

# JAMA MAPUN ETHNOECOLOGY: ECONOMIC AND SYMBOLIC (OF GRAINS, WINDS, AND STARS)

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## Introduction

IF HUMAN ECOLOGY IS THE STUDY OF THE RELATION OF human populations and their natural environment, the assumption is that neither society nor environment can be completely understood outside the concrete interlocking achieved by a particular society with a particular environment. Geertz, in his *Agricultural Involution: The Process of Ecological Change in Indonesia* (1963), pointed out the peculiar emptiness of those questions which approached the problem of man-environment relations by assuming either one as an independent, active variable and the other as a mere dependent, passive function. To inquire if and how man affects his environment is as vague as asking if and how environment affects man. In the empirical order each variable limits, conditions, and shapes the other in a mutual, dialectic fashion. A more realistic approach is to study a particular society in a particular environment and to consider both simultaneously as forming an ongoing concrete, space-time system—an ecosystem governed by its own intrinsic mechanics and having its own peculiar structure to be discovered through cultural and ecological analysis.

This realistic approach to human ecology is what we propose to use in this paper. Our aim is to show two successive, somewhat overlapping, forms of interlocking between society and environment by studying a particular changing population in a particular evolving environment: the Jama Mapun in the island of Kagayan Sulu as seen through space-time. We will attempt to show how Jama Mapun economics and symbolic images and themes are better understood by seeing them as holistically embedded in and culturally tied up with their total surrounding, the environmental pattern composed of land, sea, plants, animals, winds, currents, and stars.

The data and insights we will be using here are based on a nine-month fieldwork among the Jama Mapun, the first three months in 1963 when we did the pilot study of the group, and the other six in 1966 when we did our main ethnoecological study.<sup>1</sup> The present paper is only a working,

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preliminary formulation of one major aspect of our study, work on which is still going on. Hence comments on the paper will be welcome.

### The Jama Mapun in Kagayan

The Jama Mapun ethno-linguistic group is not limited to the island of Kagayan alone. Many of them are found in Southern Palawan, parts of coastal North Borneo, and in many small islands and islets in-between, for instance, in Turtle Islands (Taganak, Bagu:an, Bo:an,<sup>2</sup> Leheman, Sibaung, and Great Bakungan). In the 1960 Census the population of Kagayan was given as 10,789, about 10,000 of which may be considered "pure" Jama Mapun. Our estimate of the total Jama Mapun population, as found in Kagayan, Palawan, Borneo, and the intervening islands, is in the neighborhood of 20 to 25 thousand. Anthropologists have included the Jama Mapun among the nine Muslim Filipino groups in the Southern Philippines.

From linguistic and cultural evidences, the Jama Mapun constitute a major branch of the generic Samal peoples in the Sulu archipelago, which include the so-called Bajaos. One current theory is that the land-dwelling Samals started off as sea-nomads like the Bajaos, and indeed that both the Samals and the Bajaos evolved from the same, basic protoculture. In Jolo the Jama Mapun are commonly called Samal Kagayan.

Our study of the two types of Jama Mapun ecosystems is limited to the population inhabiting the island of Kagayan.<sup>3</sup> The unusual geographical and environmental conditions of this island make it an interesting subject and setting for ecological studies. Unlike Pangutaran island to the southeast which is a low, coralline, atoll-like island, Kagayan is a high island with unmistakable mountain profiles when seen from a distance. From the air it has a roughly triangular shape with an estimated area of 70 square kilometers of rich volcanic and alluvial soils. The volcanic past of Kagayan is in evidence from a rich variety of volcanic cones, two volcanic lakes, and one natural lake. Botanists and zoologists suggest that the island's flora and fauna resemble more those found in mainland Borneo than those in Northern Philippines. For instance, the *landak* (porcupine) found in Palawan and Borneo is also found in Kagayan. Geologically, too, there is evidence that the island, during the land-bridge times, was once part of the Bornean landmass. The sea between Kagayan and Borneo is quite shallow with depths averaging only 50 fathoms, in contrast to the sea northeast of Kagayan where depths quickly drop down to 200-fathom level and beyond.

Nearer to North Borneo than to either Jolo, Palawan or Zamboanga, Kagayan has strong ethnic-historical and economic ties with the older human communities in coastal North Borneo. Kagayan is 400 km. directly west of

<sup>2</sup> Glottal-stops throughout this paper are represented by the colon (:).

<sup>3</sup> There are fifteen different spellings given in the Blair & Robertson Index. We follow the Philippine Census spelling.

Zamboanga City; 300 km. west northwest of Jolo; 120 km. north, northeast of Sandakan; and 220 km. southeast of Balabac. From Manila, Kagayan would be approximately 850 km. On the map, the island appears as a microscopic blob at the southwestern rim of the Sulu Sea basin.

By motorized *kumpit* from Kagayan it takes nearly 36 hours to Zamboanga, 24 hours to Jolo, 22 hours to Palawan, but a mere 8 to 10 hours to Sandakan.

### Some Theoretical Considerations

Ecology, in its most generic sense, is defined as the study of the relation of organisms to their environment (Odum 1959:4). Human ecology is the study of a particular case of this relation, that between human organisms or populations and the natural environment. C. Daryll Forde's *Habitat, Economy and Society* and other studies in human geography fall within the general rubric of human ecology.

Although ecology as a science may be young—the term “oecology” was introduced by Haeckel in 1869—interest in the interrelation of man and his environment is as old as man himself, for human survival depended, as it still does, on his ability to know, understand, interpret, and utilize his environment. In fact all primitive societies have their own body of knowledge regarding the nature and uses of environmental resources. Such “native ecology” is what is commonly known as ethnoecology. The interest in ethnoecology has been mainly initiated in anthropology, for anthropologists realize that to understand a particular society and culture they have to learn the ways of that people. And people's ways include their local way of categorizing and valuating environmental components and their interrelationship (Conklin 1961:27).

Thus it will be helpful to distinguish between human ecology and ethnoecology. Human ecology stresses the interlocking of society and environment as objectively seen by an observer using scientific categories, notions, and measurements. Ethnoecology studies that same interlocking as subjectively seen and structured by the values and categories immanent in the culture of the human population being studied.

### Ecology and the Economic Sphere

To show the relation of ecology to the economy of a society is not difficult. For the economy or the food-quest is by definition the exploitation of the natural environment for the satisfaction of the material needs of society. Indeed the convergent developments in disciplinary geography and economics after the Second World War have only reemphasized the logically complementary natures of ecology and economics. The total involvement of society with the natural physical environment is one of the self-evident truths

in the natural and social sciences. Geographer Ginsburg (1960:5) expressed this universal phenomenon:

All peoples, whatever their race, culture, or history, wish to procure food, clothing, shelter (housing and fuel), and medical supplies to assure against discomfort, physical disability, and premature loss of life. . . . Further, in all cultures, however "primitive," it is necessary to produce or procure a variety of implements, tools, and plant equipment; and at any level above that of hunting and gathering, it is necessary to invest labor in clearing land and preparing it for cultivation.

And in the Jama Mapun case it is not difficult to show how the development of the economy is best understood in the light of the conditions operative in the physical environment, i.e. the island and marine ecology. We will show that the introduction of the coconut as a commercial plant or cash crop and the development of the motorized *kumpit* as a technological innovation in the sea-trade have so affected the traditional man-environment relation in Kagayan that a new configuration in the social and economic organization is clearly discernible—an emergent ecosystem. Social change among the islanders appears, from the ecological point of view, as really a shift in the ecosystem. This shift will be illustrated by showing the contrast between the older ecosystem typified by the *huma* (multicrop, subsistence farming) and the new ecosystem typified by the *kabbun niyug* (monocrop, exchange or market economy involving copra production).

### Ecology and the Symbolic Sphere

To show the relation of ecology to the symbolic life and the perceptual order of a society seems somewhat more difficult and perhaps unusual. The ecological framework and its special concepts, e.g. biomass, successions, climaxes, ecological niches, and energy relations do not readily appear germane to the framework and language of psychology, e.g. projections, contents, forms, and associations. Thus it may be necessary to suggest in some detail one manner in which the link-up may be done.

Researches in the theory of knowledge, psychoanalysis, social psychology, linguistics, and folklore all seem to converge towards a common hypothesis of symbols, concepts, and ideas. In the theory of knowledge the image has been traditionally regarded as a reflection or a construct from concrete reality (Lonergan 1958). Free association and the analysis of dreams in the psychoanalytic tradition assume that mental images and cognitive patterns are the results of past experiences and conditionings in one's social and natural milieu. A group of social psychologists (Krech *et al* 1962:18) asserts that: "How an individual conceives the world is dependent, first of all, upon the nature of the physical and social environments in which he is immersed." Linguistic theory in its analysis of content words and grammatical categories is generally based on the assumption that such words and

structures mean or point to particular objects or processes in one's culture and environment (Sapir 1949:102). And the analysis of folklore, of myths and place-names, seeks to throw light on society and culture by associating the images and themes to real life situations in the past (Jocano 1965).

Using a similar working assumption common in the above disciplines, we will analyze a number of Jama Mapun symbols and folktales. We hope to show that their inherent images and themes and associations are reflections or symbolic correlates of the people's way of life, specially of their food-quest. We will regard images and themes as diagnostic for understanding the people's culture and environment. Thus by associating symbolic projections with the underlying economic preoccupations we hope to provide the needed link between ecology and the symbolic.<sup>4</sup>

Stated more clearly, our hypothesis is that the environment through the economy is reflected in the symbolic sphere of a people's culture.

In our case study of the Jama Mapun we will show that the traditional ecosystem represented by the *buma* economy has its corresponding reflections in the symbolic sphere of the Jama Mapun culture. The relative absence of images and themes corresponding to the new *kabbun* economy does not argue towards the weakening of our hypothesis, but rather suggests a time lag between the emergence of a new economic pattern and the registration or distillation of this pattern in the symbolic elements of the culture. Indeed this time lag assumes a crucial pragmatic importance, for its presence enables us to reconstruct to some extent the older ecosystem through its manifestations lingering, like an after-image, in the symbolic sphere.

The term "environment," which up to now we have been throwing around without formal definition, certainly needs some clarification. Admittedly the concept is one of those abstract, protean ideas, like the philosophical "being," which is polymorphic. Through its variety of meanings and consequent vagueness it has built-in semantic traps to the uncritical.

One meaning of "environment" is given by Conklin (1961:27). Using a scientific ecological framework, he divides environmental components and their interrelations into three sets: climatic (moisture, temperature, air movement, and sunlight); edaphic (soil conditions, fertility, porosity, texture, relief, and drainage); and biotic (floral and faunal components of the habitat). He notes that climatic factors are the least amenable to control. We will be operating within this meaning of "environment" in our analysis of the ecological success of the coconut palm in Kagayan, and partly in the analysis of the *buma* as an adjustment to the rain cycle.

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<sup>4</sup> We do not wish to suggest a strictly Marxian interpretation of this problem, i.e. that the material substructure determines the ideological level, for an opposite downward determination is also possible. We adhere to a view that allows mutual feed-back.

However, there is another way of regarding environment, a mode which is more analytical and potentially more culture-bound and value-laden. Wagner suggests that "environment" be regarded not as a "great enveloping complex thing—as earlier geographers imagined," but as a *way of thinking* about certain things in relation to human events. "An environment is only an environment in relation to something that it environs, and is significant insofar as it interacts in some way with that thing" (Wagner 1960:5).

Admittedly Wagner's mode of representing "environment" is heavily cognitive, but also highly useful because it includes and goes beyond Conklin's triple set. Wagner goes beyond Conklin since there are other elements that are neither climatic, edaphic nor biotic which nevertheless interact with human populations. This second meaning of environment becomes useful in the study of symbolic elements in relation to ecology and will be resorted to as an underlying assumption in our analysis of the role of stars in appreciating the roles of fishing, hunting, and farming in traditional Jama Mapun food-quest.

We prescind from other specialized meanings of ecology, e.g. cultural, social, artificial, and others.

### **The Traditional Ecosystem: Huma**

Approaching the island of Kagayan Sulu, either northwesterly from Palawan or southeasterly from Jolo, the eye is delighted by the sight of a green island-mass rising out of the sea-scape. As one approaches nearer, he will see that the greenness is due to rows of coconut palms sliding majestically down from the volcanic hill tops to the water edges. Kagayan is practically covered with coconut trees, about 75 per cent of the total island area, which is about 70 square kilometers. This is a sight one would see in 1966.

If one could turn back the ecological clock to 1521 or to 1842, the eye would still be delighted by the sight of a green island-mass rising out of the horizon, but on closer look one would see not coconut palms but secondary or even primary forest blanketing the hills and valleys. This is, at least, what Pigafetta and Captain Charles Wilkes tell us.

Pigafetta probably was the first westerner to set eyes and to write about Kagayan Sulu. In 1521, weeks after Magellan met his death in Mactan, the rest of the fleet left Cebu for Borneo. On their way they made brief stopovers in Kagayan and Palawan in search for food. We are thankful to Pigafetta for giving us the first or earliest known map of the island and especially for a brief but ecologically significant description of the inhabitants and their environment, thus providing us with some historical base line.

. . . laying our course west southwest, we cast anchor at an island not very large and almost uninhabited. The people of that island are Moros and were banished from an island called Burne. They go naked as do the others. They

have blow-pipes and small quivers at their side, full of arrows and a poisonous herb. They have daggers whose hafts are adorned with gold and precious gems, spears, bucklers, and small cuirasses of buffalo horn. They called us holy beings. Little food was to be found in that island, but [there were] immense trees. It lies in a latitude of seven and one half degrees toward the Arctic Pole, and is forty-three leguas from Chippit. Its name is Caghaian. (B & R, Vol. 33, p. 207).<sup>5</sup>

And from the *Narrative of the United States Exploring Expedition During the Years 1838, 1839, 1840, 1841, 1842* we have another brief account of the island by Captain Charles Wilkes:

... and at daylight on the 7th [February 1842] we made the islands of Cagayan Sooloo, in latitude 7:03:30 N, and longitude 118:37 E. The tide or current was passing the island to the west-southwest, three quarters of a mile per hour; we had soundings of seventy-five fathoms. Cagayan Sooloo has a pleasant appearance from the sea, and may be termed a high island. It is less covered with undergrowth and mangrove-bushes than the neighboring islands, and the reefs are comparatively small. It has fallen off in importance, and by comparing former accounts with those I received, and from its present aspect, it would seem that it has decreased both in population and products. (B & R, Vol. 43, p. 189.)

With these two historical base lines given and our present knowledge of conditions in the island, it is pertinent to ask what happened, sociologically and ecologically, between 1521 through 1842 to 1966. Clearly there has been a change in the composition of the island biomass and ecological balance, from one dominated by forests and slight human population to another dominated by commercial coconuts and greater population pressure. Recalling our hypothesis that an ecological approach studies a particular interlocking achieved by a particular society with a particular environment in a definite period of time, we can say that here we have two successive types of ecosystem.

To understand the peculiar configuration and functions of the various sociocultural and ecological components in each of the two ecosystem, let us first sketch the broad characteristics of the earlier ecosystem.

Let us designate the earlier, pre-coconut ecosystem as the *huma*. For although the traditional Jama Mapun food-quest was a complex of fishing and marine-food collecting (*padilaut* and *ngusaba*), trading (*lomeh*), and farming (*huma*), it was the latter which was the basic economic activity and which was chiefly affected by the transition to the *kabbun* economy. It may be thus appropriate to typify the entire traditional food-quest by the heading *huma*, to reconstruct which is still possible. For besides the descriptions of the *huma* given by older Jama Mapun who practised it, instances of the practice may still be observed, mostly among the Jama Mapun immigrants

<sup>5</sup> B & R stands for Blair and Robertson, Taipei Edition. The place called Chippit is in northwestern Zamboanga.

in Palawan as an existing, though diminishing alternative economic activity side by side and overlapping with the ever more common and popular *kabbun*.

Before 1900 all Jama Mapun families subsisted generally by practising *huma*. The *huma* is a subsistence farm consisting of dry or upland rice, corn, cassava, camote, several root crops and vegetables and fruit trees. Our fieldwork revealed that Jama Mapun recognize several "types" of each of the major *huma* crops. The following enumeration was supplied by an old Jama Mapun woman of the village of Duhul Batu, the community we studied in detail.

<i>Plant</i>	<i>No. of types (native categories)</i> <sup>6</sup>
banana	21
cassava ( <i>bastila: kayu</i> )	14
sugarcane ( <i>tabbu</i> )	11
palay ( <i>paoy</i> )	7
ubi	5
gabi	5
camote ( <i>bastila</i> )	4
corn ( <i>gandum</i> )	3

A *huma* may also contain different kinds of beans (string beans, mungo, peanuts), watermelon, eggplants, small pepper (*lara*), tomatoes, and aromatic grass (the Cebuano *tanglad*). Often one finds a lemon (*limao*) tree growing outside a Jama Mapun house.

A Jama Mapun family, living according to this *huma* culture, adjusted to his climatic environment by fitting his planting activities to the annual cycle of two rainy seasons. The first rainy season, and the main one, is the *uwan ta:un* which begins around June and lasts for about three months. The second rainy season, a shorter one called *uwan puli:an*, occurs sometime in November. The islanders plant their main crops, rice and corn, during the *uwan ta:un*; the minor crops are planted during the later rainy season.

From the evidence supplied by Pigafetta and Wilkes, Kagayan was not very thickly populated; before 1900 there were probably no more than 3,000 inhabitants in the island. It must also be remembered that early Jama Mapun were partly nomadic. Thus older Jama Mapun informants told us they clear and till any area in any measure they pleased. For land then was regarded as a free good open to any family willing to work.<sup>7</sup> During this period

<sup>6</sup> Cf. Conklin (1947) who writes that Hanunoo plant taxonomy, based on native criteria, outnumbers those in botanical books. He also notes that an ideal Hanunoo swidden plot may contain some forty-eight basic kinds of plants. The Jama Mapun *huma* undoubtedly is a type of swidden agriculture.

Some of the plants mentioned here, e.g. corn and camote, are intrusive to the Philippines, having been introduced by Spaniards.

<sup>7</sup> The concept of land ownership came later, around 1917, when the first land survey was made by a private company; in 1925 the whole island was publicly surveyed and divided; stone markers (*bato*) were set to mark one property from another. Implications of this innovation will become more significant later on when we touch on the coconut farms or *kabbuns*.



each family began preparing the ground before the *uwan ta:un* in June. Among the foothills and gentle slopes of volcanic cones, where secondary forests could still be found and where plowing was therefore impractical, people prepared the soil by *kaingin* fashion—cutting down trees and slashing the underbrush and burning them when sufficiently dry. But along the valleys and other level areas, particularly around Lake Sapa: in the southeast end of the island, Jama Mapun used wooden plows (*pagdayao*) pulled by bulls; cattle was reported by Wilkes as present in the island in 1842. A farm prepared by plowing is sometimes called a *badja*.

All cleaning by slash-and-burn or by plowing was done by male members of the families. Women normally helped in the plowed field by removing weeds and breaking the soil into finer texture. Planting was done by both men and women. The men, walking ahead, bore holes in the ground by using a pointed pole, "digging stick," and the women walking behind them dropped the seeds and covered them with their foot. Sometimes both operations were done by one person.

During the four to five months when the palay was growing, continual weeding was kept on by the womenfolk. Harvesting was done by all the members of the family. With the rice and corn harvest the main farming activity ends for that year until the next *uwan ta:un* the following year.

The minor rainy season, *uwan puli:an*, was associated with the minor crops, some of them not necessarily following a strict annual cycle, e.g. camote, cassava, ubi, gabi, string beans, mongo, peanuts, eggplants, pepper, onions, tomatoes, sugarcane, watermelon, and various kinds of bananas. These secondary crops were usually planted near the homestead. Thus one may picture, in pre-*kabbun* Kagayan, Jama Mapun houses surrounded by a rich variety of primary and secondary crops following their own cycle of growth and fruiting to provide a continuous supply of harvestable resources. But this idyllic picture of subsistence farming has some basic limitations, as may be seen in similar examples from other parts of the world.

It will be helpful, at this juncture, to bring in the concept of a generalized and specialized ecosystem. By a generalized ecosystem ecologists understand a given habitat where nutrients are shared by and channelled into a great number of plant and animal species, e.g. a natural pond or a natural forest where a large number of organisms compete for wood, light, and space. A specialized ecosystem is a given habitat where the resources are shared by one or a small number of species thereby benefitting a great number of the privileged species. Because a general ecosystem has a great variety of species with a relatively smaller number of members, it has a high diversity index. On the other hand, a specialized ecosystem has a low diversity index because it has fewer species with a large number of individuals. The transition from

a generalized to a specialized ecosystem, if the species being favored are beneficial to man, is normally engineered and maintained by man.

Geertz has pointed out (1963:16) that the swidden type of agriculture under which would fall Conklin's Hanunoo swidden and our Jama Mapun *huma*, is a human imitation of a generalized ecosystem. Swidden and *huma* agriculturists maintain a multicrop farm, i.e. with a high-diversity index, in imitation of a natural forest. Thus Geertz insightfully calls a swidden plot a sort of "harvestable forest," a "canny imitation of nature." His excellent analysis of the dynamics of swidden agriculture, the cycling of soil nutrients through periodic fallowing and plot rotation, would apply, *mutatis mutandis*, to our Jama Mapun *huma*. However, although we both treat of "two types of ecosystem," there is some fundamental difference in the second terms of our comparison, between his *sawah* (wet or padi rice) and our *kabbun* (commercial coconut). The nature of this difference and its sociocultural implications will be treated in the third part.

#### Marine-food Collecting: Ngusaha:

Before we move on to analyze the *kabbun*, we must touch on the other aspects of the Jama Mapun adjustment to their island environment, the other links in the total interlocking. For besides being *huma* agriculturists the early Jama Mapun were part-time food-gatherers and traders. We must now see how these other economic activities fitted with the *huma* and with the general conditions of the island and marine setting.

The non-agricultural aspects of the Jama Mapun food-quest is difficult to pigeon-hole within the usual meaning of "food-gathering"—whether fishing, hunting, or seed gathering. Food-gathering culture, as an anthropological concept, seems to be a generalization from data supplied by primitive groups in continental areas like the Americas, Africa, and Australia, hence the difficulty of applying the concept of food-gathering to archipelagic and coastal groups as those found in Southeast Asia. We have therefore to explain what we mean by marine-food gathering as practised by the early Jama Mapun.

Marine-food gathering is a complex of economic-oriented activities which included fishing, shell gathering, and hunting for turtle eggs, sea-gull eggs collecting of birds' nest, *beche de mer* (trepang) and other marine resources

The Turtle Islands are, of course, the prime source of turtle eggs at present, but the territory has been traditionally inhabited by Jama Mapun islanders. And in the past the effective egg-laying range of turtles included Kagayan and the surrounding islets, as is at present to a limited extent.

Next to turtle eggs Jama Mapun also collected sea-gull eggs laid seasonally by thousands of sea-gulls (*kollo-kollo*) in the many sandy islets around

Kagayan.<sup>8</sup> Both kinds of eggs as well as shellfish were important sources of protein and calcium for the islanders.

It may be recalled, at this point, our hypothesis that the early Jama Mapun approached the culture of the Bajaos, and that both may have shared or evolved from the same protoculture. In the light of this hypothesis, their marine-food gathering becomes more meaningful.

Another element of this marine-food gathering complex is the underlying nomadism presupposed by these activities. The Bajao culture, as we know them at present, is rightfully called sea-nomadic because of its migratory nature. Some limited sea-nomadism may also have characterized part of the marine food-quest of the early Jama Mapun.

To sum up in one word all these aspects of the marine-food gathering complex we would suggest (as we did with *huma*) the term *ngusaba*.

*Ngusaba*,<sup>9</sup> in this specialized sense of marine-food gathering, is to be regarded, like *huma*, as a definite adjustment of the Jama Mapun to their island and marine environment. For the collecting of sea-shells, for instance, involved not only a practical knowledge of edible shells (of which Jama Mapun recognize no less than 43 "types"); it also implied familiarity with monthly and seasonal tides. Likewise the hunting for turtle eggs and sea-gull eggs required knowledge of nesting places and seasonal habits of turtles and birds.

Fishing, as another part of *ngusaba*, included the use of weirs, harpoons, hook-and-line, plant-poison, basket-traps (*bobo*), and lately also spearguns with rubber-band propellant and goggles. Although not all of these fishing techniques are in evidence in Kagayan now, informants assured us that they used to be quite common.

#### Traditional Trade: Lomeh

A third set of economic activities, in addition to *huma* and *ngusaba*, was trading with Palawan natives and Borneo Chinese. We call this aspect of the food-quest *lomeh* (sailing). The Jama Mapun trade pattern expressed by *lomeh* may be viewed from the content of the trade as well as from the dynamics of it, i.e. in terms of winds, currents, and stars—knowledge of

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<sup>8</sup> Two kinds of *kollo-kollo* are recognized: the "aristocratic" white which lay white eggs up in trees high up in the beaches; and the "commoner" greyish-black which lay greyish eggs on the sands. The favorite places of these layers are said to be the islets between Kagayan and the Turtle Islands.

<sup>9</sup> Our choice of the term was suggested by the following linguistic consideration. *Ngusaba* (which ordinarily means "means of livelihood") seems to be a verbal cognate of the word *nusa* (island). If our etymological hypothesis is correct the root-meaning of *ngusaba* should be "islanding," going from *nusa* to *nusa* in search for food—which is what the Bajao-like background of the Jama Mapun would lead us to suspect. Incidentally, *nusa* is also a common word for "island" among all the Samal groups, e.g. *Lami-nusa* (from *lami*, pleasant, and *nusa*).

which conditioned pre-motorboat navigation. On the content of this early trade we have some indication from Wilkes (B & R, Vol. 43, p. 189).

Its [Kagayan's] caves formerly supplied a large quantity of edible birds'-nests; large number of cattle were to be found upon it; and its cultivation was carried on to some extent. These articles of commerce are not so much attended to at the present time, and the *beche de mer* and the tortoise-shell, formerly brought hither, are now carried to other places.

If Pigafetta's information were correct, namely, that the inhabitants of Kagayan Sulu in 1521 were "banished from an island called Burne" (Borneo or Brunei)—and there is no contrary evidence that these were not the predecessors of the present Jama Mapun—then they must have had some contact and trading relations with the Chinese in Borneo and Sulu. Recent historical writings are throwing more light on the extent and importance of Chinese trade contacts with Southeast Asia, particularly Borneo, Sulu, and Luzon (Majul 1966, Lamb 1964, Outram 1959). The relevance of these early trade contacts in respect to the society and culture of the peoples of Sulu and Borneo lies principally in its role as a stimulus for trade. Lamb, for instance, believes that from Sung times there is evidence that the Chinese were trading with Sarawak, "exchanging ceramics and beads for local products including, it is possible, the substance which forms the basis for bird's nest soup."<sup>10</sup> The early Jama Mapun met by Wilkes in 1842 and by Pigafetta in 1521 already could have known that the Chinese, both the passing traders and the immigrants, loved birds' nests, *beche de mer*, and other marine foods. Awareness of these trading opportunities encouraged the islanders to widen the scope of their *ngusaba* to include marine items fancied by the Chinese. In exchange the Jama Mapun, who did not seem to have developed the weaving art, brought back articles of clothing, as well as gold, precious gems, iron, porcelain, and other commodities not producible by the level of culture and technology of the island people.<sup>11</sup> It was also possible that the Chinese traders themselves, in their junks, visited and traded in Kagayan on their way to Sulu, specially if they passed through the straits of Balabac from China Sea. Kagayan lies directly in the route of any vessel sailing from Balabac to Jolo or Zamboanga.

Contemporaneous with this Jama Mapun trade with the Chinese in Borneo was the trade with the animist pagans of Palawan (Palawanin, Tagbanuwa, and others). Trade with these rice-growing pagans, like those with the commercial Chinese, was strictly of the barter type. Early Jama Mapun

<sup>10</sup> Archaeological excavations of the National Museum in Calatagan, Batangas and Bolinao, Pangasinan revealed the amazing volume of Chinese porcelain tradewares that entered the Philippines from the Tang dynasty onward.

<sup>11</sup> Dr. Robert B. Fox suggested the insight that a purely sea-nomadic existence could not have developed without a Chinese market where they could get non-marine commodities. As one old Jama Mapun told us, you cannot subsist on fish and turtle eggs alone.

traders used to sail to Palawan, in their *leppa and sappit*,<sup>12</sup> loaded with cloth, brass gongs and artifacts, spears, bolos, and other items valued by the natives of Palawan. The traders used to arrive in Palawan just before harvest time. At their arrival transactions were entered into with the Palawan *panglimas* and chiefs to decide how many *banoyo*s of palay and how many *gantas* of rice (*bobas*) each article would be worth in exchange. After the harvest the traders would sail back to the island with plenty of palay and rice and some forest products, like rattan and *almaciga*, to trade with the Chinese once more, and thus kept the cycle of barter trade.

At this point it is pertinent to ask why the Jama Mapun traded for rice when they were already producing rice in their *humas* in the island. We do not have enough data yet to answer this difficulty. We can suggest, however, that the rice trade was either an alternative form of food-quest side by side with the *huma* or a later development in the Jama Mapun economic adjustment. Whatever may be the actual reason for this seeming neutralization of the *huma* agriculture in Kagayan, the important thing at this juncture is the dynamics of the trade itself as a manifestation of the Jama Mapun interlocking with the marine environment.

This adjustment to the marine environment was effected not only by the exploitation of marine resources for direct consumption and for exchange trade with outsiders, as we have sketched above, but also by the development of navigation based on the knowledge of winds, currents, and stars. The skill of Jama Mapun as sailors was dramatically tested when two of them, *Jilan* and *Kahil*, and one *Bisayan*, sailed to Australia to take two American soldiers escaping from Palawan during World War II. This daring exploit of sailing through the Indonesian archipelago on a native sail-boat suggests a highly sophisticated knowledge of navigation.

Part of the Jama Mapun ethnoecology is their intimate knowledge of various winds, their directions, seasons, and associations with land phenomena. Any Jama Mapun elder (the younger ones seem to be losing the wind-lore as they rely now more often on motorized vessels) can tell you the names and associations of the various winds. Below we give their English equivalents, based on the cardinal points of the compass.

<i>English</i>	<i>Jama Mapun</i>	<i>Remarks</i>
Wind from:	<i>Baliw man:</i>	
north	<i>uttara:</i>	Low-tide in the morning ( <i>laggu: subu</i> or <i>tabik uttara:</i> )
northeast	<i>timob-laut</i>	

<sup>12</sup> *Leppa* was a double-masted vessel; *sappit* was a single-mast, round-bottom type, the predecessor of the *kumpit* which originally was powered by sail and only later by inboard motor.

<i>English</i>	<i>Jama Mapun</i>	<i>Remarks</i>
east	<i>timob</i>	
southeast	<i>tunggara</i>	
south	<i>sabtan</i>	Low-tide in the afternoon ( <i>laggu: kobap or tabik sabtan</i> )
southwest	<i>balat-daya</i>	
west	<i>balat</i>	
northwest	<i>hilaga</i>	
"land-wind"	<i>ambun</i>	Early morning wind blowing from a large body of land
"sea-wind"	<i>dalat</i>	Late afternoon wind from the sea towards the land

Through their intimate knowledge of the winds, the Jama Mapun have developed quite amazing associations between certain winds and some natural phenomena. For instance, it is a common Jama Mapun observation that when the *kapuk* tree starts fruiting, the *sabtan* wind is halfway through its six-month cycle; and that when the fruits begin to fall, the *sabtan* is dying down. Another interesting association is with the May fly. The name given to this ephemeral flying-ant is *manuk-manuk balat-daya* (literally, winged-creature of the *balat-daya* wind) because they appear in their winged forms during the season of the *balat-daya*. And the term for clouds is *tai baliw* ("wind-shits").

It sometimes happens, while sailing under one wind, that sailors suddenly meet a strong wind blowing from another direction and causing a new surface current. In a stormy condition when no other point of reference is available, they have an ingenious way of telling where the new current is taking them. They have learned that a current going in one direction is not reversed by the flow of a new current brought in by a strong wind. The new current moves only on the surface; a few feet below this the original current continues in its original course. Just by simply lowering their legs or their paddles, these seasoned sailors can detect the old current below and the new current above and thus estimate their boat's drift and bearing.

For night navigation, when no stars are visible to guide them, this knowledge of the winds and the currents becomes their sole guide in finding their way through the dark sea. But when stars are visible, they navigate by them. The Jama Mapun's star-lore will be fully treated in the section on the symbolic. Here we will briefly mention that these sailors know that the north-star, which they call *sibilut*, does not move (*nya: usik*) from its position in the northern horizon. Thus, like all sailors in the northern hemisphere, the Jama Mapun rely heavily on *sibilut*, although other constellations are also readily used.<sup>13</sup>

<sup>13</sup> As Kagayan lies seven degrees north of the equator, *Polaris* is sometimes hardly visible on the horizon, specially as one moves down to Borneo. Thus Jama Mapun use some of the outstanding stars and constellations in the southern hemisphere like *Crux*.

The preceding presentation of the Jama Mapun food-quest and economy tried to show that their underlying activities and behavior are best understood as particular responses and adaptations to the land and sea environment with their climatic cycles, marine biotic resources, and such physical variables as winds, currents, and stars which, in the Wagnerian sense, were ecologically important to the islanders.

If we have divided the entire network of the Jama Mapun interlocking with their environment into the *huma*, the *ngusaba*, and the *lomeb* it was not to create the impression that these were separate and unrelated strands of ecological adaptations. The traditional Jama Mapun family, as an economic unit, engaged in these three areas of adjustment to nature not all at once but according to the opportunities and schedules dictated by processes and limitations inherent in the environment—planting during the rainy seasons, egg gathering during the nesting season, fishing and shell collecting when weather and tides permitted, trading when the winds and trade opportunities were favorable.

Because these ecological adaptations have characterized the Jama Mapun culture and society for such a long time, before the *kabbun* was developed in the early 1900's, it is not surprising that many elements would find their way into the symbolic sphere of their culture. How to discover the ecological elements registered and crystallized in the images and themes of their symbolic world is the scope of the following section.

### Ecology and the Symbolic

By the symbolic we mean the common images and themes in the culture and world-view of a people. Such images and themes reside in the language, literature, beliefs, legends, myths, and sayings of a people. There may be many ways of penetrating into this symbolic world. One method which we will be using in this section is to elicit them through a projective technique similar to those used in psychology.

In the ideal ink-blot test, a subject is presented an objectively patternless field or set of elements. The trick is to make the subject introduce some pattern upon the elements by projecting his own image patterns. In this way an investigator draws out the "mind" of the subject and comes into contact with his symbolic world. If the same test is given to a number of subjects belonging to a given group, e.g. an ethno-linguistic group, and the same patterning becomes apparent, then it may be concluded that recurrent patterns or images are not peculiar to a single subject but common to the entire group.

In our study of the symbolic in Jama Mapun culture we were guided by the above principles and assumptions. But instead of using a card with

ink-blots, we presented a natural phenomenon, i.e. the "star-blots" on the night sky. The essential elements of a projective test are there—an objectively patternless field or set of elements which are open to being patterned by a subject. We know, for instance, from Greco-Roman and Anglo-Saxon mythology, that constellations are structured differently by different peoples. What looked like a great-bear-with-a-tail (*Ursa Major*) to the Latins, appeared as a big-dipper-with-a-handle to the English. And so with the other constellations. At first we wondered if a Jama Mapun living in the tropics would see in this popular constellation the Latin bear or the English dipper. To our great surprise (because it confirmed our expectation) the Jama Mapun see neither a bear nor a dipper but a fish-trap called *bobo* with a string tied to it!<sup>14</sup>

We repeated this experimental procedure, asking different Jama Mapun subjects both in Kagayan and in Palawan (among the immigrant families in Pulut, Brooke's Point). We pointed to the general direction of the familiar English constellations, e.g. Big Dipper, Southern Cross, Pleides, Orion, and others. Later we allowed our subjects a free rein, and they pointed to patterns we never heard of, e.g. *Anak Datu* (Datu's son), *Niyug* (coconut), *Mopo* (pig), and others. Below we tabulate our findings, giving the original Jama Mapun with the English rough equivalent, if any, and some remarks as to their general shapes and ecological associations.

<i>Jama Mapun</i>	<i>English</i>	<i>Remarks</i>
1. <i>Tanggong</i>		Three stars imagined as composed of one male and two females travelling in a single line across the sky. <i>Tanggong</i> has a very important plant-lore and origin myths associated with it.
2. <i>Bobo</i>	Big Dipper	The body of the dipper is imagined as a fish-trap in the form of a bamboo-basket. The handle of the dipper is seen as a string tied to the <i>Bobo</i> . There is a belief that when many stars can be seen within the <i>Bobo</i> , it is a good sign for fishing.
3. <i>Anak Datu</i>	Two stars from the constellation <i>Centaur</i>	Two stars to the side of the South-Cross. The islanders imagine the two as sons of a <i>datu</i> trying to harpoon or spear a blow-fish ( <i>Bunta</i> ), the constellation <i>Cruz</i> .

<sup>14</sup>The Manobos of Mindanao imagine none of the three. It is said they see a quadrangular sail tied to a mast. Another proof of the highly subjective patterning of constellations.



<i>Jama Mapun</i>	<i>English</i>	<i>Remarks</i>
4. <i>Bunta</i>	Southern Cross	The four stars which appear as a cross to Westerners are outlined by the islanders to represent the rotund body of a blow-fish ( <i>bunta</i> ) being speared by <i>Anak Datu</i> .
5. <i>Batik</i> ( <i>balatik</i> )	Orion's Belt	The series of stars defining Orion's belt is imagined as the shaft of a <i>batik</i> or spear-trap. Commonly used in Southeast Asia, the <i>batik</i> or <i>balatik</i> is usually laid to shoot across the path of animals or men who happen to trip the release mechanism hidden on the trail. The constellation <i>batik</i> is seen as aimed at another constellation, the <i>Mopo</i> (pig) or the English Pleides.
6. <i>Mopo</i>	Pleides	<i>Mopo</i> is an ancient term for pig. Only the pre-Islamic Jama Mapun who were under no injunction against pork could have constructed a pig constellation related to hunting. Both the Jama Mapun and the Palawan pagans use <i>Mopo</i> for predicting the start of the rice planting season. Ideally planting should begin when, at dawn, <i>Mopo</i> is at the three-o'clock position in the sky.
7. <i>Sangat bawi</i>		A group of stars with a V-shape resembling the jaw ( <i>sangat</i> ) of a <i>bawi</i> (pig). Like <i>Mopo</i> , <i>Sangat bawi</i> is associated with <i>Batik</i> in a hunting legend.
8. <i>Tendak</i>		Three stars arranged like a triangle. <i>Tendak</i> is the name of a small walking-fish found in swamps and mangroves. The constellation is associated with sailing and wind-prediction.
9. <i>Kabaw</i>		A constellation showing the body and pinchers of a crab ( <i>kabaw</i> ).
10. <i>Niyu-niyu</i>		A group of stars resembling a coconut palm ( <i>niyu</i> ); the pattern shows the leaves, trunk, and roots. It sets in the south, and its rising is closely

<i>Jama Mapun</i>	<i>English</i>	<i>Remarks</i>
		associated with the occurrence of certain winds and with the planting of coconuts.
11. <i>Niyu-niyu punggul</i>		A group of stars imagined as resembling the crown of coconut leaves without a trunk. Some Palawanin imagine the group as a chicken ( <i>manuk</i> ).
12. <i>Naga</i>	Milky Way	The white swath of stars across the dark sky is conceived as a snake or dragon ( <i>naga</i> ) which is a mythical and artistic symbol common not only in China but in many parts of the Southeast Asia as well. Cf. Geertz, <i>The Religion of Java</i> .
13. <i>Sibilui</i>	North Star	A popular star among sailors as they know that it has a fixed position in the northern horizon.
14. <i>Kababasan</i>	Morning Star	<i>Kababasan</i> is probably a cognate of the Cebuano word for the same star, <i>kabugwason</i> .
15. <i>Bintang Gauk</i>	Evening Star	<i>Bintang</i> is the Malay term for star. The <i>Jama Mapun</i> word for star is <i>pote:an</i> (probably derived from <i>pote:</i> ; white); may also be a cognate to the Cebuano <i>bitoon</i> .
16. <i>Lumba-lumba</i>		A constellation named after the dolphin ( <i>lumba-lumba</i> ); associated with wind-prediction.

If we make a simple tabulation of the number of times certain images and/or associations occur, we come out with the following categories and counts.

<i>Images/Associations</i>	<i>Number</i>	<i>Constellations/Star</i>
1. Plant and Agriculture	4	<i>tanggong, niyu-niyu, niyu-niyu punggul, mopo</i>
2. Marine and Fishing	6	<i>bunta, anak datu, tendak, bobo, kabaw, lumba-lumba</i>
3. Animal and Hunting	4	<i>batik, mopo, sangat bawi, naga</i>
4. Navigation	4	<i>sibilui, bunta, niyu-niyu, tendak</i>
5. Others	2	<i>kababasan, bintang gauk.</i>

*Note:* Some constellations were classified twice, because although their form may belong to one category, their association is with another, e.g. *Mopo* under both hunting (animal form) and agriculture (association). So with a few others.

Among the agriculture-associated constellations the most significant is *Tanggong*. For although this does not carry a plant image, it has a well-known association with a plant myth which throws some light on the antiquity of the rice-planting element of the Jama Mapun *huma*. The *huma-tanggong* link-up is revealed in the legend of *Tanggong*. Informant: Alpad Amilhamja of Duhul Batu.

#### *The Origin of Rice-Planting*

In the beginning there were only three people, a man called Tohng and his two wives, Masikla and Mayuyu. One day Masikla took some grass leaves and placed them in a pot over a fire; while she went down to the seashore to look for some sea-food, she asked Mayuyu to look after the pot. Mayuyu, who did not know what was inside the pot cooking was carefully instructed by Masikla not to open the pot until her return. But Mayuyu was so curious to find out what was inside the pot; she decided to open it without waiting for Masikla's return. To Mayuyu's surprise she saw that half of the pot contained grass leaves and the other half, rice. When Masikla returned she was very angry with Mayuyu for opening the pot against her instructions, saying that if she had only obeyed her, people need not have to plant rice or wait for rice to head and bear grain. People could have turned grass into rice by simply putting them inside a cooking pot.

On another day Tohng went out to the field. Neither of his wives knew what he was doing out there in the field. Mayuyu, curious as ever, secretly followed Tohng to spy on him. Hiding behind some bushes, Mayuyu saw that Tohng was sitting under the shade of a tree, playing on his bamboo flute, doing no work at all. While beside him, near the edge of the field, his bolo and ax were cutting down trees and the underbrush. The instruments were working by themselves without Tohng holding them. Mayuyu made another blunder by stepping out of hiding and berating Tohng and shouting at him for his laziness. At this disturbance the bolo and the ax dropped to the ground and never again worked by themselves. Tohng became very angry at Mayuyu and told her that had she not disturbed the bolo and the ax, people need not have to work with their own hands. Thus both Tohng and Masikla were angry at Mayuyu for her mistakes which caused a lot of hard work and sorrow on people. Because of this Tohng and Masikla left the earth and took to the heavens. Masikla left first, followed by Tohng, and lastly by Mayuyu who did not want to be left behind.

Since then these three became three stars travelling in single file across the night sky. These three stars now form the constellation called *Tanggong* which the Jama Mapun use for timing the start in the preparation of their *huma* and rice planting.

Folklorists and myth-analysts may look into the contents and literary values of this star-linked legend, but our interest is simply to point to the

congruence between its theme and the *huma* practice which we know from other sources was part of the ancient food-quest of the Jama Mapun.

The *huma*, however, is by nature a multi-crop farm and included not only rice but other species of plants like cassava, ubi, sugar cane, and others. Our search into food and plant legends yielded two short origin-myths, one about the sugar cane, and the other about the *ubi*.

#### *The Origin of Sugar Cane (tabbo)*

In the early days of *Tana: Mapun* (the name by which Jama Mapun call the island of Kagayan), the sea between the northern islets and the mainland was very shallow, so that people could travel back and forth on *gakits* (rafts) propelled only by poles.

One day a man was rafting to one of the islets. As he was leaning on his pole to propel his raft, the pole snapped and some juice from the pole splattered on the man's face; some juice entered his mouth, and on tasting it, the man found it was sweet. Thus people discovered that a certain plant, the *tabbo*, has a sweet juice.

#### *The Origin of Ubi*

In the beginning people did not know that *ubi* was edible. One day a couple of fishermen landed on an islet. They pulled their boat up the beach and prepared to cook some of their provision. They looked around for some objects to serve as a stove. They found three hard, brown objects. After they finished cooking, and as they removed their pot, they noticed that the brown objects cracked open and revealed a white substance inside. Curious at this strange substance, they tasted it and found it was good to the taste. This was how people discovered *ubi*.

Why only rice, sugar cane, and ubi have found a place in the symbolic sphere of the Jama Mapun culture may suggest that these three were some of the earliest food plant known to and cultivated by the early islanders. Some of the plant species, for instance the corn (maize) found in a *huma*, were intrusive to the Philippines and thus to the inhabitants of Kagayan too.

Going back to the Jama Mapun ethnoastronomy, we find that not only agriculture but also fishing, hunting, and sailing are reflected in the images woven by Jama Mapun upon the stars. Without going into detailed analysis to link the images to the corresponding society-environment complex, we would like to draw attention to the fact that the constellations *bunta*, *anak datu*, and *bobo* are all related to fishing. The Jama Mapun have a belief that when the constellation *bobo* has many stars inside it, it is a sign that fishermen will catch much fish.

The constellation *niyu-niyu* has two associations: one with coconut planting,<sup>15</sup> and the other with wind prediction and navigation. According to some Jama Mapun coconut planting should be synchronized with the rising of the *niyu-niyu*. Planting should be done when the leaves and the fruits of the *niyu-niyu* are just above the horizon, for then the planted coconuts will start bearing fruit very early. On the other hand if planting is done when the *niyu-niyu* is already high in the sky, the trees will not bear fruits until they are already quite tall.

The *niyu-niyu* is likewise associated with the predicting of weather and winds. According to Bilal Kolong, a well-travelled Jama Mapun, sailors can tell the coming of certain winds by watching certain marks along the trunk of *niyu-niyu*. If in the early evening the first *buku* (the node-like marks on coconut tree trunks) is visible, the wind *timob-laut* (northeast wind) will be blowing. There are two other *buku* marks below the first one: the *buku makkit* and the *alun panjang*, both marks being signs for climatic phenomena. When the entire constellation emerges in the sky, at early evening, one will see the *bunka kamut*, the roots of the *niyu-niyu*, which is the signal for the start of generally bad weather in the sea.

Similar analysis could be made of the other constellations in an effort to link them with specific elements in the general ecosystem of the Jama Mapun. But we have sufficiently indicated, we hope, the main thrust of our thesis, namely, that the symbolic sphere of a people's culture contains reflections of the underlying economic preoccupation and ideological traces of their general environmental experiences. All the main components of the earlier adjustments of the islanders to their land and marine environment—the *huma*, the *ngusaba*, and the *lomeb*—find corresponding reflections in the symbolic projections woven around *tanggong*, *bobo*, and *niyu-niyu*.

### The Emergent Ecosystem: Kabbun

An investigator visiting Kagayan Sulu in 1966 to study the socio-economy and environmental adjustment of its inhabitants—if he is aware of the previous ecological picture—will surely be amazed at the changes he will see. Instead of multi-crop *humas*, he will see solid patches of coconut *kabbuns*. Instead of the graceful sails of the *leppas* and *sappits* etched on the horizon or riding anchor near the shore, he will see motorized *kumpits* chugging in and out of the main harbor at Lupa Pula (the poblacion of the municipality). Where before there were no schools, now he will see Jama Mapun children trudging to public schools or playing in the school campus

<sup>15</sup> This first association suggests that the Jama Mapun had an early experience with the coconut palm, but not in its commercial context. The world market for coconut oil, and hence for copra, started picking up only around 1890 in response to the diminishing supply of whale oil for which coconut was found to be a good substitute.

of the Notre Dame High School. Occasionally he may catch the grey bulk of patrolling Navy boats across the harbor or hear the whine of the red missionary plane winging in to make a landing on the white coral airstrip. And he will see trucks and motorcycles running over dirt roads around the island. Such is the transformation that has visited the island and society of the "natives" encountered by Wilkes and Pigafetta several centuries and generations ago.

Our interest, however, is the new ecological interlocking achieved by contemporary Jama Mapun after the introduction of a monetized agriculture based on commercial copra, and after a technological innovation in trade brought about by the use of marine engines.

That the old *huma* has yielded to the new *kabbun* is here taken as ecologically given. Thus the important question is how this shift has come about. Why did the coconut plant become so successful as an economic and an ecological factor in the island? What were the instigating factors that triggered the march of the coconut population into the territories formerly occupied by secondary forest and subsistence crops?

The first stimulus towards the *kabbun* shift was supplied by the Chinese traders. We have seen that the presence of the Chinese in nearby Borneo<sup>16</sup> served as a stimulus for the widening of the early Jama Mapun *ngusaba* to include birds' nest, trepang, tortoise shells, and other forest and marine products valued by the Chinese. A parallel development happened in respect to the coconut. The enterprising spirit of the Chinese, in the latter case, led them to cross over to Kagayan to get at the source of these products; some of them crossed over from Jolo, Pangutaran, and Sibutu. In Kagayan they opened stores and thereby introduced consumer goods and money right in the villages. Just about this time, say, the last quarter of the 19th century, the world demand for coconut oil began to rise. The Chinese, alert to the possibilities of the coconut, started buying whole nuts and encouraged the islanders to cultivate them, as there were a few trees scattered in some villages then.

The second, and no doubt the main, stimulus towards the *kabbun* shift was the establishment of a coconut plantation in Kagayan. The first Deputy Governor of the island was an ex-soldier, Guy Stratton, a ranch-bred American from Wichita, Kansas who had a big dream (partly realized) of starting a cattle ranch and coconut plantation.<sup>17</sup> And like the Chinese he was aware

<sup>16</sup> *Tana:bebing*, literally the land nearby, is commonly used by the Jama Mapun to refer to Borneo.

<sup>17</sup> As a westerner Stratton must also have been familiar with the Dutch and English plantation systems in Malaya and the East Indies. His choice of Kagayan as a ranching site was not blind. Kagayan has some excellent grazing areas near the two volcanic lakes which can serve as watering places. And we know from Wilkes that even in 1842 there was a good number of cattle in the island. Why cattle-raising did not become a major economic base in the island is a good ecological problem.

of the world possibilities for copra. Thus, together with Atkins Kroll and Company who gave much financial backing in exchange for his running a general store owned by them, Stratton launched into a large-scale planting of coconuts. He chose the best lands available for the plantation and for ranch, which was not too difficult in his capacity as "king of the island." Besides there was much excellent land then for his needs. In the development of the plantation he encouraged and, often, coerced the natives to plant and cultivate coconuts. Some older Jama Mapun today still recall that Stratton would often grant passes to traders bound for Palawan or Borneo on the condition that they plant fifty coconut trees each. Thus side by side with the growth of the coconut plantation, native coconut farms also began to develop.

Stratton arrived in the island around 1910, and by 1920 the company was beginning to harvest and sell copra. Thus began the gradual transformation of the economic base of the people as well as the ecological balance in the island. No doubt there was a definite logic in the economic change, the long-range effect of it in terms of the island's biomass was probably not realized by either the company officials or the Chinese traders who triggered the change. By 1932 probably more than 50 per cent of the island was planted to coconut. There was enough open land left, however, on which to practise the old *huma*. But the trend towards the *kabbun* was unmistakably there. This was dramatically revealed during the destructive freak storm that levelled Kagayan in 1932. Many Jama Mapun suffered in this natural catastrophe, both through the physical loss of houses and cattle and through the destruction of their young coconut farms which were then beginning to yield fruits and to bring in some money. It was this experience with money, with its easy convertibility to consumer goods from the Chinese stores, which sealed the fate of the *huma*. For immediately after the storm the peoples replanted their lands with more coconuts. During the war, when the replanted trees were yet unproductive and when there was no market for copra, the people went back temporarily to the *huma* practice and to rice-trade with Palawan. But after the war the post-storm trees were already bearing fruits. The people went back to copra business. And thus the *kabbun* kept on crowding out the *huma*.

One way of gauging the revolutionary impact of the *kabbun* economy on the outlook of the people is in the mass migration of Jama Mapun families in the last twenty years to Palawan to look for new land on which to plant coconuts. We estimate about 30 per cent of the island population have moved out to Palawan; some went to Borneo. Of course population growth and the consequent pressure on the island are partly responsible for this migration. But the fact that immigrant families invariably planted coconut trees in their new habitat betrays the fact that the main driving desire was to establish a *kabbun*.

The analysis of the instigating factors in the shift towards the *kabbun* brought out only the role of the Chinese traders and the plantation officials. We must now look into the socio-psychological variable in the people themselves, which abetted the initial stimuli. How to explain the shift, from the people's standpoint.

One possible explanation lies in the difference of energy expenditure involved in the two types of economic activity. The *huma* system required more energy expenditure repeated annually, whereas the *kabbun* system required less; the coconut palm once planted required minimal care and weeding. In the *huma* a family gets a return only once; in a *kabbun* the harvest is three times a year throughout the life-cycle of the palms which may be as long as eighty years. There are more natural risks inherent in a rice farm, e.g. pests, drought, etc. but less in a coconut grove. Finally, it seems to be an economic law that once a society has set its foot inside a cash or market economy, at least in a semi-monetized form, it cannot easily revert to its primitive non-monetized footing.

But even if we try to explain the transition by taking account of the instigating and participating human factors, our interlocking framework remains incomplete unless our analysis include the environmental side of the man-nature equation. We must thus revert to the concept of the ecosystem and explain the *kabbun* shift in ecological terms.

The success of the coconut *kabbuns* in Kagayan shows that the ecological conditions in the island favored it. Mere socio-cultural acceptance of an agricultural innovation is not a complete guarantee that the innovation will succeed unless favorable natural conditions are likewise present and operative. Hence we have to discover these environmental variables and show how the natural organic requirements of the coconut as a plant species were satisfied. In short, we have to investigate the natural environmental components, in Conklin's sense, which enabled the coconut to establish an ecological *niche* in the island.<sup>18</sup>

The natural requirements or preconditions for the successful growing of coconuts include favorable latitude, altitude, soil, drainage, and climate. The coconut is a tropical plant and grows best within the tropic zone; it cannot tolerate high altitudes and prefers coastal areas; it can adjust to a relatively wide range of soil types—alluvial, lateritic, sandy, clay and volcanic; but it prefers soils with moderate calcareous content, for instance, soils from coastal lowlands developed from a coralline base (Huke 1963:22).

The coconut requires a warm climate without a great daily variation in temperature. The palm grows well where temperatures throughout the

<sup>18</sup> It is interesting to draw a parallel between the introduction of the coconut species in Kagayan (commercially) and the introduction of the horse in North America. The resulting social and ecological transformations in both instances are quite revolutionary.



year average between 22 degrees C. and 32 degrees C. Optimum average monthly temperature should be between 26 degrees C. and 28 degrees C. And the average diurnal variation should be around 7 degrees C. (Huke 1963: 269; Child 1964:46). The coconut tree is highly dependent on water, rainfall, and subsoil water. It grows best under a well distributed annual rainfall between 50 and 90 inches of rain. Higher precipitation is tolerated as long as there is a good drainage. The palm cannot stand stagnant water, but has a high tolerance for brackish water and thus can adapt well to coastal margins. It gets stunted under heavy shade and cannot survive competition from unchecked forest growth. Its need for good insolation (sunlight requirement) makes the coconut grow tall, a fact which also exposes the palm to damage from strong winds and storms.

These natural conditions are best met by islands, peninsulas, and archipelagoes in the tropics—the macro-ecology of the coconut palm.

Five large producing areas—Philippines, Indonesia, Malaya, Ceylon, and Oceania—account for over 90 per cent of the world's exportable coconut products. . . . another factor appears to be very important, namely, location. The Philippine islands, Indonesia and Oceania are archipelagoes composed of hundreds of small and large islands. Ceylon is an island, Malaya is a peninsula. In archipelagoes, islands and peninsulas the length of the coastline is considerable, its ratio to the area of the country reaching very high figures, greatly exceeding those of continental countries. (Child 1964:29)

A check on the ecological conditions in the island of Kagayan reveals that the natural requirements and preconditions for the successful growing of the coconut palm are well met.

First, Kagayan is within the tropic belt. It lies astride the line defining the 7th degree N. latitude. In the Philippines commercial coconuts are grown as far north as 18 degrees N. latitude.

Second, the highest elevation in Kagayan is Mt. Liran with a height of 1021 feet (thus not really a "mountain" by common standard). The rest of the land is coastal and lowland between hills and volcanic forms. The highest altitude where coconuts can be grown commercially is 2000 feet, although near the equator coconut palms can be found up to 4000 feet above sea-level.

Third, Kagayan has some type of volcanic soil. The island has six volcanic cones and two volcanic lakes; the larger cones are arranged like a castle's crown around the triangular shape of the island; the smaller cones are scattered in the island's interior. The soil in the lowland areas may have a good calcareous content as these places were built up gradually from an underlying coralline base.

Fourth, drainage in Kagayan is excellent. Unlike a large island, like Negros or Cebu, with a central camel-back ridge which forces rain water to

flow from the high center to the low edges and out to the sea, Kagayan's system of hills and volcanic cones are so arranged that rain-water flow over most of the land forms. In fact the confluence of three mountain-sides has resulted in a small natural lake, *Sapa:*, near the southeastern corner of the island-triangle.

Fifth, rainfall and moisture requirements are sufficiently present. Being a volcanic island, the under soil is porous volcanic stuff which easily absorbs and holds water needed by coconut roots. Rain is abundant and occurs at two intervals (cf. *uwan ta:un* and *uwan puli:an* in connection with the *huma* system). The dry season around March is relatively short.

Lastly, Kagayan is outside the typhoon belt. Destructive storms are extremely rare, the last one being in 1932, as we mentioned. Insolation is not a problem either. Being a small island without high mountains or heavy forest, plants are fully exposed to sunshine. And the loading of copra in small kumpits can be done in several convenient points around the three sides of the island (cf. the observations of Wilkes and Pigafetta again), thus facilitating the transit of copra from any point in the island's interior.

One final note on the *huma-kabbun* transition as seen on the biotic level. The very natures of the two plant species, rice (the major biotic form in a *huma*) and the coconut, seems to have tilted the balance in favor of the palm in the contest for ecological space. The life cycle of the coconut is of a much higher order than that of rice. Once coconuts have taken root in a particular habitat it is quite difficult to abolish them without man's intervention, whereas the ephemeral rice plants have a life cycle of three to five months only, and left to themselves are easily choked by weeds. One is sturdier and more tenacious, the other is delicate and needs constant care to flourish. Thus from the very nature of the competing species, the weak species was crowded out by the stronger one. Nor could the two co-exist within the same biotic community, since rice cannot grow under the shadow and with the tangled roots of the coconut.

Our investigation of the environmental variables in the emergent *kabbun* ecosystem has shown that the success of the coconut in achieving an ecological *niche* in the island was as much due to the economic, social, and psychological orientation of the human variables as to the favorable climatic and edaphic preconditions present in the island,<sup>19</sup> as well as to the very natures of the competing economic species themselves.

<sup>19</sup> Our check on the climatic and edaphic components favorable to the coconut's success in the island certainly needs instrumental verification. During our fieldwork there were no available measurements or information on these components. But we took steps to remedy the lack. Through our efforts and the cooperation of the Notre Dame Fathers, specially Father Crumpp, the Oblate Superior in Sulu, and Father Lacasse, the educator-missionary assigned in Kagayan, the Weather Bureau was induced to put up a rain-gauge station in the island in cooperation with the Notre Dame school. We also collected soil samples for analysis. And we hope in subsequent studies to obtain accurate temperature measurements.

### The New Trade: Kumpit

The new ecological balance, brought about by the substitution of the *bu-ma*, by the *kabbun* ecosystem, has its counterpart in the development of a new trade brought about by the substitution of wind power by inboard motors.<sup>20</sup> In our description of the pre-motorboat trade practices we emphasized the fact that the dependence on wind cycles conditioned the sea-roving habits of the early Jama Mapun. This conditioning was to such an extent that the people have developed a whole body of knowledge of winds, currents and stars, a body of knowledge which is nothing short of ethno-navigation. The Jama Mapun have developed a marine culture, moreover, which reflected itself even in their symbolic images and associations.

The motorized *kumpit* came after the establishment of the *kabbun*, for the use of the inboard motor became popular only after World War II. To date there are close to a hundred *kumpits* in Kagayan, some owned by the Chinese traders, many owned by the rich *hadjis* and ordinary Jama Mapun families. Many of these *kumpits* are being made in Borneo where skilled boat-makers and fine boat-building materials are easily available. Some Jama Mapun traders acquired their *kumpits* on credit from the *towkies* (Chinese trade-capitalists) in Borneo. The Chinese impose the condition that the islanders sold their copra exclusively to them while the *kumpits* were being paid back. Thus in one stroke these smart *towkies* got the goodwill of the islanders and assured themselves of a constant supply of copra.

The new trade does not differ much from the traditional one in its basic orientation. The Borneo-Kagayan trade alignment is a very ancient system, dating back doubtless to the Brunei-Manila trade relation existing before the Spaniards arrived in 1521. This is a fact that is often overlooked in trying to control the flow of goods from Borneo to the Philippines.<sup>21</sup> The coming of motorized vessels only meant the strengthening of the trading bond.

One characteristic of the new trade lies in the substitution of trade items. The routes and the network are basically the same; but the demands and consequently the supply of trade goods is relatively new. In the old *lomeh* the bulk of trade goods was rice, sea foods, forests products, cloth, and iron

<sup>20</sup> There seems to be no comparable shift from the old *ngusha* (fishing, gathering of marine resources) to an improved fishing technology. Or at least no appreciable reformation yet that is worth a separate treatment. Probably some entrepreneuring native might yet come up to fill this gap. At present many Jama Mapun are content to buy fish from professional Samal fishermen living in an anchorage behind the harbor at Lupa Pula.

<sup>21</sup> It is common knowledge that the copra trade with Borneo Chinese is linked with the import of cigarettes and other trade goods legally tagged as "smuggled." We are aware of a host of cultural, historical, and ethical problems involved in this aspect of the *kumpit* trade. Such problems, however, would require a much longer paper than his one.

implements; in the new *kumpit* trade the main bulk is copra, rice, and other basic commodities not available in Kagayan.

Another characteristic of the new trade, and the most basic from the ecological standpoint, is the fundamental difference between wind and engine power.<sup>22</sup> It used to take one to two days to sail from Kagayan to Borneo, a good wind willing; now it only takes from eight to ten hours. Instead of relying on the direction and prevalence of various winds familiar to the early traders, the new traders have become practically masters of their schedule and choice of ports, thanks to mechanical power. This technological innovation allows them to leave at any time whenever copra was available and to shift to any port—Zamboanga, Jolo, Palawan, or Borneo—depending on the current price levels of trade goods in these ports.

Finally, the new *kumpit* trade is giving Jama Mapun sailors a wider trading scope. Now many of them sell copra that come not only from Kagayan but from Palawan as well. Some traders have gone up and down the length of western and eastern Palawan buying copra to sell to Zamboanga or Borneo. The new trade may be seen as an outgrowth of the traditional Palawan-Kagayan barter trade in brass gongs and rice. The new trade, however, no longer deals through barter goods but in copra and money.

The transition to the *kabbun* and *kumpit* economy is another way of expressing that a change to a type of monetized market is underway. This monetary implication flows right out of the nature of a commercial plant: copra, in the economic context, is a cash crop. For one does not produce copra to eat but to sell for money with which to buy basic commodities which in a primitive economy would have been directly produced from the land or from native technology. Thus the Jama Mapun by embracing the cash-based *kabbun* virtually rejected direct food-production through the *buma*. The islanders now find that cash, as an economic substitute, is more versatile for acquiring the basic commodities they still need but no longer produce. And once their economic energy expenditure was committed to the *kabbun* pattern, it was difficult to back out due to the quasi-permanent nature of a coconut farm; they had little choice but to go on in this new monetized direction. The coming of motorized *kumpits* was therefore looked upon as a complement to the *kabbun* system, for the use of the motorized vessels enabled them to maximize their revenue from copra by adjusting to the price levels in various ports; it also enabled them to bring back consumer and luxury goods from Borneo to be sold in the Philippines where they command a high price, thus further increasing their revenue.

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<sup>22</sup> *Kumpit* owners are familiar with the standard brands of inboard motors, e.g. Yanmar (Japanese), Jute (German), Daiya (Japanese), MWM (German), Lester (English), Pearlbank (English), Southheron (Chinese), and Caterpillar (American). This is in order of popularity, according to one informant.

### Sociological Correlates

Many of the features attendant to socio-cultural changes and which are often observed in societies making the transition from a primitive to a peasant economy are found in the Jama Mapun society in Kagayan. We will not discuss all of these features here. But we would like to indicate a few of the outstanding ones.

One marked change is seen in the practice of reciprocity which was highly characteristic of the traditional Jama Mapun culture. In the *huma* system, a type of reciprocal labor used to be practised. One was called *gandangin* where a family invited its neighbors to help clean and plant its *huma*; the only obligation of the host family was to feed the helpers. The other practice was call *liyu-liyu* (literally, taking turns), a sort of mutual labor pool similar to a *bayaniban*, where the entire labor force shifted from farm to farm of each of the members until all were benefited. These two types of reciprocity patterns are gradually disappearing. With the new emphasis on money, hired labor is becoming the rule. If a family needs help in harvesting its *kabbun*, they hire helpers even from among their relatives who own *kabbuns* and those who do not but manage the farms. Thus even kinship ties are losing some of its economic functions.

A second marked change is the reversal in the trend towards education. When the public school was first introduced in the island between 1910 and 1920, many families fled to Borneo in fear of losing their Muslim religion in a school distrustfully attributed to a Christian government. This negative attitude, however, has taken a dramatic turn to the positive in the climate of a money economy. Many families are now allowing their children to enter school, but their reasoning is not that they have lost their distrust of the Christian government but that they see the economic advantage of schooling. Many of the high school students we interviewed are planning to become teachers, *mastal*, with the whole-hearted support of their parents. And the main reason is that teachers receive a monthly salary. Both students and parents argue that to be a *mastal* is a better way of making a living, better than working a *huma* or *kabbun*. In a *kabbun* one has to wait for three months before one can earn some money; a *mastal* receives money every month without soiling his hands husking and drying copra. Thus the movement towards education has a definite economic, i.e. money-conscious, underpinning. Of course the economic consideration is not true of all the students and parents, but many do think in these money-oriented terms.

A third marked change is the new value land has taken in Jama Mapun eyes. Formerly land in Kagayan was a free good; people could work on a *huma* practically anywhere and in any measure they pleased. Land litigation was unheard of. Now many cases in the municipal court in Lupa Pula involve land quarrel. Their attachment to the land has been greatly condi-

tioned, strangely enough, by the quasi-permanent nature of a coconut farm. For one can transfer his *huma* every year or two; but one is tied down to the land where his coconuts are growing. This new consciousness of land value and land ownership was also brought about by the official land survey conducted in the 1920's when free, communal land was parcelled out and assigned to definite families. In economic terms, land was transformed from a free good to a scarce commodity. A corollary to this transvaluation of land was the surprising number of immigrant families going to Palawan in search of land on which to start a *kabbun* with all its implication for money making.

Finally, division of labor along sexual lines made a smooth transition from the *huma* to the *kabbun* production mechanics. Men still do the heavier tasks: in the past, clearing the field, plowing; now, picking the nuts with long poles, gathering them to the drying places, and husking. Women still handle the lighter tasks: in the past, planting, weeding, harvesting; now, extricating coconut meat and drying them over slow fires.

#### Contrasts and Conclusions

Our discussion of the Jama Mapun ethnoecology was an attempt to understand the *huma* and *kabbun* systems not only as human economic specializations but also as natural ecological transformations. Both the *huma* and the *kabbun* are types of ecosystems, specific interlockings of the island population with their island-sea environment. We used both the ecological and ethnoecological frameworks, one as an objective assessment of the ecological balance between the Jama Mapun and the environment, and the other as a culture-based evaluation of the environments as perceived by them and as revealed in their symbolic world.

Our treatment of the food-quest as an aspect of the ecological balance of man with nature differs in some important respects from that of Geertz. His characterization and contrasting of the *swidden* and the *sawab* limited the ecological scope to the physical mechanics and nutrient cycles of the two ecosystems. The *swidden* was described as an inelastic but canny imitation of a forest, of a generalized ecosystem. In a *swidden* the ecological transformation goes with nature's grain, "not through altering its diversity index, but through more or less maintaining its over-all pattern of composition while changing selected items of its content; that is, by substituting certain humanly preferred species for others in functional roles ('nichies') with in the pre-existing biotic community" (Geertz: 1963:15).

The *sawab*, on the other hand, was described as an intensive, elastic reworking of the ecosystem through specialization, by changing the diversity index of a pre-existing biotic community. The emphasis was on the micro ecology of the *padi* field.

The sociological and demographic correlates of the two ecosystems were described in terms of volume: because the swidden is inelastic and dependent on the existence of diminishing forests, the man-land ratio is likewise limited; and because the *sawah* is elastic and open to intensification through improved technology, it can support a higher volume of human consumers.

Our contrast between the *huma* and the *kabbun* differs mainly in the wider meaning we gave to the term "environmental variables." For besides the climatic, edaphic, and biotic variables suggested by Conklin, we included such other variables as winds, currents, and stars which were significant in the total adjustment of the island population to their marine environment. In this wider interpretation we find Wagner's definition of environment as more useful, i.e. as a way of thinking about certain things in relation to human events.

Another important difference in our "two types of ecosystem" is the introduction of the money variable implicit in the cash-oriented nature of a *kabbun*. No amount of ecological analysis, if reliance is placed only on organic laws and nutrient cycles and energy relations, can explain the *kabbun*. The *kabbun* adjustment is one step away from direct subsistence activity, i.e. direct dependence on the land typified in the *huma*. There is no direct link, as in a food chain or in ecological pyramids (Odum 1959:59), between *kabbun* activity and food-acquisition. The link is provided by a cultural factor expressed in the concept of money. This intervening variable is a dimension of the superorganic which is always present in man's confrontation with nature, and is essential in understanding the *kabbun* (Forde 1934).<sup>23</sup>

The process of ecological transformations in Kagayan has important implications for the future of the island society. The cultural decision in favor of a cash crop like copra tied the Jama Mapun economy to the world market for coconut oil. The implication here is that henceforth the island economy has become a dependent variable to the laws of supply and demand and price stability for coconut oil in the world market. The *kabbun* opened a window for the islanders to the realities of twentieth century international trade. The new *kumpit* trade opened a second window to the larger society in Southeast Asia. Modern consumer goods are finding their way, through the active *kumpits*, to this little island near the middle of the Sulu Sea basin. Just as copra made the people suppliers for the world market, the new *kumpit* trade made them buyers of the latest manufactures from the industrialized world.

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<sup>23</sup> Aside from the ecological there are several productive frameworks for understanding this decreased direct dependence on the land as a result of technological improvement of man's exploitive industries. See Clifton R. Wharton, *Research on Agricultural Development in Southeast Asia* (1965), Cyril S. Belshaw, *Traditional Exchange and Modern Markets* (1965), and Norton Ginsburg (ed.), *Essays on Geography and Economic Development* (1960).

Gone is the life of the old *buma*, which through self-subsistence tended to isolate them. By rejecting isolationism they have entered into a new life of interdependence with the world society. Henceforth their life depends on, and contributes to, the wider life of the world at large.

### References

- BARNOUW, VICTOR. *Culture and Personality*. Homewood, Illinois: The Dorsey Press, Inc., 1963.
- BELSHAW, CYRIL S. *Traditional Exchange and Modern Markets*. New Jersey: Prentice-Hall, Inc., 1965.
- BLAIR & ROBERTSON. *The Philippine Islands*. Taipei Edition, Vols. 33 & 43, 1905.
- CHILD, REGINALD. *Coconuts*. London: Longmans, Green and Co., Ltd., 1964.
- CONKLIN, HAROLD C. *Hanunoo Agriculture in the Philippines*. Rome: Food and Agricultural Organization of the United Nations, 1957.
- . "The Study of Shifting Cultivation," *Current Anthropology*, Vol. 2, No. 1 (February, 1961), 27-61.
- FORDE, C. DARYLL. *Habitat, Economy and Society*. London: Methuen & Co., Ltd., 1934.
- HUKE, ROBERT E. *Shadows on the Land*. Manila: Bookmark, 1963.
- GEERTZ, CLIFFORD. *Agricultural Involution*. Berkeley and Los Angeles: University of California Press, 1963.
- GINSBURG, NORTON, ed. *Essays on Geography and Economic Development*. Chicago, Illinois: University of Chicago Press, 1960.
- JOCANO, F. LANDA. "Twenty-Three Place-Name Legends from Antique Province, Philippines," *Asian Studies*, Vol. 3, No. 1 (April 1965), 16-40.
- KRECH, DAVID, et al. *Individual in Society*. New York: McGraw-Hill Book Co., Inc. (International Student Edition), 1962.
- LAMB, ALASTAIR. "Early History," in *Malaysia*, Wang Gungwu, ed. Singapore: Donald Moore Books Ltd., 1964.
- LECLAIR, EDWARD E., JR. "Economic Theory and Economic Anthropology," *American Anthropologist*, LXIV (December 6, 1962), 1172-1203.
- LONERGAN, BERNARD. *Insights: A Study of Human Understanding*. New York: Philosophical Library, Ltd., 1956.
- MAJUL, CESAR A. "Chinese Relationship with the Sultanate of Sulu," in *The Chinese in the Philippines*, Alfonso Felix, Jr., ed. Manila: Solidaridad Publishing House, 1966, pp. 143-149.
- ODUM, E.P. *Fundamentals of Ecology*. Philadelphia and London: Saunders, 1959.
- OUTRAM, R. "The Chinese," in *The Peoples of Sarawak*, Tom Harrison, ed. Kuching, Sarawak: Government Printing Office, 1959, pp. 115-128.
- SAPIR, EDWARD. *Language*. New York: Harcourt, Brace & World, Inc., 1929.
- WAGNER, PHILIP. *The Human Use of the Earth*. New York: The Free Press of Glencoe, 1960.
- WHARTON, CLIFTON R. *Research on Agricultural Development in Southeast Asia*. New York: The Agricultural Development Council, Inc., 1965.