvian farmers. The article goes into the intricacies of the structural components of the raised-bed fields including their linearity and the relationships between the 'crop zone' and the 'water zone'. Specifically, the paper hypothesized that the use of the nitrogen-fixing bacteria present in the adjacent canals, when exploited, will increase the productivity of the fields. By showing the beneficial factors of the nitrogen-fixing bacteria, this paper also presents many of the pre-Columbian perspectives and understandings of their surrounding environment. This base of knowledge included understanding temperature in relation to evaporation, nutrient allocation, and ecological interdependence.

Carter, William E., *Aymara Communities and the Bolivian Agrarian Reform*. University of Florida Monographs, Social Sciences, No.24, Fall 1964.

This book provides a good outline for the agricultural and environmental issues facing the Aymara communities including variable weather patterns, steep-sloping mountain ranges, and systems of power control. As the book is written before the research of Kolata was done, it is an important perspective of resolutions possible external to the plateau, raised-bed agriculture. Therefore, this book provides a backdrop for the historical situation of the Aymara peoples.

Kolata, Alan L. *Tiwanaku and Its Hinterland: Archaeology and Paleoecology of an Andean Civilization*. Plenum Publishing Co, 1998.

This collection of articles reports environmental research by the Wila Jawira project on the south shores of Lake Titicaca. It emphasizes four points concerning climate changes and cultural evolution, agricultural technology and sustainable agriculture, the control required for the productivity of raised-bed agriculture infers the need for a greater, overarching system of control, and that a drought was potentially the reason for the downfall of the Tiwanaku settlement.

Lansing, Stephen J. *Priests and Programmers: Technologies of Power in the Engineered Landscape of Bali*. Princeton University Press, 1991.

This book is an intricate anthropological and ecological analysis of the significance of the ancient Balinese Water Temple Systems and their effects on agriculture and water allocation in rural Bali. Lansing attempts to show how modern

agriculture is completely dependent upon the ancient systems and further emphasizes the crucial element of synthesized ritual in the organization of the temple systems.