

Landscapes and the Archaeology of the Ifugao Agricultural Terraces: Establishing Antiquity and Social Organisation

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Abstract

This paper provides a summary of the results of an archaeological and landscape survey in Banaue, Ifugao carried out in 2007. This survey is part of a larger study that explores the relationship between irrigation management and social organisation of the Ifugao in the Northern Philippines. This historical ecological study examines the sustainability of Ifugao irrigated-terrace farming, and documents dynamic and recursive linkages between the Ifugao and their environment. Its focus on the apparent disjunction between water management and sociopolitical stratification, identifies factors that underlie the sustainability of Ifugao agriculture, and structural correlates that generate an intensive agricultural landscape.

The sustainability of Ifugao agriculture is related to the social structure that links individuals through attachment to the agricultural field. As such, this investigation establishes the nature of Ifugao social organisation through the "house" concept. Corollary to determining cultural patterns in Ifugao, this project aims to resolve debates on the antiquity of the entire Cordillera terraced field tradition. Archaeological and ethnohistoric work will confirm whether the conventional 'long history' or the revisionist 'short history' more accurately represents the occupational history of this region.

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Introduction

Landscapes are manifestations of humanity's interactions with the environment. As such, a landscape approach provides significant contributions in understanding history and culture. This paper exemplifies the increasing importance of the meaning and use of the landscape in comprehending cultural and historical patterns. I combine spatial analysis, ethnohistoric, and ethnographic approaches to reconstruct Cordillera culture-history and develop a model to establish the antiquity of Ifugao agricultural terraces.

Establishing the cultural chronology of the Philippine Cordillera sets up resolution on the antiquity of Ifugao agricultural terraces and provides answer to question on population movements before the arrival of the Spanish in northern Philippines. It will also anchor discussions on the relationships between the landscape, agricultural systems, and social organisation.

The terraced¹ fields of the Philippines' Central Cordillera illustrate a remarkable modification of marginal landscape to suit rice production. This environmental alteration coupled with intensification of agricultural production has long been viewed by anthropologists as complementary. More recently however, anthropology has offered a more nuanced view in which intensification is a process (where water management and construction of monumental architecture are components) (Glick 1996; Glick and Kirchner 2000; Lansing 1991; Lansing and Kremer 1993; Mabry 1996; Scarborough *et al.* 2000; Schoenfelder 2000). Ethnographic (i.e. Geertz 1980; Hunt and Hunt 1974, 1976; Hunt 1988; Netting 1974) and archaeological (Doolittle 1990; Downing and Gibson 1974; Glick 1970; Pérez Rodríguez 2006) applications of this model have revealed some of its limitations and shortcomings. These studies have confirmed that many communities have traditional means of dispute resolution and cooperation that permit large-scale irrigation outside of a centralised polity.

The Ifugao rice-terraced fields represent portions of an agricultural system that consists of intensive and extensive components that require complex technological knowledge and intricate social organisation. Their distribution occurs over a wide range of edaphic and climatic regimes and support population densities of as many as 250 individuals per square kilometre of cultivable land (in the 1970s) (Conklin 1980).

¹ I use the terms agricultural and rice terraces (interchangeably) to refer to these irrigated paddy fields.

In this paper, the results of a four-month archaeological research program in Banaue, Ifugao are combined with ethnographic data and Geographic Information Systems (GIS) database on agricultural fields in an attempt to understand human-environment interaction, managerial requirements of maintaining the Ifugao rice terraces, and provide radiometric age determinations for a Banaue terrace system.

The developmental trajectory of agricultural terraces in the Philippine Cordilleras is still poorly understood. The presence of early settlements within the town centre of Banaue, Ifugao (as told by oral-historical accounts) provides an opportunity to investigate the antiquity of terrace farming in the area. Consequently, early settlements/villages also offer a chance to intensively investigate the dynamics of agricultural development and social organisation of the Ifugao.

The Ifugao

Central Cordilleran agricultural systems appear to have some common features (Bodner 1986; Conklin 1980). Aside from terraced pond fields that are irrigated either by springs or streams (or both) through a series of canals, we also see the presence of swidden fields that produce taro, sweet potatoes, legumes, and other vegetables. This feature is interesting because intensive rice farming and extensive swiddening are both present in this agricultural system—a characteristic termed *composite agricultural system* by Rambo (1996).

Despite this general similarity, differences throughout the region (Central Cordillera) have been recognised and can be identified today. Ecological variations present recognisable patterning. A seasonal distribution of an average 3,000 mm annual rainfall (as opposed to ca. 1800 mm annual rainfall in other regions), the rugged topography, and irrigated ponded terraces and interspersed patches of woodlots that occupy the gentler slopes, often occurring with settlements in the lower portions of valleys (Conklin 1980) distinguish Ifugao from other areas in the region.

Appreciating and understanding the unique dynamics of Ifugao agricultural system require an awareness of environmental and cultural attributes of the Ifugao. An historical ecological approach fits this need. The methodological theory of historical ecology is increasingly being considered as a compelling approach in understanding human-environment interaction (Balée 2006). The realisation that there is a need to look at multiple lines of evidence, including the history of landscapes, has

contributed to the growing influence of the approach.

The term “landscape” in this study refers to what Crumley and Marquardt (1990:73) consider as “the spatial manifestation of the relations between humans and their environment”. The landscape is the imposition of culture onto the physical environment or nature and associated with this is the decision-making opportunities to allocate differential energy expenditures on the environment.

The distribution of the rice terraces, and the intricacies of water sharing in Banaue, Ifugao give rise to another debate: the antiquity of terracing and rice cultivation in Ifugao. Although Maher’s (1973, 1978, 1985) series of archaeological investigations provided radiometric dates, the context of his charcoal samples were not clearly explained. A major component of this study is to offer a terrace growth model through landscape analysis. I am making the assumption that areas first settled and subsequently cultivated are those that are optimal for agricultural production (i.e. stable source of water, gentle slope). This growth model based on general characteristics of the landscape will then be anchored with C¹⁴ age determinations.

Postulations on the age of the Ifugao rice terraces have been based on two main models. One maintains that the Ifugao started building terraces as early as two to three thousand years ago. The other claims that terrace construction in the area is a recent development, influenced by migration to Central Cordillera of lowland groups pushed by the pressure of Spanish expansion into Northern Luzon at ca. AD 1572 (Keesing 1962). Appropriately, the interpretation of greater age is the older of the two. Barton and Beyer, through estimates of how long it would have taken to construct the elaborate systems which fill valley after valley of Ifugao, proposed dates between 2000–3000 years ago.

For more than half a decade, no competing model was proposed for the age of the Cordillera rice terraces: Barton’s (1919) and Beyer’s (1955) estimates were either accepted or rejected without any alternative position. However, by the 1960s evidence has come in that mounted a strong challenge to the older hypothesis and supports the view of a relatively recent move into Ifugao territory, probably associated in some way with Spanish pressure. Even with these interests, Conklin (1967) points out that despite the richness of reporting on many aspects of Ifugao culture, such fundamental activities as terrace construction have been given scant attention.

The origins and age of the Ifugao rice terraces (Figure 1) in the Philippine Cordillera continue to provoke academic and popular debates. While one reason can be attributed to the existence of two alternative models of the antiquity of these agricultural marvels – that have significant repercussions for Southeast Asian and Philippine prehistory, another lies in the symbolic importance of the rice terraces in humanity’s connection to the landscape. In fact, these monumental structures have become emblematic of the world’s cultural landscape heritage (UNESCO 1995).

Ethnographic studies of Ifugao go back to early Spanish contacts (Alarcón 1965 [1857]; Antolín 1970 [1789]). During the first half of the 20th century, intensive investigation of the Ifugao was carried out by noted figures in Philippine anthropology (Barton 1919; Beyer 1955; Lambrecht 1929) and peaked with Conklin’s (1967; 1980) description of the landscape and agricultural system. These studies provided information and

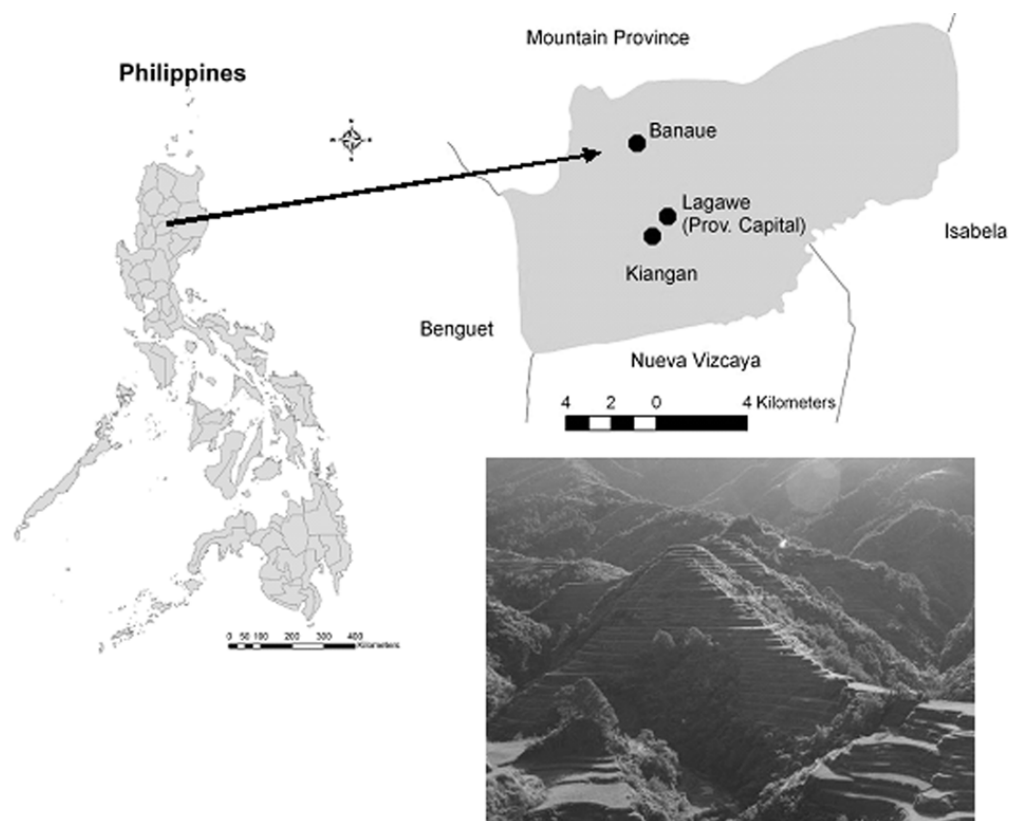


Figure 1. Ifugao province with the location of the Municipalities of Banaue and Kiangan, Ifugao (inset: Hanga and Talugtug terraces in Viewpoint, Banaue, Ifugao.) (Figure appeared in Acabado 2009:801).

snapshots of Ifugao life as well as the basis for this research. Moreover, these early researchers also resulted in debates on the dating of arrival of the Ifugao in Central Cordillera and the subsequent construction of rice terraces.

The debates on the age of Ifugao rice terraces are still intense, even though archaeological and ethnographic studies that try to provide resolution are only a handful (Table 1). These debates are essentially based on two extreme clusters—pre-Hispanic model (as early as 2000–3000 years BP) and post-contact trend (as late as 300 BP). Ironically, a majority of the population (and scholars) adheres to the former model although it is not based on empirical observations (even with Scott's [1974:199] contention that descriptions of Ifugao irrigated rice terraces were non-existent in Spanish documents until AD 1801—the Spanish were already in the Ifugao region as early as AD 1750).

These debates remain intense because of the implications that are attached to the antiquity of the terraces. Filipino scholars, specifically archaeologists, tend to adhere to the “earlier” model not because of the evidence provided by Beyer and Barton, but because of nationalistic sentiments. Similarly, most Ifugaos I interacted with prefer the same “earlier” dating. Considering the imposition of national policies after the

Table 1. Dates proposed for the inception of the Ifugao rice terraces.
(Table appeared in Acabado 2009:803)

Author	Date	Major Points
Barton (1919) and Beyer (1955)	2000–3000 BP	Estimated how long it would have taken to construct the elaborate terrace systems which fill valley after valley of Ifugao country
Keesing (1962) and Dozier (1966)	<300 BP	Movements to upper elevation of Cordillera peoples were associated with the Spanish pressure
Lambrecht (1967)	<300 BP	Used lexical and linguistic evidence by analysing Ifugao romantic tales (<i>hudhud</i>); Observed short duration of terrace building and concluded a recent origin of the terraces.
Maher (1973: 52-55)	205 ± 100 BP 735 ± 105 BP	Radiocarbon dates from two house platforms

World War II, especially as these relate to land tenure and access to ancestral domain, a much older date provides validation for their (Ifugao) claim to the land.

Methods

My study of Ifugao agriculture and social organisation included four stages of research: GIS-based analyses of the Ifugao landscape; a field survey that involved GPS mapping, archaeological excavations; ethnographic interviews; and laboratory and data analysis. The first stage requires digitisation of topographic and land use maps as well as satellite and aerial photographs to develop a digital elevation model of the Ifugao region. Estimates of labour and agricultural productivity were also developed for one terrace system using the GIS database and information that I culled from the ethnographic interviews.

Simple regression analyses were used to examine environmental data in the GIS database. I expect that certain environmental conditions underlie the suitability of areas that were/are optimal for wet rice agriculture and terracing in the highlands of Northern Luzon. Research in Bali (Lansing 1991; Scarborough *et al.* 2000), for example, demonstrates how water was shared between upstream and downstream populations elsewhere in Southeast Asia. I applied a similar perspective to investigate the social organisation of irrigation among the Ifugao. In this vein, I expect that earliest construction of rice terraces among the Ifugao began near sources of water (rivers, springs) and on areas that had relatively gentle slopes.

Stage two (field survey) of my study focused on GPS mapping and subsurface excavations, to acquire samples for radiocarbon dating guided by a Bayesian Model. Sites for mapping were selected after I had constructed the GIS database. In consultation with Ifugao informants, I selected well-preserved sites for excavations (Figure 2).

Between June and September 2007, with the help of graduate students from the University of the Philippines-Archaeological Studies Program (UP-ASP) and local Ifugao farmers, terrace wall excavations were undertaken. These coincided with the "off season" (i.e. late July to late November) of the Ifugao agricultural calendar (Conklin 1980). This phase marks the time when farmers often repair damaged walls. This period ensured that my fieldwork will not disrupt major agricultural activities, such as the preparation of fields and planting of rice.

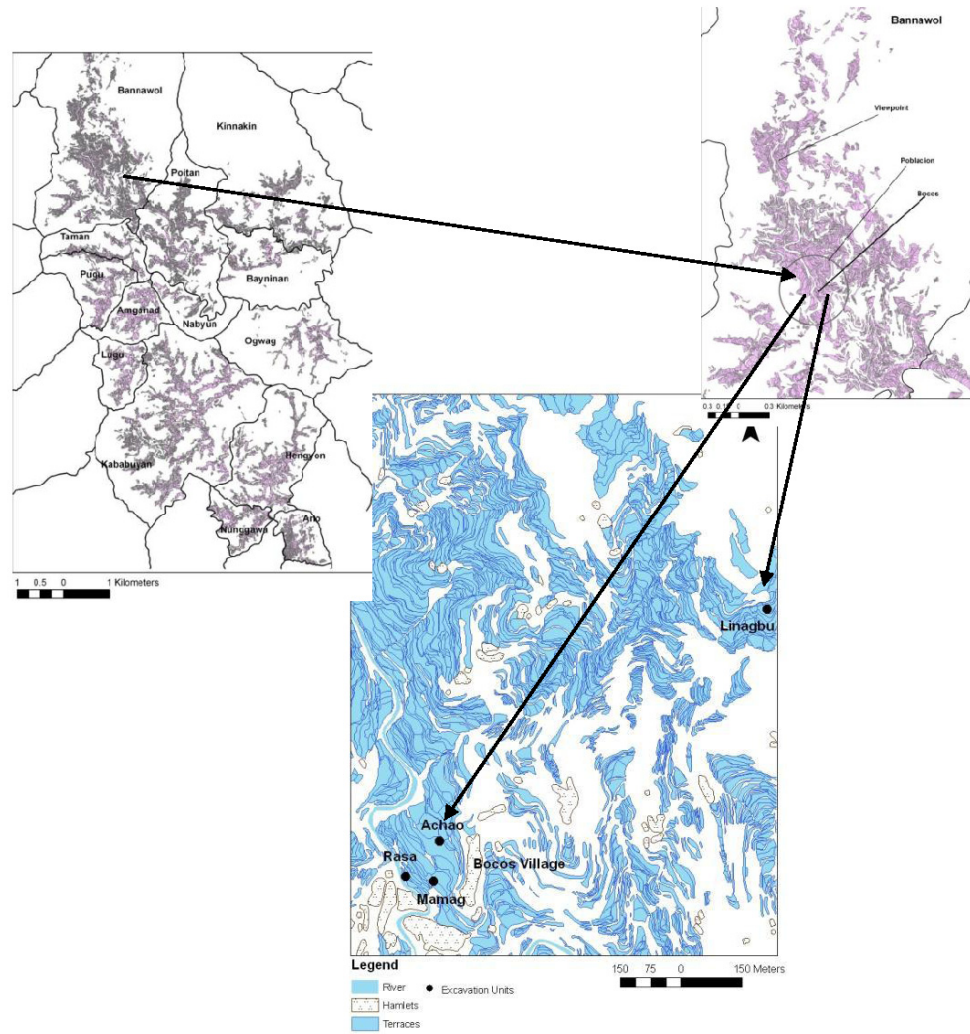


Figure 2. Location of Bocos excavation units in relation to the rest of Banaue terrace systems.

GIS

This section briefly describes the process of digitising eight land use maps of North Central Ifugao that were originally prepared by Conklin (1972). The eight maps that were digitised were composed of the Gohang, Bannawol, Pula, Ogwag, and Kinnakin, Amgode, Hengyon, and Linge plates (Conklin 1972). The eight plates that were digitised were composed of several agricultural districts. However, only the complete agricultural districts, or to some extent comprehensive enough, were chosen for analysis. These were the agricultural districts of: Amganad, Bannawol,

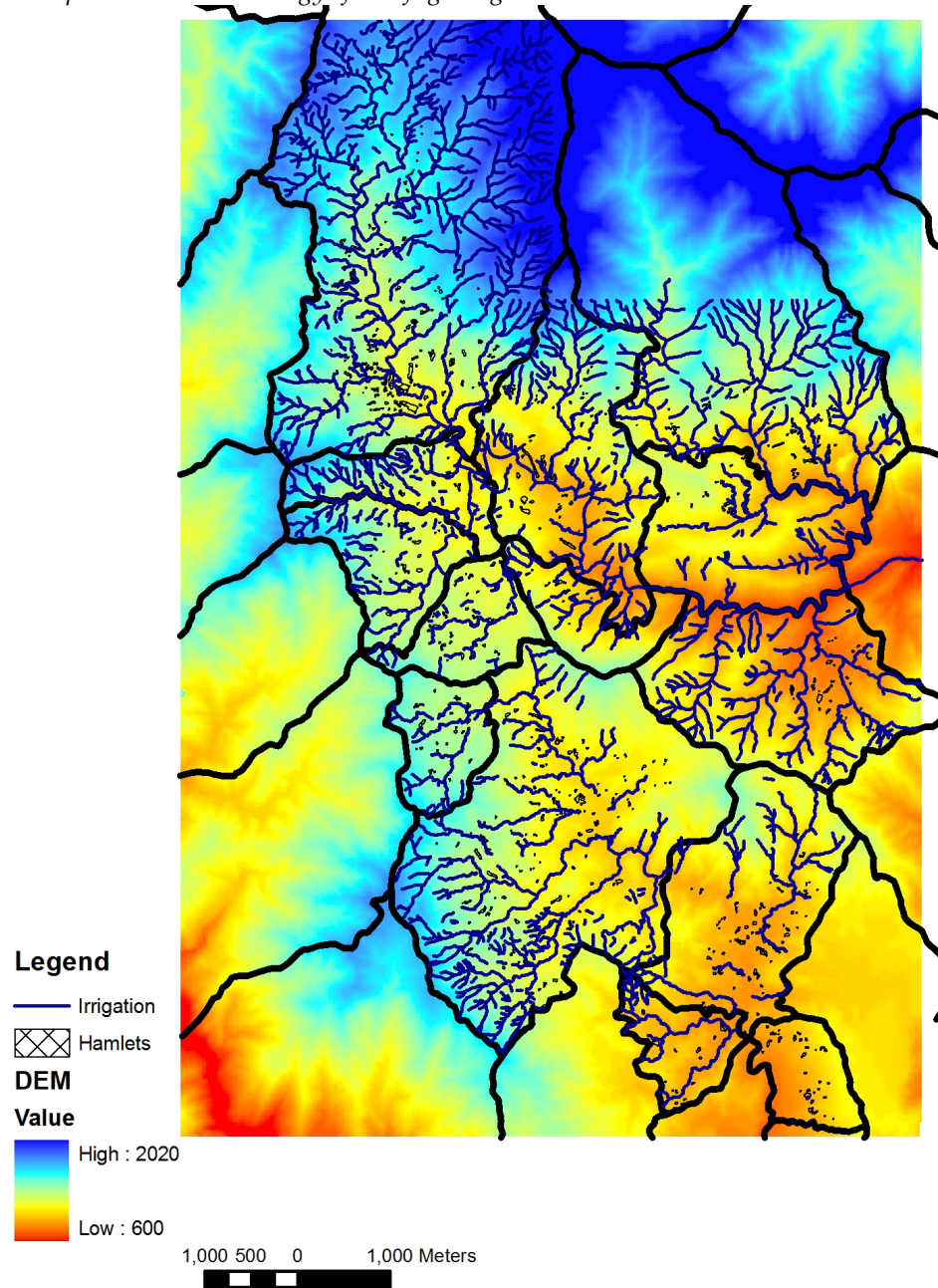


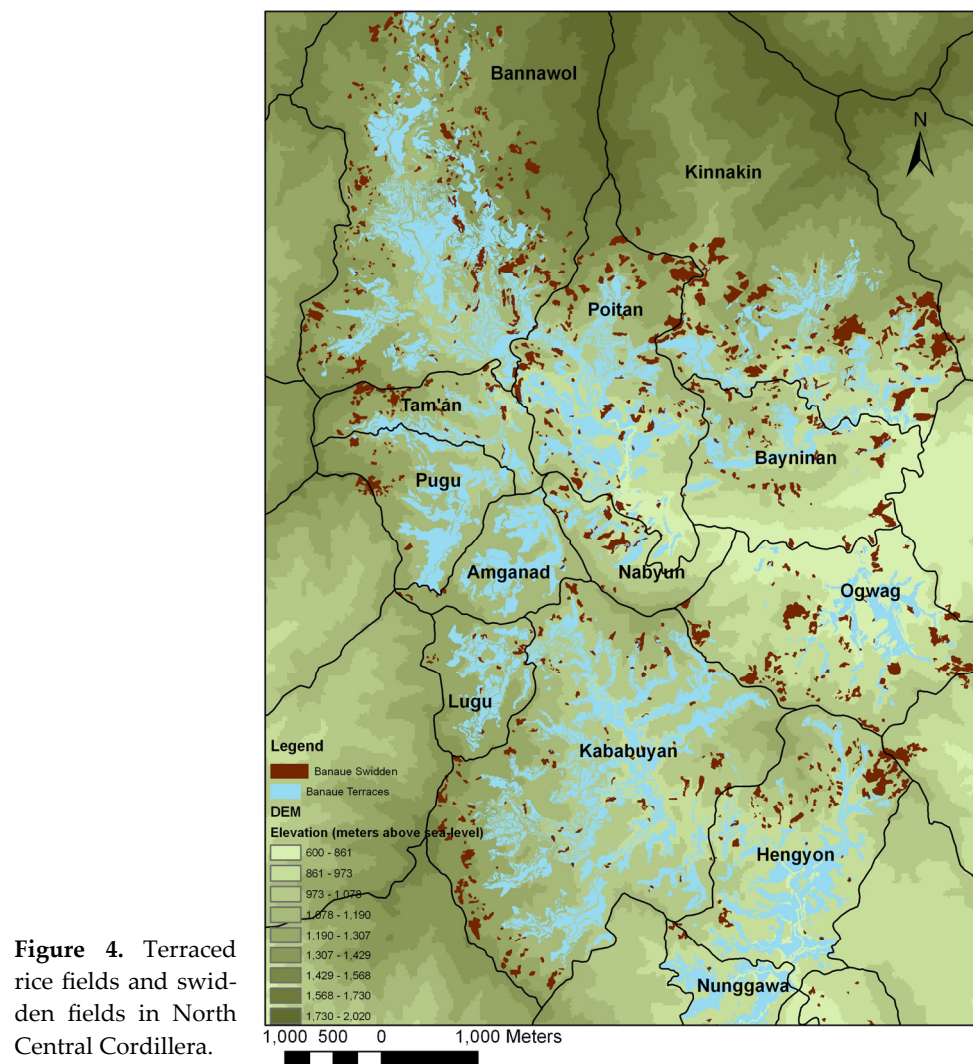
Figure 3. The 13 agricultural districts that were selected for landscape analyses.

Bayninan, Kinnakin, Lugu, Nabyun, Ogwag, Pugo, Pu'itan, Tam'an, Kababuyan, Nunggawa, and, Hengyon (Figure 3).

I began this project during my MA work in 2003 and continued to digitise the maps for my PhD research. Some of the features were later digitised with the help of Gilbert Gonzales. The whole process took almost

five years to complete. The completion of the GIS database was an important stage in my PhD work: the fieldwork component (excavations and interviews) was set up by the landscape information provided by the GIS database. In this manner, this investigation is a continuation of the work I began during my MA program.

The land use maps of North Central Ifugao that were prepared by Conklin in the late 1960's to early 1970's were scanned and digitised using "heads up" digitising in the software ArcGIS. Four thematic features that were directly significant to this paper were selected for individual digitising. These were: 1) the terraced rice fields and swidden fields (Figure 4); and, 2) settlements/villages and the drainage system (Figure 5). To develop digital elevation model (DEM), topographic contours with 20-



metre intervals were also included in the digitising (based on Conklin's 20m contour relief).

The "heads up" (or manual) digitising was carried out using ArcGIS. ArcGIS was also used to generate data on elevation, land area, distances, the aspect, and the slope. The last two items were generated from the DEM. The spatial relations/object generated from the digitised maps were placed into an MS Excel spreadsheet. Multiple regression analysis and correlation coefficients were run to determine relationships between the features of interest and the statistical significance of the relationships. The level of confidence used for this study was set at 95%. Spatial autocorrelation however, was not carried out in this exercise because I believe that many factors influenced the cultural features in the landscape of the Ifugao.

Ethnographic Interviews

The primary purpose of ethnographic interviews in this study is geared towards understanding Ifugao agricultural practices that ultimately informs self-organisation as well as developing Bayesian model for dating construction and use of Ifugao agricultural terraces. Utilising previous ethnographies and similar studies (i.e. Lansing 1991; Scarborough *et al.* 2000), I conducted informal, unstructured interviews with key informants. Five community elders were chosen primarily because of their ages and apparent experience in the agricultural practices and general culture of the Ifugao. My research assistant, Maureen Salvador, interviewed three of the informants while I interviewed the other two. Four of the interviews were conducted within three days and served as my introduction to the community. The fifth became my guide while mapping the terraces. As such, I was able to carry out in-depth interviews for two weeks.

These interviews focused on questions about cooperative work (and the concept of reciprocity), rituals associated with agricultural events, and activities that relate to construction and maintenance/repair of terrace walls. Information provided by these interviews resulted in the development of methodology for establishing the antiquity of the terraces and determining the social organisation of the Ifugao.

Excavations

Subsurface archaeological excavations in this investigation were carried out to obtain charcoal samples within and beneath the terrace walls

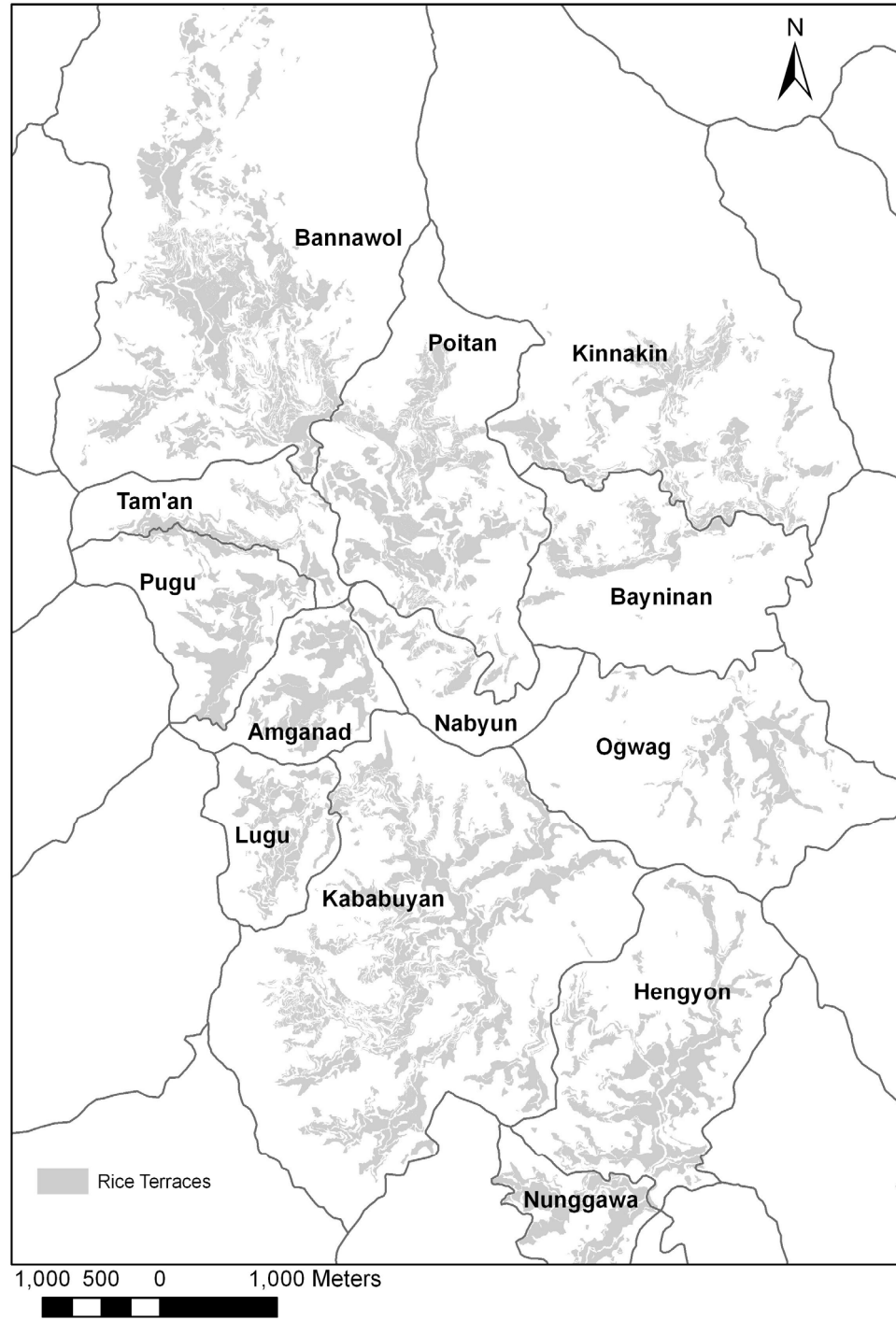


Figure 5. Distribution of hamlets (right) and drainage system (left) in North Central Cordillera

(Figure 6) in the Bocos terrace system. Although the primary objective is to acquire datable charcoal in solid context, we also collected earthenware sherds (presented in succeeding sections) during the course of the excavations. The selection of the Bocos terrace system as sampling site for archaeological excavations was based on GIS-modeling and oral history.

Excavations and gathering of charcoal samples were guided by a Bayesian model (Buck *et al.* 1996) developed to address the intermixture of materials in agricultural layers. Following Dye's (2009) call for a standard methodology for calibrating ¹⁴C results and incorporation of stratigraphic information in the calibration, this investigation utilised use of Bayesian modelling to date agricultural terraces, which by nature have layers with a chaotic mixture of materials. Anywhere in the world, dating agricultural terraces presents methodological difficulties because of their construction technology and use. However, as this study illustrates, a Bayesian

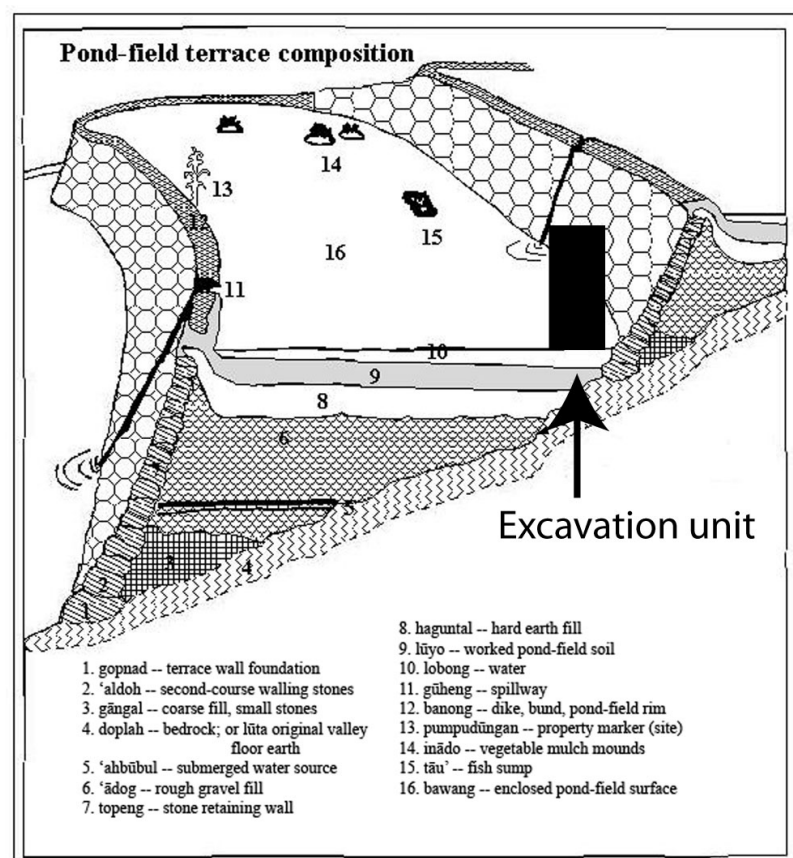


Figure 6. Location of excavation units in Ifugao agricultural terraces. (Figure appeared in Acabado 2009:806)

approach addresses the problem by incorporating stratigraphy, ethnographic information and ^{14}C dates in the calibration process. Consequently, charcoal samples were obtained from two main strata— from the layer just beneath the current agricultural soil and underneath the terrace wall foundation. These samples provided the required information to calibrate radiocarbon determinations and date the archaeological event of terrace wall construction.

Bocos Excavation Sites²

Using the information gleaned from the digitised land use maps and ethnographic data on rice terracing practices in Ifugao, I identified four excavation units within the Bocos terrace system (Municipality of Banaue) to obtain charcoal samples for radiocarbon determinations. These excavation units were selected based on their proximity to the river, with the assumption that units nearest to the river would provide the earliest dates (Keesing 1962; Maher 1973). Moreover, the Bocos system is located on the southernmost section of the Banaue terrace systems. Working on the assumption that populations were moving up the valley through Alimit River, then, Bocos terraces should be the oldest in the Banaue area. More importantly, the environmental features of Bocos suggest less energy requirement for terrace-building and more optimal for wet-rice production; less slope gradient, better water source, and adjacent to a large village.

I excavated two units located near Alimit River, one excavation unit in the middle of the terrace system and one excavation unit on mountain top terraces. Following Conklin's (1980) cross-sectional illustration of an Ifugao pond field and information culled from local Ifugao farmers, I chose to excavate the wall section of the terraces. I believe that the wall foundation is the best location for dating the construction of a particular terrace. Ifugao farmers stated that even though some terrace walls occasionally collapse, wall foundations (*kopnad*) generally remain in their original place.

Two charcoal samples acquired from each excavation unit were used for ^{14}C dating. These were collected from the layer beneath the wall foundation and from the layer within which the wall foundation is located. All of the excavation units yielded similar stratigraphic profiles: Layer I, cultivated soil (*luyo*); Layer II, hard earth fill and wall foundation (*haguntal* and *gopnad*, respectively); and Layer III, original valley floor (*doplah*)

² This section appeared in Acabado 2009:807.

(Figure 7). Three of the four excavation units provided data that corresponded with the Bayesian model for dating rice terrace construction used in this study (discussed below). The unit located in the middle of the system (*achao*) produced a single charcoal sample from Layer II, thus, the information provided by unit *Achao* was used to support the use-date of the terrace. All of the charcoal samples were remains of *Pinus kesiya* Royle ex Gordon, commonly known as Cordillera pine, which has a lifespan of 100–150 years (Kha 1965).

Results and Analyses

This section briefly describes results of my investigations, focusing on three major themes: distribution of agricultural fields, antiquity, and establishing the house concept. Some of the information presented here has

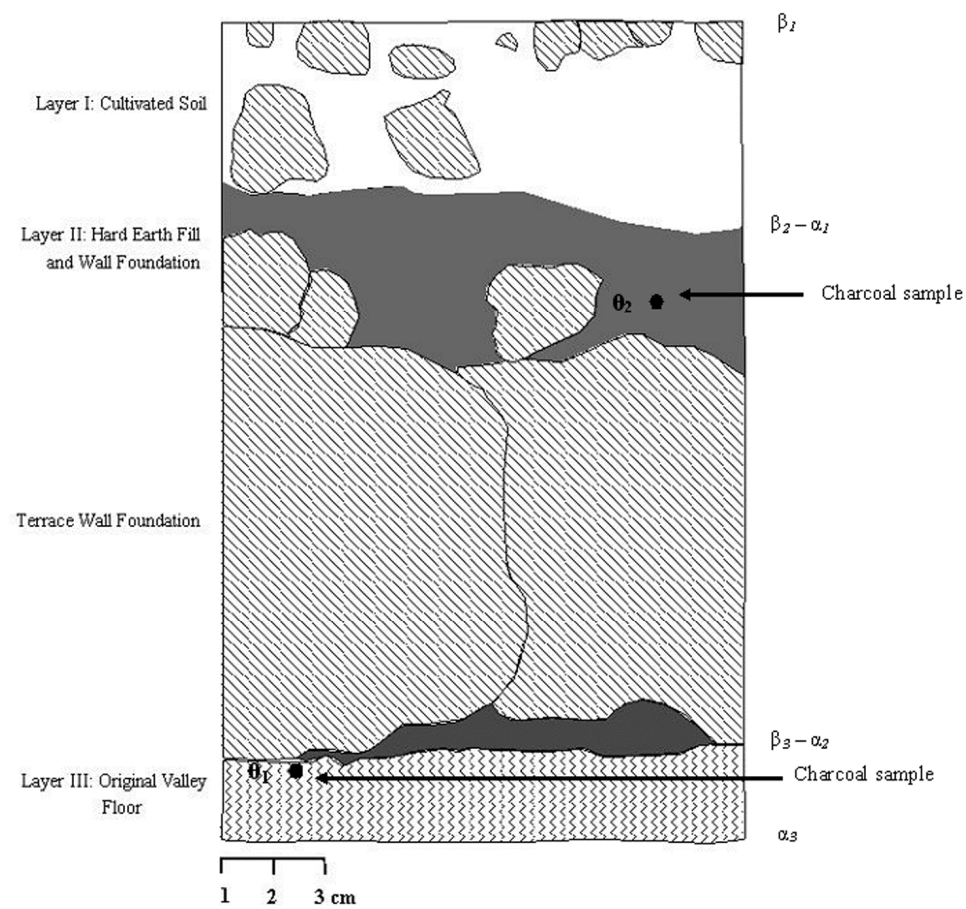


Figure 7. Typical profile of Bocos excavation units (Figure appeared in Acabado 2009:809).

been discussed elsewhere (Acabado 2009; 2010; in press).

Distribution of Agricultural Features

The topographic locations of terraced rice fields and swidden fields in North Central Cordillera (Figure 8) suggest that the two subsistence patterns are interrelated. Although wet-terraced fields are clustered along relatively gentler slopes and swidden fields are scattered on higher elevations and steeper gradients, production requirements, consumption needs, and social factors (i.e. status and prestige) provide evidence of the

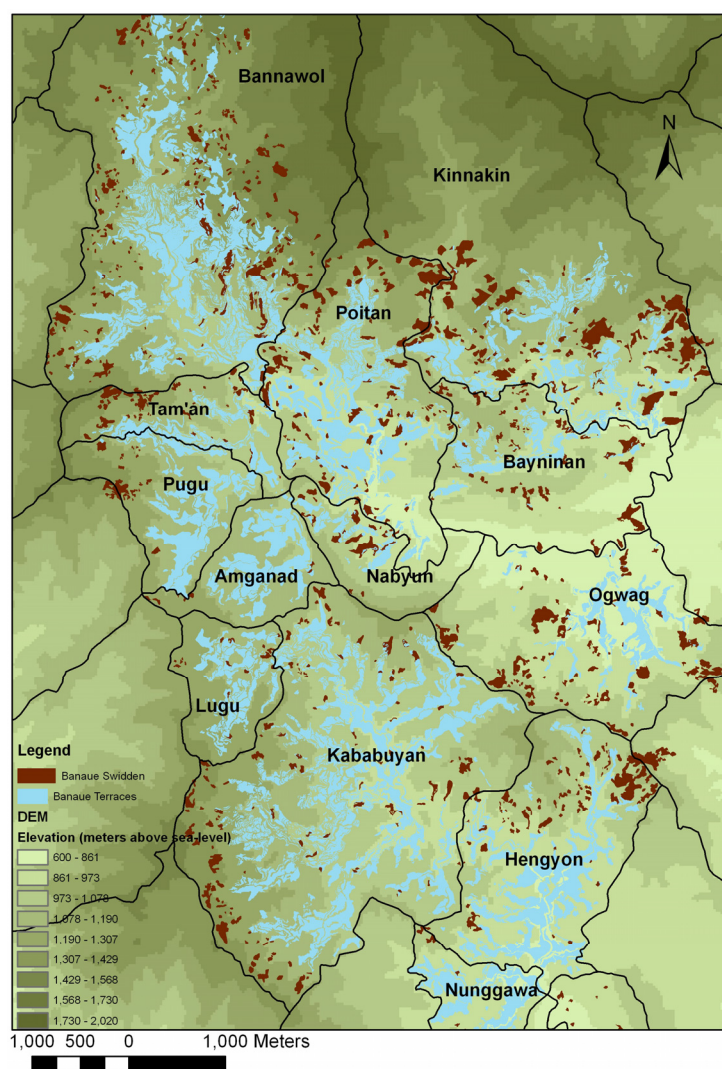


Figure 8. Distribution of terraced rice fields and swidden fields in North Central Cordillera.

complementarity of the two subsistence patterns. Thus, landscape as well as ethnographic information obtained for this study underscores the interrelatedness of the two production strategies in a single integrated system.

Ethnographic information corroborates results of the GIS analysis carried out in this study. Moreover, these datasets suggest that swiddening and wet-rice cultivation in Ifugao are characterised by: (1) diversified system that usually uses both paddy and swidden; (2) they started with paddy and then added swidden; (3) some people who do not have enough paddy use swidden. These features of Ifugao agroecology imply risk minimisation that combines two subsistence patterns. The interrelatedness of the strategies employed by the Ifugao (and other upland populations in Southeast Asia) challenges the unilineal model of agricultural intensification from swidden to wetfield agriculture.

Establishing the Age of the Ifugao Terraces³

In illustrating the power of Bayesian framework, I attempted to solve the difficulty of dating agricultural terraces, where information on the age of events was obtained from ¹⁴C dating, stratigraphy, Ifugao tradition, and events recorded historically. Radiocarbon dates have been seen as the only definitive proof of Ifugao terrace antiquity, but the nature of terracing technology rules out ad hoc procedure in choosing ¹⁴C samples from different layers. The most secure sample (layer under the terrace wall) is related to wall construction, but does not directly date the construction event. Bayesian approach then, provides us with the tool to determine the age of the event in interest.

It appears that there was an explosion of terrace building in the valley of Banaue after AD 1585 (Table 2). The Bayesian modeling employed in this investigation shows that the Bocos terrace system saw rapid terrace expansion between ca. AD 1486 to AD 1788–302 years from the valley floor to the mountain top. The results of calibration and modeling of this study counter-indicate Beyer's and Barton's hypotheses (2,000 to 3,000 BP) while supporting Keesing's and Lambrecht's (post-Spanish) arguments. Furthermore, there is also an indication of temporal change, as illustrated by the dates generated for terrace wall construction.

Whether this expansion reflects the elite (*kadangyan*) demand for

³ Some parts of this section appeared in Acabado 2009:811-813.

Table 2. Probability analyses of pre-Spanish or post-Spanish construction of Bocos rice terrace walls (Table appeared in Acabado 2009:811).

Excavation Unit	Elevation (metres above sea level)	Post-Spanish (Post-AD1585) Probability
Mamag	1040	74.6%
Rasa	1060	98.5%
Linagbu	1340	99.9%

surplus (rice-land holdings is one of the major determinants of Ifugao social ranking) or based on commoners' (*nawatwat*) exploitation of marginal environments to move up the social ladder, remains unclear. Despite the likely increase in population due to lowland groups escaping the Spanish, contact-period descriptions of Ifugao settlements point to low population densities; the startling high population density found in the twentieth century could be a later development, resulting in extension of terraces to steeper slopes and in higher step formations (Keesing 1962). However, these movements could be the impetus for more terrace construction.

Social Organisation

In defining the social organisation of the Ifugao, I use the concept of "house", originally proposed by Levi-Strauss (1982), to explain the web of relationships that make up the Ifugao social system (i.e. Figure 9). The limitation of traditional kinship explanatory models in understanding the perpetuation of an "estate" provides a take-off point in utilising the house concept to characterise Ifugao social organisation. Kinship analysis is insufficient to explain the variation and flexibility exhibited by Ifugao society.

Belonging to a "house" (or *himpuntunagan*) seems more appropriate in looking at the links of an individual to a wider social web. Thus, relations in an *himpuntunagan* are the organising unit in Ifugao. Furthermore, this analytical concept ("house") directly relates to self-organising principles acting on Ifugao agricultural practices and extends to their social organisation. It seems that landscape and social forces create a need for cooperation.

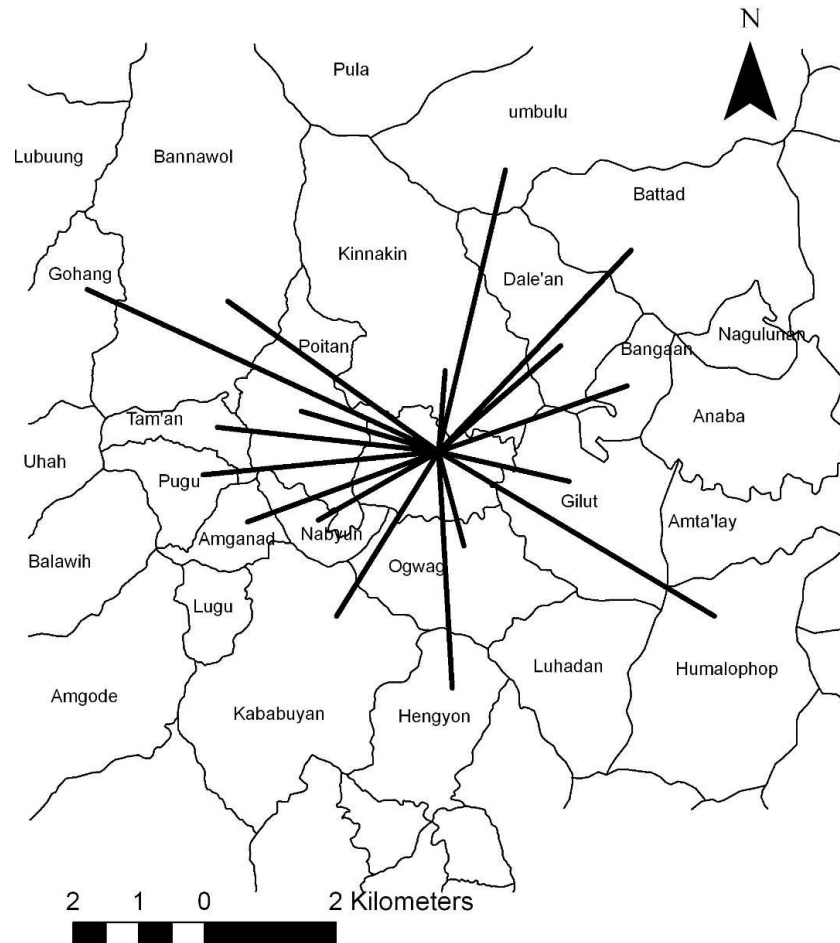


Figure 9. Extent of Bayninan residents' consanguineal links with other agricultural districts in 1966. They make up the consanguineal network upon which every family depends for potential and actual support in economic, political, social, and ritual affairs (adapted from Conklin 1980:33).

The social organisational aspect of water management and agricultural system among the Ifugao appears to be guided by self-organisation. As opposed to explanations associated with Witfogel's model, there is clearly no indication that managing Ifugao an agricultural resource was moving towards centralisation. Even in contemporary Ifugao social setting, there seems to be resentment to the national and local governments' effort to control the use of water and land. Relationships based on the house concept possibly operated on Ifugao communities described by early ethnographic accounts of Barton (1919). We can also

assume that these relationships were present during the mid-17th century when production intensification and terrace expansion occurred.

Environmental limitations to agricultural production seem to have favoured self-organisation and the elaboration of ranking. If the onset of migration to the inner Cordillera was spurred by the arrival of the Spanish, as the radiocarbon dates support, it is possible that *himpuntunagan* relationships intensified during this process. The formal establishment of Spanish presence in the region in the mid-19th century did not result in centralisation, as what occurred in the lowlands. Rather, it probably caused more fragmentation.

Summary

This investigation provides us with new sets of information that has significant implications to the history and development of the Ifugao agricultural terraces. Results of this study provide us with the baseline information to develop a model to establish Cordillera regional chronology and the historical relationship between upland and lowland populations. In addition, results of this investigation also offer evidence that challenges dominant archaeological perspectives on subsistence patterns and the link between social organisation and production system.

The Bayesian model developed to calibrate radiocarbon determinations obtained by this study serves as the first step to establish the antiquity of the entire Cordillera terrace tradition (Acabado 2009). The model's apparent success in determining construction sequence in the Bocos terrace system makes it a solid approach to accomplish this objective (confirm the age of other terrace systems across the Philippine Cordillera). Moreover, the dates provided by the determinations and subsequent calibrations suggest that the "long history" model espoused by Beyer and Barton is no longer tenable for the Bannawol terrace systems.

Results of the culture historical reconstruction then support population movement directly related to the arrival of the Spanish in the Philippines. As the Bayesian model imply, intensification of production and expansion of terrace systems in the Bannawol district coincided with the advance of the Spanish conquistadors to northern Philippines. Although some of the dates provided by the calibrations appear to be earlier than the physical arrival of the Spanish in the Cagayan Valley region, it can be assumed that the establishment of Spanish garrisons in Manila and Central Luzon (Pampanga) created a "ripple effect" that

spurred the movement of Cagayan Valley populations to the interior of the Cordillera. The nature of this movement is still unclear, but I believe that sporadic movement occurred before the physical arrival of the Spanish ca. AD 1591 (Keesing 1962) in the Cagayan Valley and a massive migration followed right after the establishment of the garrison in the region.

As the above assumption imply, small-scale populations were already present in the interior of the Cordilleras before the influx of the “refugees”. This suggests that subsistence strategies practiced by the original settlers were no longer sufficient to feed a growing population. By making use of an historical ecological approach, this investigation hypothesises that the infrastructure for irrigated-rice cultivation existed in the interior region in the form of wet-taro fields. With increases in population (rice-eating migrants), these taro fields could have been converted into rice fields. Moreover, existing subsistence strategies (swiddening and gardening) were incorporated in the production system capable of supporting a growing population.

The ensuing subsistence strategy (agroecology) combined several forms of production technology to mitigate risks presented by a mountainous environment. This finding (and other examples from upland systems in Southeast Asia) challenges the supposed evolutionary relationship between swiddening and intensive rice cultivation. Landscape and ethnographic information provides us with evidence to this complementary production system.

The interrelatedness of subsistence strategies established the need for cooperation among Ifugao farmers and villages. This is exemplified by the nature of Ifugao social organisation based on the “house” concept and the application of self-organising principles. Since the Ifugao production system is a form of risk-minimisation, political and economic autonomy provides added assurance to the survival of the minimal economic unit (hamlet) in the region. Thus, the existence of complex irrigation and agricultural systems does not necessarily correlate with political centralisation.

Findings of this study attest to the effectiveness of the landscape approach in looking at subsistence patterns and change. The relevance of complementary agricultural systems has given us the opportunity to revisit debates on the evolutionary relationship between “simple” and intensive systems. As the Ifugao terrace archaeology suggests, the inclusion of production systems from Southeast Asia in the equation of subsistence

patterns and social structures that support them, would produce a different view of history.

Landscape Approach and Ifugao Terrace Archaeology

The landscape approach employed in this investigation provided a model and a number of hypotheses in understanding Ifugao prehistory and social organisation. Resolving the issue of terrace antiquity offered several more themes that are relevant to the culture history of Cordillera in particular, and northern Luzon in general. Ethnohistoric information suggests a drastic population decline in the eastern fringes of the Cordillera (Keesing 1962; Scott 1974) 50 years after the initial contact with the Spanish. This population decline had been explained through either European diseases—deaths (Newson 2009) or migration to the interior of the Cordillera mountain range (Keesing 1962).

There is, however, no empirical evidence yet for population decline through diseases. Information on population density in the region is also scant, although early Spanish accounts identified substantial number of villages in the Cagayan lowlands that had disappeared after initial contact. Keesing proposed that the disappearance of villages might be associated with population movement to avoid Spanish taxation. The Cordillera, thus, became a refugium of sorts.

Population movement could have occurred even before the arrival of Spanish forces in the region. A “ripple-effect” could have taken place that prompted lowland groups to move up to the mountains and join settlements already established there. This hypothesis suggests a massive movement of population.

Radiocarbon determinations utilised to determine the construction date of the terraces suggest a similar scenario. There were small-scale settlements in Ifugao before the 1600’s and that these populations were wet-taro and dry-rice cultivators. At the onset of Spanish push to the north, we see a corresponding expansion (intensification of production) of the agricultural system (terrace-expansion). Evidence from the study area suggests that it took eight generations, ca. 250 years, to construct irrigated agricultural terraces from the edge of the river to the mountaintops.

This migration can be considered an act of active resistance against the Spanish. It suggests that the social organisation of pre-Hispanic populations in present-day Cagayan Valley had the mechanism for large-scale movements. It also indicates that the lowland and highland

Philippines (at least in Luzon) would have the same patterns before Spanish colonisation. Consequently, this information implies that the arrival of “refugees” initiated agricultural intensification and subsequently expanded social stratification.

The social ranking that emerged in Ifugao can be related to the ritual and social significance of rice. As mentioned in the previous sections, customary Ifugao status is based mainly on rice-land holdings. This could have limited everyone’s access to lands optimal for rice production.

Ranking however did not develop into centralised control of resources—because of the need for cooperation and the importance of commons property. The unpredictability of the Cordillera environment and inadequacy of rice production led to the formation of a tripartite Ifugao agricultural system, which is related to social organisation: while rice signifies social prestige, swidden fields and house gardens supply most of the nourishment of the population.

Investigation on Ifugao landscape and social organisation offer deeper understanding of Cordillera culture history and ethnography. As such, this study provides several important contributions to Philippine and Southeast Asian anthropology.

Contributions

This research offers a much needed reference point in archaeological studies of northern Philippine highlands. The GIS modeling, as well as radiocarbon dates provide a baseline for further studies in other areas of the Philippine Cordillera. This aspect is significant because almost four decades has passed since the last archaeological excavation was conducted in the province (Maher 1973; 1978; 1985) and an almost complete absence of archaeological chronology in the area remains.

Thus, this investigation shed light on the long running debate on the age of the Ifugao agricultural terraces. It also establishes Ifugao social organisation and the interaction between landscape and human behavior. These themes offer a glimpse of how a multifaceted approach (ethnohistory, ethnography, spatial analysis, and archaeology) results in a better understanding of human history. The absence of prior archaeological chronology, discussions on the relationships between agricultural and irrigation systems with social organisation seems a tall task. However, with a three-pronged research strategy, this investigation addressed issues significant to the archaeology and ethnography of the Ifugao. I believe that

this study will pave the way and hopes that this serves as baseline research for further investigations in the region.

This work provides four major contributions: 1) complementary discussions on Ifugao social organisation by proposing the concept of house society and self-organisation; 2) descriptions of the distribution of agricultural terraces and swidden fields in the Ifugao landscape by digitising land use maps prepared by Conklin; 3) an historical development and intensification model based on Ifugao agroecology; and 4) proposal of a later date of the Banaue agricultural terraces and development of a working model to date other agricultural terraces in the Philippine Cordillera.

This study also contributes to larger Philippine and Southeast Asian anthropology and history (Figure 10). As mentioned earlier, the perceived differences between uncolonised (highland) and colonised (lowland) groups are results of history and colonialism, rather than differences in biology or environment. It is my hope that this study serves to change these perceptions.

Contributions to Wider Ifugao and Philippine Scholarship

This research is intended to shed light on the relationships between Ifugao social organisation and landscape. Previous scholars have characterised Ifugao social organisation within lineage and kinship discourses. While these perspectives are useful in understanding the webs of Ifugao social relationships, they are inadequate in explaining how these webs are constructed.

The use of the house concept, in addition to previous scholarship that utilised kinship models, provide us with the tool to investigate Ifugao social organisation that early ethnographers encountered. Establishing the house concept also allows us to investigate the self-organising nature of agriculture-related rituals. I argued earlier that self-organisation was responsible in the decentralised nature of Ifugao irrigation management. This finding suggests that cooperation is the overriding concern in the Ifugao agricultural system—as exemplified by the practice of *baddang/uggbu* (Ifugao customary cooperative-like work groups).

Related to the discussion on agricultural systems, this work dealt with agrarian issues that relate to the relationship between intensive agricultural terraces and extensive swidden fields. While the prevailing wisdom on this theme focuses on the evolutionary relationship between

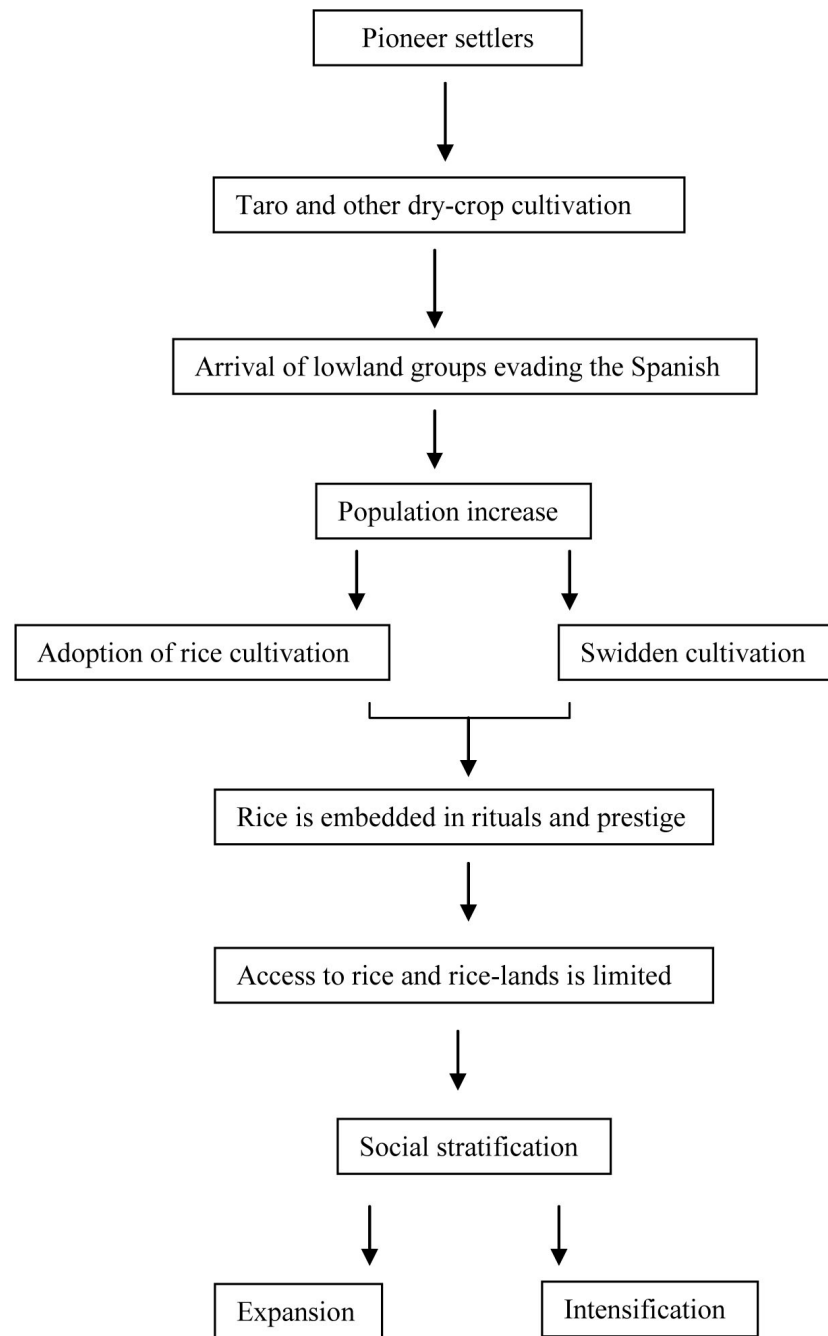


Figure 10. Culture-historical model for the development of Ifugao agricultural terraces.

the two systems, information on the distribution of the irrigated terraces and swidden fields—and ethnographic data—suggest that this is not applicable to the Ifugao case. Throughout history, swidden fields yielded more resources than irrigated rice terraces in Ifugao (Conklin 1967; Keesing 1962; Scott 1974). As such, I argue that the relationship between the two systems is based on risk minimisation.

The importance of the Ifugao tripartite agricultural structure was also argued. Most studies on agrarian ecology focused on food production systems, and forest management was often ignored. The work of Sajor (1999) suggests that local agroforestry management is vital to the preservation of forest cover and watershed maintenance in Ifugao. I extend this argument and include agroforestry as part of the Ifugao agricultural system. As Eder's (1982) study indicated, forest cover is important in the preservation of the Ifugao terraces.

Future Directions

This work serves as a vehicle for further investigations in understanding the history of agricultural terraces and culture in the Philippine Cordilleras. The Bayesian methodology developed in this investigation can be applied to all agricultural terraces in the region as well as in other parts of the Philippines (and Southeast Asia). Results of radiocarbon determinations and use of a Bayesian model presented above provide promising avenue for finally establishing the origins, construction, and expansion of Philippine agricultural terraces. In addition, the use of house society to characterise the Ifugao social organisation could be further explored and extended to other Cordillera groups (i.e. Kalinga, Bontoc, Ibaloi) that share similar patterns with the Ifugao.

Studies in other areas of Ifugao (and the Cordillera) will help calibrate the core assumptions mentioned in this paper. Since there is a likelihood of migration to the uplands as a response to the arrival of the Spanish, the interior of the Cordillera became a refugee destination. Early radiocarbon dates from future excavations should cluster around AD 1500. This will revise the dominant wisdom in Philippine history and open more research opportunities in this time period.

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