A QUIET HARVEST: LINKAGE BETWEEN RITUAL, SEED SELECTION, AND THE HISTORICAL USE OF THE FINGER-BLADED KNIFE AS A TRADITIONAL PLANT BREEDING TOOL IN IFUGAO, PHILIPPINES

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Authorization to Submit Thesis

This thesis of Kevin Murphy, submitted for the degree of Master of Arts with a Major in Anthropology and titled "A QUIET HARVEST: LINKAGE BETWEEN RITUAL, SEED SELECTION, AND THE HISTORICAL USE OF THE FINGER-BLADED KNIFE AS A TRADITIONAL PLANT BREEDING TOOL IN IFUGAO, PHILIPPINES," has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

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Abstract

The transverse harvest knife, also commonly called the finger or finger-bladed knife, has been utilized by rice farmers in southeast Asia for many centuries. The finger knife persisted in many traditional cultures long after the introduction of the sickle, a tool which provided farmers with the means to execute a much faster harvest. Several theories in interpretative archaeology have attempted to account for this rejection of more modern technological innovations. These theories, which include community-based social organization ideas and practical reasons for the continued use of the finger knife, are presented in this paper. Here I suggest an alternate theory based on a re-interpretation of existing research and fusion of existing theories: the primary reason for the historical and continued use of the finger knife is for seed selection through a centuries old tradition of plant breeding. I accept the accuracy of the practical and community-based, socio-cultural reasons for the use of the finger knife put forth by other authors and suggest that seed selection and genetic improvement was the driving factor in the use of the finger knife. Indeed, intricate planting and harvesting rituals, which both ensured and encouraged varietal conservation and improvement, co-evolved with the use of the finger knife as the primary harvest tool due to its unique ability to aid the farmer in the art and science of seed selection. I focus my theory on the terrace-building Ifugao people in the mountainous Cordillera region of northcentral Philippines. When combined with previous ideas, this interpretative theory, based on the connection between ethnoagronomy and material culture, may provide a more complete picture of the story around the persistence of the finger knife in traditional rice-growing cultures in southeast Asia.

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In addition, the author is most appreciative of the generous guidance and assistance in gaining access to the Dr. Harold Conklin collection of Ifugao finger knives provided by Dr. Roger Colten and Maureen DaRos White of the Division of Anthropology, Yale Peabody Museum.

Dedication

This thesis is dedicated to the memory of three outstanding scientists. Dr. Ben Vergara, a National Scientist awardee conferred by the Philippine National Academy of Science and Technology agriculture division, collected and donated numerous unique Ifugao finger knives to the Rice Museum housed at the International Rice Research Institute (IRRI). Dr. Bart Duff, an economist in the Agricultural Engineering Department at IRRI, coordinated the Women in Rice Farming Systems program to address women's concerns in both research and extension programs on rice farming systems. Dr. Harold Conklin, a linguist and cultural anthropologist, worked with the Ifuago for decades and wrote the seminal book 'Ethnographic Atlas of Ifugao'. His collection of finger knives, housed at the Peabody Museum at Yale University, were particularly useful in the development of this research project.

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Overview

In this paper I utilize interpretive archaeology (Hodder, 1991; Shanks and Hodder, 1995) to present novel aspects to a theory which bridges the anthropological sub-fields of material culture and ethnoagronomy (Nazarea-Sandoval, 1991; Pieroni et al., 2005). I do not use original research in this manuscript, but rather use a discursive approach to focus on the intersection between the rice-based ethnoagronomy of the Ifugao people of the Cordillera Region of the Philippines and their material culture; specifically, the traditional use of the finger-bladed knife. Interpretation is a multivocal, ongoing process; there is no final and definitive account of the past and different interpretations of the same field are quite possible (Shanks and Hodder, 1995). Indeed, archaeological interpretations are creative, likely to be suited to different purposes, and require the interpreter to take responsibility for his or her actions and interpretations (Shanks and Hodder, 1995).

Interpretive and Processual Archaeology

Interpretative archaeology seeks to clarify current debates in archaeology between processual and post-processual approaches. Processual archaeology is often thought of as a good means of obtaining positive knowledge of the past. Post-processual archaeology is largely a reaction to what was thought of as an overly objective and improbable processual

framework. Post-processual archaeology celebrates subjectivity over objectivity. This is the gap interpretative archaeology seeks to fill.

To better understand the importance of interpretive archaeology, it is useful to explore briefly the theoretical underpinnings of processual archaeology. Processual archaeology, also called "New Archaeology," emerged in the 1960's amongst a new generation of archaeologists intent on the development of meaningful theories about culture, and in search of laws that explained equally both ethnographic data as well as archaeological data (Fagan, 2005, p. 200). Processual archaeology differed from "Old Archaeology" because it demanded more scientific explanations for the diverse processes of cultural change. Processual archaeology also suggested that cultural systems did not stand alone, but rather were an interactive component of much larger environmental and societal systems.

New archaeology was championed by Lewis Binford, who embraced the work of Walter Taylor, Leslie White, James Griffin and Albert Spaulding to develop the framework for the field of processual archaeology. Binford had several key contributions to processual archaeology (Binford, 1962; Binford, 1980; Binford, 1981). First, he argued that archaeology needed to move into the realm of rigorous scientific testing and that independent methods of testing ideas and theories needed to be developed and added to currently used archaeological methods of induction and inference. Second, he maintained that systemic changes in human cultures were evolutionary adaptations to concurrent changes in either competing or neighboring cultural systems or to changes in the surrounding natural environment. Thus, by studying the artifacts at a given archaeological site, it was not only possible, but also incumbent upon the archaeologist, to theorize as to

the function of the artifacts within the cultural system. Third, Binford proposed the use of research strategies to pose hypotheses about the observations of a collection of observable data. These hypotheses could be proved or disproved, and this information in turn would form the base of further proposition and hypotheses testing.

David Clarke was also a proponent of processual archaeology. He suggested that despite generations of collecting and filling our museums with artifacts, our ideas of the meaning and the cultural significance remained staid (Johnson, pp.16-17, 22). Clarke drew upon the ideas of Julian Steward, who stressed cultural ecology and adaptation, and Gordon Childe, who suggested that artifacts are 'expressions of cultural norms' and that these 'norms define what a culture is' (Johnson, 2010, p. 17, 28). New archaeologists were influenced by Childe but began to separate themselves from the normative conception of culture through a focus on cultural evolution, systems thinking, cultural process, and adaptive cultural change as influenced by the external environment and the use of a scientific approach to explain the artifacts that were discovered.

One of the key points emphasized in New Archaeology in the 1960s was that archaeology needed to move away from the idea that culture was more than a collection of 'different randomly applied norms' (Johnson, 2010, pp.24-25). Rather, culture was a functioning system and as such, comparable to other types of systems that exist in the biological and physical worlds. This idea had two immediate impacts on New Archaeology, both debated extensively over the past 50 years. First, culture as systems stressed the theory that despite different cultures having different artifact styles or religious ceremonies, their underlying social system had underlying similarities. In other words, cultural systems could be generalized. Second, it allowed New Archaeologists to work in a

more optimistic environment than their predecessors (i.e. Franz Boas and contemporaries) and spurred them on to push the boundaries as to what archaeology could conceptually and/or realistically achieve.

Johnson (2010, pp. 72-74) recognizes six important concepts about cultural systems. First, cultures are adapted to an external environment and this has proved formative in the evolution of cultural systems. Second, cultural systems are observable, in that they 'depend on systems of energy and information flow rather than on thoughts and norms'. For example, while it is impossible to dig up a cultural system and observe it, it is possible to quantify land suitable for cultivation in an area or estimate the calorific value in a local faunal assemblage to gauge 'subsistence'. Third, systems can be modeled and compared from culture to culture, which can lead to generalizations about cultural processes – an important component of processual archaeology. Fourth, individual elements that make up cultural systems are interdependent upon one another. For example, it is impossible to look at trade as a subsystem in a prehistoric society without recognizing the impacts, positive and negative, that subsistence, climate, local ecology, and ritual have on trade. Fifth, it is possible to explain how these interrelated elements are linked through an examination of their function. For example, agricultural intensification could be linked to prestige of the elites, and this social ranking might in turn also be related to ritual elaboration. Finally, these important subsystem linkages can be viewed in terms of relatedness, relationships and correlations rather than via simple cause and effect models. Rather than focusing on circular chicken and egg scenarios, systems-based archaeologists should focus on which subsystems are most related to one another, and therefore be better able to explain system change or stability on a larger system level.

Colin Renfrew, another new archaeologist, used tree-ring calibration or radiocarbon dating to date the origins of megaliths in Western Europe (Renfrew, 1970). He then went on to suggest that chronology was less important than attempting to understand the cultural processes involved in the construction and use of megaliths, and he worked out theories to explain the existence and distribution of these megaliths. These theories included adaptation to environmental factors and competition among societies, which he then attempted to test through further analyses.

Middle range theory (MRT) was first developed by Binford in the early 1970s as an attempt to build a knowledge bridge between ancient times and current times. Binford used the term MRT to recognize the pursuit of greater accuracy in the identification and measurements of properties in past cultural systems. MRT was developed as an attempt to bind the dynamic and extinct properties of prehistory with the static properties which were common to both the past and the present (Fagan, 2005, pp. 202-203). A static record is derived from concrete archaeological data on artifacts like sherds or tools. A dynamic property is the way that past cultures functioned and developed as a system and were transformed via interactions with the environment and neighboring groups. As archaeologists construct analogies to explain the past based on their interpretations of archaeological evidence, they make assumptions about 'the middle range' or the 'space between statics and dynamics' (Johnson, 2010 p. 51). It is from Binford's attempts to span this gap in as scientific a way as possible that the concept of MRT arose.

MRT has over the past three decades proven a useful theory for the sub-discipline of ethnoarchaeology, or the 'the study of living societies as a way of understanding and interpreting the archaeological record' (Fagan, 2005, p. 203). Ethnoarchaeological studies

are critically important to gain a more comprehensive understanding between the dynamics of the past and their products (the static archaeological record) because they provide a means to achieve direct exposure to these products in present day, living systems (Binford, 1080). According to Johnson, the only place we can see a "definite, certain, measurable link between a set of activity patterns or dynamics and what they look like archaeologically is in the present" (2010, p. 53). Although we are unable to witness or read about pre-historic cultural activities like farming or hunting, MRT provides a framework for looking at similar activities in the present day, or ethnographic present.

In a study of wolf behavior in the context of predator and scavenger behavior, Binford (1981) defined variations in bone assemblages in the present time, and in so doing, described a diagnostic frame of reference to compare with archaeological material. By developing this diagnostic frame of reference, Binford was able to give meaning to the archaeological record. One of the primary ways MRT is being used by archaeologists today is through the utilization of experimentation to link the present day to the archaeological record (Atici, 2006; French 2015). Experimentation allows archaeologists to have control over the particular variables that are being investigated (Amick et al., 1989). For example, experimental archaeology has revealed how polished and flaked stone tools were manufactured and used by comparing microscopic traces of wear on prehistoric tools and comparing this with experimentally used modern tools (Johnson, 2010, p. 54).

One of the primary criticisms of MRT is that it is based on a uniformitarian assumption, which states that conditions in the past were similar to those in the present. However, if conditions in the past differed from those of today, MRT becomes less useful and in many cases, irrelevant. In most cases, we simply do not know whether the

uniformitarian assumption is correct. To take the uniformitarian assumption on environmental conditions and frame it within cultural evolution, MRT can and has been challenged by anthropologists who hold that all cultures are historically unique and are not in fact basically similar to one another at each stage of cultural evolution.

New archaeologists suggested that it is imperative upon the archaeologist to be honest about their own biases, aims and interests. Clarke wrote of the need to be 'explicit and precise' in one's analyses and argued that clear research questions should be formulated when surveying dig sites (Johnson, 2010, pp. 26-27). Finally, processual archaeology stressed the importance of understanding variability. This dovetailed with concurrent emerging and/or expanding use of statistics, big data, experimental design and sampling theory in other disciplines. It is these latter points that bring us back to interpretative archaeology as the primary theory used in this thesis.

Hodder (1991) suggested that "an interpretive post-processual archaeology needs to incorporate three components: a guarded objectivity of the data, hermeneutic procedures for inferring internal meanings, and reflexivity." Interpretive archaeology is characterized by the following aspects: 1) Interpretation is a practice which requires that the interpreter takes responsibility of his or her actions and interpretations; 2) social practices have to do with meanings and the making sense of things; 3) interpretation is an ongoing process – there is no final and definitive account of the past; 4) interpretation is multi-vocal – different interpretations of the same field are very possible; 5) archaeological interpretations then are likely to be suited to different purposes, needs and desires; and 6) interpretation is creative, requiring attention and response to the interests and needs of people who have or express interests in the material past (Shanks and Hodder, 1995).

Therefore, in full transparency of these six aspects of interpretive archaeology, I argue here that the finger-bladed knife was used primarily as a seed selection tool by the Ifugao to improve and diversify locally adapted highland rice varieties.

Contextualization

This thesis began as an exploration of farmer rice breeders in the Philippines. On three different trips to Luzon, the largest island in the Philippines, I met with key participants in the farmer-led organization called MASIPAG ('Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura', translated from Tagalog to English as 'Farmer-Scientist Partnership for Development'). MASIPAG is "a farmer-led network of people's organizations, NGOs and scientists working towards the sustainable use and management of biodiversity through farmers' control of genetic and biological resources, agricultural production and associated knowledge." (www.masipag.org). Their mission is to improve the quality of life of resource-poor farmers in a rice dominated agricultural system. As of 2016, MASIPAG has collected and maintained over 600 traditional rice varieties and their team of 70 farmer-breeders have developed over 599 new varieties. Of these, 12 are considered flood tolerant, 18 drought tolerant, 20 saline tolerant and 24 resistant to pests or diseases. Their 188 trial farms maintain traditional rice varieties in-situ, and their two national back-up farms and eight regional back-up farms maintain both traditional rice varieties and the newly developed MASIPAG rice varieties in-situ. Through their extensive networking and outreach activities, they have reached approximately 30,000 farmers across 63 provinces within the Philippines.

I traveled to several locations throughout Luzon and met with rice famers, farmer-breeders, in-situ conservation back-up farm managers, community members, and

MASIPAG staff. I conducted a dozen in-depth interviews that spanned topics ranging from the history and motivation for the establishment of MASIPAG, the breeding methodologies employed, the role of individual farmers in variety development and within the organization, the breadth and scope of MASIPAG and the logistical processes they used to reach such a large number of farmers across a fragmented and dispersed cultural landscape across dozens of distinct geographical islands and linguistic groups.

Through a visit to the Rice Museum at the International Rice Research Institute and my travels to the Ifugao region I learned of the finger knife. I became intrigued with understanding the historical role the finger knife plays in the rice-based agricultural systems throughout the Philippines. At this time, I began the process of thinking through and deciding to shift the topic of my thesis to fully explore the potential role of the finger knife in traditional seed selection practices within the Ifugao region of the Philippines.

My argument within this thesis is an interpretive reflection of my background as a farmer, agronomist, and plant breeder, with an intimate knowledge of the tools that were used by generations of famers as seed savers, seed selectors, and crop breeders. I add to the creative, multi-vocal discourse on the use and utility of finger knives in the spirit of offering an interpretation that attempts to make sense of this tool as it is uniquely suited to a purpose and a need not fully threshed out in the literature. I suggest that the finger knife is a uniquely designed tool that meets the need for ritual and respect for rice within the Ifuago worldview while developing a structured seed saving system that encourages biologically important methods for varietal improvement and development.

Background: Rice, Religious Beliefs, and Culture of the Ifugao

The Ifugao people of Cordillera Region in north-central Luzon Province in the Philippines inhabit a steep, mountainous landscape approximately 17º north of the equator. Rainfall is abundant in this region, with 2,000 to 3,000 mm of rain per year falling on the mixed tropical montane forest and rice terraces (Conklin, 1980: 1-4). Activities of the Ifuago are traditionally tied to agricultural management of ponded terraces (permanent cultivation) and swiddens (shifting cultivation), and ecological management of private forests (*muyong*) typically located above the primary farming locations. Food obtained through the farming of swiddens, primarily sweet potatoes, is used to supplement Ifugao diet, as a form of crop security if rice harvests are low or ponded terraces damaged (Conklin, 1980: 1).

Monogamy is the rule of the Ifugao, who practice bilateral, consanguineal kinship, with secondary bonds of "neighborhood and propinquity" (Conklin, 1980: 5). Inheritance of property, conflict resolution and decisions regarding agriculture, follows a primogeniture birth order (Acebado, 2013; Conklin, 1980: 5). This inheritance rule allows both for the terraces and other agricultural land and private forests to remain undivided, and for rituals which emphasize Ifugao ancestor veneration to establish a clear connection between the living and the dead (Acebado, 2013). Ifugao live primarily in "hamlets" composed of families with terraces in the same vicinity, bound together by either kinship or common ecological concerns. Several dozen hamlets comprise an average "district", each with or led by a *tomona*, the ritual leader who makes all district-wide agricultural decisions (Acebado, 2013; Conklin, 1980: 6). The *tomona* owns a centrally located rice field, which is traditionally the first to be planted and harvested, and manages the property of this ritual

field; in particular, the rice gods (*būl-uls*) and basket reliquary (*panu'būngan*) (Conklin, 1980: 6).

Borrowing from the "house" concept of social organization (Lévi-Strauss, 1982; Waterson 1995), Acebado (2013) argues that the ritual agricultural field (*puntonaan*) acts as the central, connecting point of Ifugao social relationships and indeed becomes an emergent property that defines Ifugao social organization. The Ifugao have continuously grown rice in an intricate series of terraces for hundreds of years. The increased expansion of terraces throughout the Cordillera Region of the Philippines resulted in ever-greater demands on soil, land, and water resources, leading to a "self-organization" model of social organization, where increased resource pressures led villagers within adjoining settlements to share labor and limited natural resources such as ponded terraces, land for shifting cultivation and forest resources, and water (Acebado, 2013). This cooperative, self-organization is evident in the synchronization of various labor-intensive agricultural activities of communities within a watershed for activities including planting, weeding, pest control, irrigation, and harvest (Acebado, 2013; Conklin 1980: 1-39).

Movements and migrations of Austronesian speakers brought cultivars of rice and taro to the Philippines, and these two crops formed the basis of pre-historic food production in Luzon (Haberle 1998; Harlan 1971). The exact age of the rice terraces of the Ifugao region has been a matter of debate over the past 100 years. The pre-contact model put forth by Barton (1919) and reinforced by Beyer (1955) suggests that the terraces were 2,000 to 3,000 years old. This timeframe was based on calculations on the minimum amount of time it was projected to take to build terraces of this magnitude, and the pre-contact model is still the one most Filipinos adhere to today. The post-contact model suggests that the

Spanish arrival to, and colonization of, Luzon in the 1600s expedited the movement of indigenous lowland groups to the Cordillera highlands, resulting in the construction of the rice terraces between 300 and 400 years ago (Acabado 2009; Acabado 2012a; Dozier 1966; Keesing 1962; Lambrecht 1967; Maher 1973). Recent archaeological evidence suggests that the Little Ice Age, which increased aridity in the Cagayan lowlands while simultaneously increasing rainfall in the highlands, encouraged an earlier group of people who may have moved into the Cordillera highlands in the 13th century (Peterson and Acabado, 2015).

Over 2000 deities have been recorded within he religious belief system of the Ifugao (Barton 1946; Lambrect, 1962). Approximately half of these deities are associated with rice (Acabado and Martin, 2016). Conklin (1980) classified Ifugao rituals into 37 categories; of these 17 were directly related to rice farming practices or consumption of rice. Other rituals are associated with births, engagements, weddings, funerals, and human health and the curing powers of the Ifugao religious leaders known as *mumbaki*. Rituals in traditional Ifugao religion, led by *mumbaki*, typically take place in a rice granary or a house.

According to Acabado and Martin (2016), the Ifugao cosmos is comprised of six distinct realms. The realm of humans and the physical world is known as *Pugaw*; the other five realms are located in the spiritual world. Within the physical world, water plays several important roles in the religious practices of the Ifugao. Water is used to communicate with their deities after a successful harvest season and to entreat the gods of the Skyworld to cleanse them of sickness and sorrow (Acabado and Martin, 2016). The deliberate and focused use of water in agricultural rituals seem to be a cultural strategy that

regulates detrimental water-related activities, an example of how ritual and agricultural practice link in the interest of community cooperation (Acabado and Martin, 2016).

The Ifugao people, due to their widespread construction and continued cultivation of their extensive system of rice terraces, are the most well-known of several minority ethnolinguistic groups in the Cordillera Region. Four clusters of terraces in the Ifugao region of the Philippine Cordillera were recognized by UNESCO as a World Heritage Cultural Landscape in 1995, and reclassified on the List of World Heritage in Danger in 2001. The terraces dapple the rugged landscape primarily across Ifugao and Mountain (formerly Bontoc) Provinces, but can also be found in the provinces of Apayao, Benguet, and Kalinga. In Ifugao Province alone there are an estimated 20,000 kilometers of terrace walls, 7000 of which are composed of rock quarried from the mountainsides or alternatively carried up many hundreds of meters from the river bed below (Conklin 1980; Reid 1991).

Rice production holds a place at the center of the Ifugao worldview (Barton 1919; Conklin 1980). Asian rice, *Oryza sativa*, is the staple crop for more than 50% of the global population, and is the most widely grown crop species worldwide (Yu et al. 2002; World Rice Statistics, http://www.irri.org; FAOSTAT, http://apps.fao.org). *O. sativa* was domesticated from *O. rufipogon* during the Neolithic era approximately 10,000 years BP, which gave rise to both the *japonica* and *indica* major variety groups (Khush 1997; Crawford and Chen 1998). It is the tropical japonica subpopulation that is traditionally grown on hillsides in Southeast Asia (Garris et al. 2005; Khush 1997).

According to Conklin (1980: 13-35), the rice growing cycle begins in much of the Cordillera (with notable exceptions) in the rainy season with terrace repair and formation

and field preparation, typically performed by men, followed by rice planting by women (Phase I). As the dry season arrives, rice cultivation and weeding occurs, followed by harvest (Phase II). However, this farming cycle was based on the use of traditional rice varieties (in Banaue, collectively called *tinawon*) which were adapted to centuries old cultivation patterns. The traditional cycles were somewhat disrupted by the introduction of new varieties, which varied significantly in the number of days to reach harvest maturity, to the region (Acabado 2010: 42). However, adoption of new varieties from formal breeding programs outside of the Cordillera region was often resisted or very slow to take hold, due partially to their inability to fit within the Ifuago agricultural cycle. In addition to their importance in rice production in Ifugao, the terraces also serve as the primary location for cultural rituals.

Current challenges to the traditional Ifugao lifestyle includes the rapid influx of tourism, outmigration for lowland city and overseas employment, and the related decline of traditional farming practices and spiritual rituals, the latter often performed by the *mumbaki*, or local priest (Nozawa et al. 2009: 71). Efforts focused on the conservation of traditional rice varieties and historically sustainable farming practices are methods currently employed to help revitalize traditional rice production practices in Ifugao.

CHAPTER 2: THE FINGER-BLADED KNIFE: TRADITIONAL USE AND RICE RITUALS AMONG THE IFUGAO AND EXAMPLES ACROSS SOUTHEAST ASIA

Traditional Use of the Finger-bladed knife

Harvesting of rice is still accomplished in small, isolated areas of the Philippines with small handheld finger-bladed knives that likely resemble the very first harvest knives created (Movilon and Schlosser, 1999) (Figure 1). A small metal blade is fitted crosswise into a short piece of wood and the harvester holds the tool with the blade running transverse across the palm, fingers bent around the rice stalk beneath the panicle, and draws the stalk in toward the blade, severing the panicle from the rest of the rice plant (Figure 2). Types of plants used for the handle range widely, from bamboo to hard woods such as mahogany. If metal for a blade was unavailable, farmers in the Philippines were reported to use the sharp edge from the shell of a bivalve mussel, which could often be found in the irrigated rice fields (Jagor, 1875). The knives are called by various names throughout the Philippines due to the different languages and dialects spoken. For example, the finger knife is called '*rakem'* in Ilokano, '*rakam*' in Isneg, '*lakom*' in Kalinga', and '*lakem*' in Bontoc and Lepanto Kankanay (Reid, 1991).

Movilon and Schlosser (1999) describe differences among traditional rice harvest knives most commonly used in the Philippines: the finger or transverse-bladed knife and the sickle. The sickle is a well-balanced tool with either a smooth or serrated blade shaped like a hook, which fits into a handle. Typically, the harvester will gather the rice stalks in a bundle in one hand and uses the other hand to cut the stalks close to the ground (Movilon and Schlosser, 1999). The time-saving benefits during rice harvest of a sickle over a finger-bladed knife is readily apparent. In the province of Nueva Ecija, Ilocano farmers continued

for a time to harvest using the finger knife (*rakem* or *yatab*), while Tagalog farmers had long before become acculturated to harvesting rice using a sickle (*lincao or palot*). Here, the *rakem* was shown to require almost five times the number of hours per plot to harvest rice as the *lincao* (Villafria 2015; McLennan 1980: p. 256). In another report, the finger bladed knife took approximately 240-250 hours to harvest a hectare of rice, compared to only 80-160 hours per hectare when a sickle was used (Movilon and Schlosser, 1999). Sickles have the capacity to cut multiple stalks of rice at one time, whereas a finger knife is typically used on only one to two stalks at a time. This greatly increases the speed of harvesting when using the sickle.

Why would people choose to harvest with the finger knife if the sickle were available and a much faster tool for harvest? Why has the finger knife survived despite superior technology? Two interconnected theories, based on situational practicality and social organization and established cultural roles, provide compelling reasons for the continued use of the finger knife. The first theory suggests that while practically speaking, small knives are very labor-intensive, they are useful, and optimally suited for, certain situations (e.g. the harvest of one panicle at a time). The finger knife is superior to the sickle in harvesting individual panicles in an area where the rice has ripened unevenly. Taller, traditional varieties frequently found in the upland regions of Ifugao are better suited to harvesting with small hand-held knives (Movilon and Schlosser, 1999). In Nueva Ecija, Philippines, the use of the finger knife reduced shattering during harvest, thus conserving the greatest number of grains from the panicle, while almost eliminating the collection of extraneous weeds (Villafria 2015; McLennan 1980: p. 256). The sickle is not as nimble, and weeds are often gathered up in the rice sheaves. Another practical benefit of

the finger knife is its potential to salvage a rice crop that has lodged due to strong winds or heavy rains. The smaller sized bundles resulting from finger knife harvest allows for easier transport from field to storage facility, needs simply to be hung or flipped over to dry, and often does not require threshing until the rice is ready to be consumed due to the space saving size of the bundles. One bundle is often sized to meet the need for one family meal. While in storage, the bundles provide additional aeration to keep the rice seed from mold, sprouting, or spoilage (Movilon and Schlosser, 1999).

The second common theory, often intertwined with practical issues detailed in the first theory regarding the use of finger knives rather than sickles, is due to the connection between traditional harvesting systems and moral principles associated with community employment and income sharing. Miles (1979) argues that though the finger knife has no sacred significance among the Yao people of Thailand, it is critical because it promotes employment opportunities. Similarly, in Indonesia, the *bawan* harvesting system encourages farmers to open up their fields and invite villagers willing to participate in the harvest using traditional transverse-bladed knives (*ani-ani*). At the end of each day, payment is given on a percentage basis to each of the harvesters, resulting in a significant source of income and food to the rural and landless poor (Movilon and Schlosser, 1999). The Balinese painter Nyoman Meja depicts the use of the *ani-ani* in a social setting (Figure 5).

When sickles replaced the centuries-old, traditional *ani-ani* knives on the Indonesian island of Java, rice production increased; however, so did poverty and malnutrition, primarily among women and children (Collier et al. 1973; Kikuchi et al. 1979). It was suggested that the *ani-ani* was more than simply a tool for harvesting rice;

because it was time-consuming and labor intensive compared to the sickle, it also served as a tool for a more village-wide, equitable distribution of rice (Collier et al. 1973; Kikuchi et al. 1979). Larger farmers relied on landless villagers for harvest, thus providing them with a seasonal income, a share of the harvest, and a means of livelihood. With the introduction of the sickle, entrepreneurial harvest teams went from village to village to quickly perform the work that previously had been the responsibility of the landless poor. The rearrangement of social interactions that accompanied the change in harvesting technology from the *ani-ani* to the sickle strained formerly cordial social interactions and encouraged political unrest and the widening of the gap between the wealthy and the poor (Collier et al. 1973; Kikuchi et al. 1979).

Farmers in the Yao village of Pulangka in the mountains of north Thailand use the finger knife rather than the sickle to cut rice because it allows them to harvest during the wet weather of months that coincide with two of the less labor-intensive phases of opium production: seed broadcasting and primary weeding (Miles 1979: 231). Rice panicles on plants of traditional landraces varieties often mature at different rates allowing for successive harvests on the same plant. The finger knife is ideal for cutting individual ripe panicles, allowing for careful and multiple harvests beginning at an earlier date than the rice could otherwise be cut with a sickle. The use of the finger knife enables the harvesters to reap the mature rice panicles from any given stand, while leaving the immature panicles behind. The Melaban Kantuˊ in West Kalimantan, Indonesia, like other Ibanic groups, make a small early harvest (*nyuma*) of the earliest maturing panicles, followed by a second and third harvest (Dove 1980).

Finger knives may also be ideal for cutting rice panicles in fields overcome with weeds. Another reason the Pulangka use the finger knife is due to their farming system which places a considerably lower priority on weeding than neighboring groups like the Karen, who devote approximately 1000 person hours per hectare to weeding (Hinton 1975: 111, 168). The Karen are able cut their rice with sickles because they harvest in relatively weed-free conditions (Hinton 1975). The Pulangka, on the other hand, utilize the finger knife to cut rice in weedy fields, selecting this approach over a thorough weeding during earlier months; Miles (1979) states that this is not possible with the use of the sickle. Dove (1980) disagrees, stating that in his research with the Iban, they often harvest rice stalks and weeds together with a sickle, and then remove the weeds along with the chaff in their standard threshing and winnowing operations.

Ritual, Rice Varieties and the Finger Knife in the Ifugao Cultural System

Cultivation of *tinawon* landrace varieties is central to Ifugao social life and ritual practice; they are optimally adapted to local, high-altitude Cordilleran conditions, wet-farming systems and annual farming cycles (Acabado and Martin, 2015: 283-284). For the Ifugao, a woman of prestige in the village ritually sows the first seeds of the planting season in her seedbed, after which she will confine herself to her house to fast for a day to mark the beginning of the rice planting season (Khor and Lin, 2002; Carating and Tejada, 2012).

Tinawon varieties have co-evolved around the yearly farming cycles and are indelibly linked to the extensive rituals of the Ifugao, which revolve around terraced farming systems. Because introduced, modern high-yielding varieties (HYV) were selected in centralized breeding research centers in the lowlands of the Philippines, commercial rice

does not follow the same cycle as the *tinawon* varieties. The increasing use has disrupted both the ritual and ecological facets of Ifugao society (Acabado and Martin, 2015: 283-284). Because the HYV varieties have a markedly different growth cycle and growth habit, the importance of ritual has diminished, and belief systems that were based on the local, culturally selected *tinawon* varieties are increasingly disregarded. For example, the fallow period that comes after the harvest season and lasts for several months depending on local cultural norms, is no longer a common agronomic practice. This is due to the shorter growing season of the HYVs, which many farmers utilize to plant a second crop. Without time for the soil to replenish itself, the consecutive and rapid cycling of rice has depleted soil nutrients after several years resulting low harvest yields (Acabado & Martin, 2015, 283-284).

The influx of higher yielding rice varieties negatively impacted Ifugao terrace ecology due to their reliance on synthetic fertilizers and pesticides. Mollusks, shellfish and fish that traditionally enhanced the Ifugao diet have largely been wiped out in the terraces due to toxicity caused by industrial chemicals (Acabado & Martin, 2015: 284). The new rice varieties do not require year-round inundation, the absence of which has led to an increase in abundance of *Polypheretima elongata*, a large earthworm whose tunnels weaken the terrace walls (Araral, 2013).

Harvesting comes at the end of the dry season and as harvest time approaches, the elders place a taboo sign in the middle of the village and announce a period of rest to demonstrate respect for the soil and the rice plants. Seed selection is often the first harvest performed, typically by women. Once harvest begins, both men and women use the finger knife, “the indigenous harvesting knife made of steel mounted perpendicular to a wooden

frame" (Carating and Tejada, 2012). The role of women as 'seed selectors' reflects on the high status of women in the society (Khor and Lin, 2002; Carating and Tejada, 2012). The vital role of the elder female famers has lessened considerably with the introduction of commercial rice varieties, typically harvested with a sickle, as their extensive knowledge of traditional Ifugao *tinawon* varieties is no longer valued by the community (Acabado and Martin, 2015). This has also negatively impacted the role of elder women in their traditional roles of seed selectors in the Ifugao.

Role of Ritual in the Use of Finger Knives across Southeast Asia

One of the earliest written accounts of the finger knife (Raffles 1817 1:112) suggests that its use in Java as "a grateful acknowledgement for an abundant harvest" originated in ancient times and that farmers were reluctant to harvest rice with other tools. If this tribute ceased to occur, it was commonly believed that the particular rice field would no longer continue to yield the farmer an abundant harvest (Raffles 1817 1:112). The tribute in this case is the arduousness of severing "each separate ear along with a few inches of straw" using the finger knife, even though other Javanese knives and reaping hooks available and in use at the time would be faster and more efficient (Miles 1979:227; Raffles 1817 1:112).

According to Skeat (1900: 58), the Malays adhere to the practice of using the finger knife out of "piety," so that the "soul of the rice not being disturbed thereby." Wilkinson (1932 1: 604) states that the "wooden framework is held in the hand so as to hide the blade…. The underlying idea is that the rice grains shall not see the knife and that their vitality (*semangat*) shall not suffer through fright."

Woensdregt's (1928) references to the use of the instrument among the ToBada' of the Celebes stress that the knife "must not be transferred from one hand to the other because the soul of the rice might then shift to someone else's field." By dropping the tool a harvester may cause "the soul of the rice to take fright and there will be a small harvest." The same author's statements about the decoration of the implement typify many observations concerning the supernatural significance of the device's shape and ornamentation. Additionally, Freeman reports:

> "reaping a farm is a slow and protracted operation, for each panicle is plucked separately by hand….There can be little doubt that the reaping rate would be accelerated if sickles were used…but such a method is ruled out because of the reverential attitude with the Iban adopt towards their *padi*. In reaping with the ketap, the padi is taken as it were, unawares and with a minimum of shock or disturbance, and it is believed that if more drastic and unceremonious methods were introduced, the padii spirit would be likely to flee to other farms, and that as a result, the crop would be a poor one (Freeman 1970: 206-208).

Among the Ifugao, the tradition of using finger-bladed knives is deeply intertwined with the spiritual belief of a rice deity (Figure 6). Rice gods (or *bul-ul*) are believed to be offended by harsh treatments of the rice plants, including through the use of a sickle, considered to be rough and alarming. If a sickle is used, Ifugao tradition holds that the following season's crops will witness the displeasure of the *bul-ul* (Movilon and Schlosser, 1999). When the finger knife is quietly used, the rice plant does not become distressed by the approach of the harvesters, thus allowing for a painless and inconspicuous harvest before the rice plant know what is coming. As follows, farmers often would carve the knives to resemble birds, which the plants recognize and think that are simply coming to feed (Figures 3 & 4). It is customary for harvesters to approach the rice plants quietly, whispering in tones and codes undecipherable by the rice spirits, and careful not to cast

warning shadows as they harvest (Movilon and Schlosser, 1999). Woensdregt (1928) suggests that the ToBada' people of the Celebes carve the knife with horse and bird motifs "so that the harvest will proceed as swiftly as a horse may run and a bird may fly." The shape and ornamentation of decorative finger-knife implements signifies the supernatural element of rice harvest culture and belief. Another slight variation along the same theme points to the idea that the setting of the small knife itself represents a bird (Fischer 1937: 94; Miles 1979: 227), and that the rice plant spirits do not do not mind harvest from birds but do in fact "resent the brutal use of a large knife" (Grist 1936: 125).

In an instructive rice harvest-based Javanese myth, the gods Dewi Sri and Visnu incarnate themselves as birds to teach people that rice must be harvested in the same manner as birds peck at the crop (Van Dapperen 1931: 273). Van Dapperen maintains that the finger knife has survived in Java because of this long-held respect for this rice harvest ritual since the first influence of Hinduism on the Javanese, approximately 2700 years B.P. Deviations from the bird motif have been reported among the Sarawak, whose finger knives include a brace that takes the form of a dragon (*naga*) (Roth 1896: 409), a central symbol of Bornean theologies (Miles 1976:84; Miles 1979: 227-8).

Role of the Finger Knife in Seed Selection

Here I suggest an alternate theory: a *primary* reason for the historical and continued use of the finger knife is for seed selection through a centuries old tradition of plant breeding. Though I accept the accuracy of the practical and community-based, socio-cultural reasons for the use of the finger knife put forth by other authors, I suggest that seed selection and genetic improvement was *the driving factor* in the use of the finger knife. Indeed, intricate planting and harvesting rituals, which both ensured and encouraged

varietal conservation and improvement, co-evolved with the use of the finger knife as the primary harvest tool due to its unique ability to aid the farmer in the art and science of seed selection. Even in modern, highly technological plant breeding programs around the world today, the "art" of selection, based on the breeder's intuition and experience, is considered vitally important to the release of new varieties; plant breeding is commonly defined as the art and science of improving traits and varieties of agricultural importance (Brouwer et al., 2016; Zamir, 2001; 2013).

Utilizing relatively high levels of crop and varietal diversity have shown that farmers logically and rationally exploit genetic diversity to allow crops to adapt to different environmental and cultural conditions, thereby decreasing risk, improving pest management, and providing for more stable yields and a varied diet (Bellon 1996; Benin et al., 2004; Brush et al., 1992; Brush and Meng, 1998; Rana et al., 2007; Rhodes and Nazarea, 1998; van Dusen and Taylor, 2005). Ethnoecological research also has shown that cultural values, memories and principles influence farmers' decisions on what to grow (Nazarea 1998, 2005, 2006; Rhoades and Nazarea 1998). This extends to decision-making regarding the selection, utilization and maintenance of traditional landraces over a long period of time, whereby farmers incorporate cultural traditions and practices that allow for the maintenance and continued improvement of food varieties (Brush, 1992; Nazarea, 1998; Tsegave and Berg, 2007). In addition, the development and use of site-specific tools and locally adapted agricultural systems have been used in traditional farming communities worldwide to repel pests, protect habitat, and conserve soil and water resources (Altieri et al. 1987; Altieri 2004; Berkes et al. 2000).

Skarbø (2014) showed that in the highlands of Ecuador, the farmers who ate a higher proportion of traditional foods, spoke more Kichwa than Spanish in intra-family communication, and wore the traditional dress had higher levels of agro-biodiversity, including intraspecific diversity, on their farms. In particular, farmers who consumed more traditional foods were more likely to grow more total varieties and landraces of maize, tubers, fruit crops, beans, vegetables and herbs, indicating that the use of local food traditions plays an important role in the fate of the rich crop diversity of the region (Skarbø, 2014). Furthermore, households in the study that preferred a diet with a high percentage of traditional foods also tend to grow the majority of these traditional foods rather than relying on the market. This suggests that maintenance of, and appreciation for, their cultural and agricultural heritage results in a stronger commitment to the cultivation and conservation of genetic and agro-biodiversity in their region (Skarbø 2014).

Use of the finger knife is critical to the selection of each year's seed-rice. The individual harvesting of rice panicles using traditional and/or indigenous cultural practices has played a role in the development of the diversity of traditional rice varieties. The harvest of individual panicles allows the farmer/seed-selector to carefully select plants with desirable qualities and use this seed as the seed for the following season (Movilon and Schlosser 1999). Desirable characteristics will differ based on the regional microclimates, dominant diseases and pests, the most relevant agronomic, and seed quality properties. These could include such traits as resistance to disease or insect pests, plant height, panicle structure, degree of lodging number and number of fertile tillers, seed size and color, overall plant vigor and perceived grain yield. Ethnogastronomic seed quality traits such as taste, texture, cooking time, or stickiness of the rice (Nazarea-Sandoval 1991) when cooked

would be more difficult to differentiate at this time, but will be critical post-harvest selection criteria.

In the Philippines, the terms *penar* or *penal* from the Proto Nuclear Cordilleran dialect mean 'rice grain used for seed.' This term is used specifically for rice seed that is sown in a seed bed from which seedlings will be transplanted into a pondfield (Reid, 1991). Estimates suggest that over 500 varieties of rice are adapted to the higher altitude (500 to 1600 m.a.s.l.), wet paddy, flooded farming system employed by the Ifugao (Nozawa et al. 2008: p. 71). The Kantuˀ in West Kalimantan, Indonesia do not randomly select any portion of the harvest for use as seed in the following year's swiddens. Rather, they select their seed-rice during a special phase of the harvest (*ngami'benih*), each panicle being selected individually by the harvester for its visible, desirable characteristics (Dove 1980).

Cooperation among Ifugao farmers is important because the organization of community labor and swidden field, rice terrace, and forest management is critical in order to minimize conflict from unequal access to natural resources like water. Ifugao cultural practices of inheritance rules designed to ensure the continuity of property ownership of the household and conflict resolutions that typically involve property claims, marriages and distribution of meat which illustrate that relationships are not bound to fixed territories all suggest that the Ifugao social organization is explained by the concept of the "house society" (Acabado 2010: 208). As such, the traditional agricultural practices in Ifugao have an organizing principle. For example, the village ritual head (*tomona*) coordinates certain agricultural activities in ways to increase rice productivity, control water use, manage available labor which provide continuity to the village, or "house" (Acabado 2010: 210). The *tomana* owns a central plot (*puntunagan*) which is traditionally the first to be planted

or harvested, and which serves as a signal to other villagers that they can begin planting or harvesting (Conklin 1980: 110). To put this practice into a more global context, at least within the region of Southeast Asia, we can look to the rituals and traditions associated with seed selection among the Baduy of West Java, Indonesia.

The Baduy people of the highlands of West Java still primarily grow traditional varieties of rice, despite an influx of high yielding varieties into the country. These rice varieties have been actively selected to match the varying local micro-environmental conditions, including a ecotypic diversity of soil type and fertility, exposure to sunlight, and water availability (Iskandar and Ellen 1999). Interestingly, most rice consumed as food by the Baduy are high yielding varieties purchased in the lowland markets; the local landrace varieties are produced and maintained primarily for ritualist purposes involving their traditional swidden system (Iskandar and Ellen 1999). The Baduy women, accompanied by their husbands, carefully conduct selection for superior rice genotypes within each of the approximately 89 local landraces that are grown each year; this special process is called *dipasing*. After *dipasing* occurs, homogeneous bundles of panicles from each variety are selected, marked, and hung to dry on a bamboo pole (Skandar and Ellen 1999).

A similar ritual found among the Baduy in West Java occurs just prior to planting, when the male head of a household prepares the *pungpuhunan* (the sacred place in the center of a swidden field). Two seeds of sacred rice, called the 'rice mother', are sown in the middle of the *pungpuhunan* (Iskandar and Ellen 1999), after which seven holes are planted with one landrace variety of sacred rice (*57-pare koneng*) inside the *pungpuhunan* and seven holes are planted with a different landrace variety of sacred rice (*53-pare ketan*

siang) outside the *pungpuhunan*. A minimum of five sacred landraces are planted and kept separate by the planting of other non-sacred landraces (Figure 7) (Iskandar and Ellen 1999). This has the practical purpose of preventing cross-pollination or accidental mixing of the sacred landraces, thereby ensuring its purity. Outcrossing in rice ranges from 1 to 2% in the domesticated, autogamous species *O. sativa* and from 7 to 56% in *O. rufipogon*, the wild ancestor to *O. sativa* (Oka 1998; Gao et al. 2007), depending on floral characteristics, including stigma length, anther length and percent of exerted stigma (Virmani and Athwal 1974).

CHAPTER 3: CONCLUSIONS

One of the primary reasons proposed for the extent of traditional rice diversity lies in the use of the finger knife. Grist (1953: 59-60; c.f. Grist 1986: 167-8) and others suggest that an implement that cuts panicles individually allows the harvester and seed-selectors to notice and exploit variation. This heterogeneity in a rice field may include variation for traits such as plant height, panicle length, density or weight, straw strength, number and vigor of secondary fertile tillers, color in the leaves, straw and panicle, seed size and color, overall plant vigor and perceived grain yield, and resistance to disease or insect pests. In areas of wet-rice cultivation where sickles replaced finger knives, harvest proceeds more rapidly, thus diminishing the ability of the farmer to conduct selection, whether it be positive (taking seed from superior rice plants) or negative (removal of inferior plants from the harvested population). This can result in a loss of homogeneity and a slow decrease in the overall fitness of the rice population, often resulting in random and unselected mixed stands which produce lower yields (Iskandar and Ellen, 1999).

Several theories have been put forth to explain the seemingly unwarranted rejection of the superior technology found in the sickle compared to the finger knife. These theories, which include community-based social organization ideas and practical motives for the continued use of the finger knife, are completely valid and explain some of the reasons why finger knives were used for so long after the introduction of the sickle. However, I suggest that the most important reason that the finger knife remained in use for so long was due to the centuries-long co-evolution between the finger knife harvesting tool used by farmers

and seed selectors and the planting and harvesting rituals which ensured both the conservation and the continual improvement of rice varieties.

I reached these conclusions using components of the six essential aspects central to interpretative archaeology (Hodder, 1991). The first aspect, which requires that the interpreter takes responsibility of his or her interpretations, is critical to the foundation of this thesis. My argument is based on the linkage between my observations, extensive research and history working firstly as a farmer and seed grower, and secondly as a plant breeder working on wheat, a cereal crop with many similarities to rice. This background perspective certainly colored the lens through which I attempted to understand the complex history and modern usage of the finger knife. The second aspect of interpretative archaeology is rooted in the idea that social practices have to do with the making sense of the meanings of the object in question. Indeed, social practices are deeply embedded in the development and use of the finger knife. This can be seen in the many forms the finger knives take, from spare and utilitarian to ornately bird-shaped carvings or handles that represent *bulul*, the rice god.

Within this thesis, I provided previously proposed alternate theories, all of which I consider accurate to a point. This brings up the third aspect of interpretive archaeology; that which suggest that interpretation is an ongoing process and there is no final and definitive account of the past. My interpretation of the history and use of the finger knife differs significantly from past accounts. However, these previous theories were informative in the construction and development of my hypothesis. Hence, the emphasis that interpretation is multi-vocal, where different interpretations are possible. This is the fourth component of interpretative archaeology as described by Hodder. Different interpretations are certainly

probable for the complex association between ritual, social practices, and the biological underpinnings that ensure the successful conservation and improvement of traditional rice varieties.

To this point, archaeological interpretations then are likely to be suited to different purposes, needs and desires of the interpreter (the fifth aspect of interpretive archaeology). I believe this is common practice as we objectively attempt to find the true meaning of objects and actions. It can be difficult to remove our personal perspective, past training, and current expertise from the object of study. Perhaps here it is important that anthropologists using interpretative archaeology methodology should be as forthcoming as possible regarding their background and potential bias that might color their research. This leads to the sixth and final aspect of interpretative archaeology, which suggests that interpretation is creative, and requires attention and response to the interests and needs of people who have or express interests in the material past. This creativity is essential to the novel interpretations. As my thought process slowly coalesced, I imagined many possible uses for the finger knife, and researched ritual and religious practices of the Ifugao and other peoples of Southeast Asia that might inform the social context into which finger knives fit. In this thesis, I have attempted to utilize each of the six aspects of interpretative archaeology as described by Hodder to fully explore the linkage of ritual, seed selection and historical usage of the finger knife to develop the theory that this tool was expertly crafted and utilized as a rice breeding implement that furthered the conservation of unique varieties of rice while simultaneously encouraging the further development of unique and optimally adapted rice varieties.

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Figure 1. Photos illustrating variation in blade and handle shape of finger knives collected by Dr. Harold Conklin in the Philippines. Accession #'s and general information are as follows: **a** 241693; handle 25.5 cm, collected from Uma, Lubuagan kalinga-Apayao Province; **b**, **f**, **g** 261091; handle 19 cm, blade 11 cm, collected from Bayninan, Ifugao; **c** 241618; handle 19 cm, collected from Butbut, Kalinga Subprovince, Kalinga-Apayao Province; **d** 261085; handle 19.5 cm, blade 10.5 cm, collected from Bayninan, Ifugao; **e** 261097; handle 20 cm, blade 10.5 cm, collected from Bayninan, Ifugao; **h** 261087; handle 19.5 cm, blade 13 cm, collected from Bayninan, Ifugao; **i** 261090; handle 17 cm, blade 12 cm, collected from Bayninan, Ifugao. Photos: Kevin Murphy.

Figure 2. Illustration of the proper grip and use of finger knife. Credit: North Illinois University. From: www.seasite.niu.edu

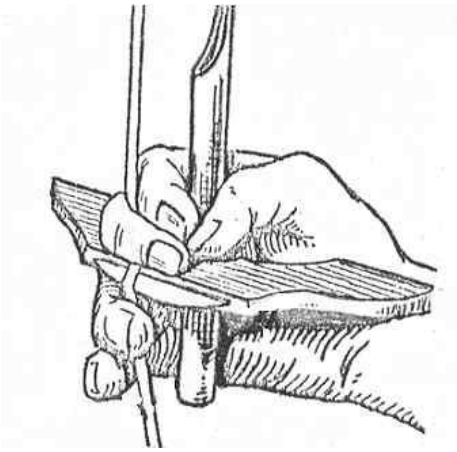


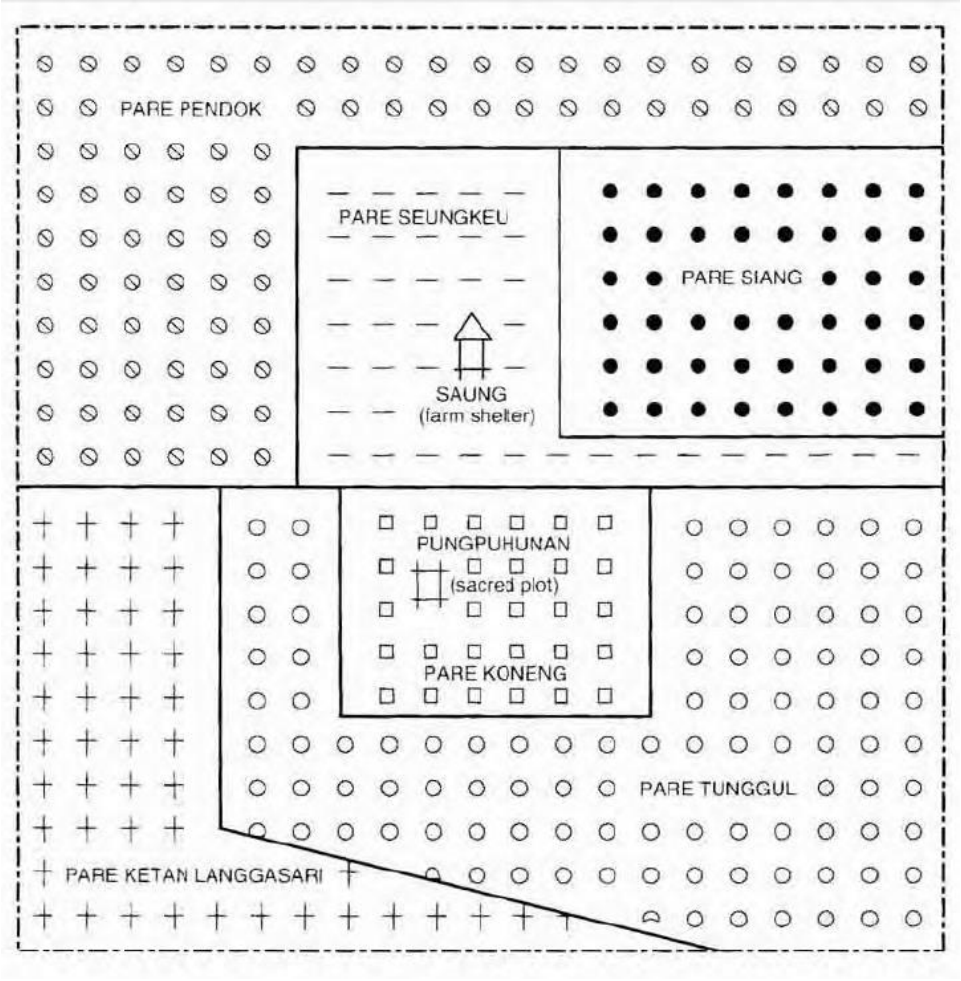
Figure 3. Finger knife with wooden handle carved in the shape of a bird. Collected from Tasek Bera, Pahang, Malasia. Accession #260102, Yale University. Photos: Kevin Murphy. The photos were taken with permission from the MET university.

Figure 4. Finger knife with the metal blade cut in the shape of a bird. Collected by Dr. Harold Conklin in Butbut, Kalinga Subprovince, Kalinga-Apayao Province. Accession #241619, Yale University. Photos: Kevin Murphy. The photos were taken with permission from the MET university.

Figure 5. Painting by Nyoman Meja of Ubud, Bali, Indonesia, called *Harvesting Rice* (c. 1990), which shows the use of the finger knife (*ani-ani*). Photo: Eugene Gorny.

Figure 6. Rice Gods Carved into the Ifugao finger knife. Source: The Metropolitan Museum of Art. Date: late 19th–early 20th century Geography: Philippines Culture: Luzon Island Credit: Bequest of John B. Elliott, 1997 Accession Number: 1999.47.54. Photos: Leonardo Hinojosa.

Figure 7. Among the Baduy of West Java, Indonesia, a minimum of five sacred landraces are planted and kept separate by the planting of other non-sacred landraces (from Iskandar and Ellen 1999).



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I would like to request permission to use and include my paper that was published in the Journal of Ethnobiology and Ethnomedicine in 2017, as a component of my MA thesis with the University of Idaho, USA. The citation of my paper is as follows:

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Citation: Journal of Ethnobiology and Ethnomedicine 2017 13:3
Published on: 13 January 2017

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Thank you very much for your time.

Kind regards,
Kevin Murphy