

# Andean Indigenous Knowledge Related to Biodiversity: Agriculture, Pastoralism, and Utilization of Wild Camelids and in Peru

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## 1. Introduction

First of all I would like to point out the importance of the Central Andes for the study of the relationship between environment and culture, that is, between biodiversity and cultural diversity. The Central Andes, being highlands situated in the tropics, has the greatest diversity of natural environment, which varies from the tropical to the frigid zone, according to the altitude. People in this region have adapted to the diverse environment and have made the maximum use of it.

In this article I would like to demonstrate a concrete image of the relationship between biodiversity and cultural diversity, focusing on the Andean indigenous knowledge related to the utilization of the ecological environment.

First I will describe pastoralism and agriculture, mainly the case of the Puica District, Department of Arequipa, where I have been engaged in fieldwork many times since 1978 (Fig.1). Then I will treat the cases of Q'ero District and Marcapata District, Department of Cuzco, as a comparative study.

Andean people domesticated many kinds of plants and have been cultivating them in the Andean valleys exploiting the diverse altitude below approximately 4,000 meters. As for the utilization of fauna, camelids are the most important. There are four kinds, llama and alpaca as domestic animals, and guanaco and vicuña as wild animals. The Andean people have long been raising domesticated animals on the high plateau situated over 4000 meters above sea level.

A kind of collective hunting of wild camelid called *chacu* was practiced at the time of the Inca Empire. Particularly vicuñas have extremely fine wool, which was used to make clothing for the Inca emperor and his royal family. When a vicuña was captured, it was not killed but released alive after its wool was cut. Thus it was an excellent system for the use and conservation of wild animals. It disappeared after the Spanish conquest, and the number of vicuñas decreased due to uncontrolled hunting. However, it was revived in 1993 after a process of adaptation and reorganization of the Inca tradition.

So I will examine the revived Inca tradition or *chacu*, which I observed at Pampa Galeras, Department of Ayacucho in 2002, paying attention to the process and factors of its revival and its significance. It is an interesting case of the revival of ancient traditional knowledge about the conservation of biodiversity in the context of modernization and globalization. Also it is interesting to examine the characteristics of this Andean traditional culture.

Then I will analyze the characteristics of Andean traditional culture related to the utilization of the ecological environment, from the viewpoint of cultural anthropology.

## 2. Pastoralism and Agriculture in the Andes

### A. Full Time Pastoralism: the Case of the Puica District in the Southwestern Highlands of Peru

The District of Puica, Department of Arequipa, Peru, is located at the western part of the high plateau in the southern Central Andes. Cotahuasi, Puica and their surrounding areas consist of vast plateaus with an average elevation of 4,000-5,000 meters above sea level and deep canyons carved into the plateaus (Fig. 2). Here plateaus and canyons display a distinct topographic discontinuity (Kariya et al. 2005: 842).

Puica extends about 30 km both from south to north and also from east to west. It is located in an area of 3,000 to 5,000 meters above sea level. Most of the area (97%) is highland plateau at more

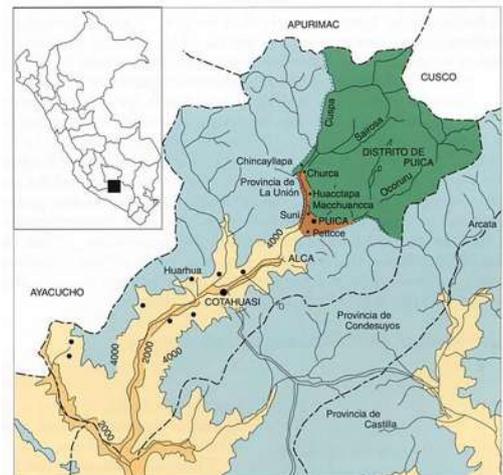


Fig.1 The location of Puica District

than 4,000 meters, and the rest is valley (Fig.3). The plateau is beyond the upper limit of the agricultural zone, but it has rich grasslands (Fig.4). Nearly 500 pastoralists live there. In the valley where the climate is relatively warm, about 2,000 farmers live and cultivate mainly potatoes and maize on terraced farmlands (Fig.5).

The ecological environment of the Central Andean highlands is thus divided into two ecosystems, that is, the plateau and the valleys, and people in each area engage in pastoralism and agriculture, respectively. The District of Puica thus has two communities, namely, a pastoral community and an agricultural community, and these two have a close reciprocal dependence on each other.

People in Puica are raising llamas and alpacas on the high plateau. The llama is the biggest Andean camelid, a little bigger than the wild guanaco, and is used for transport. A mature one can carry on its back up to about 40 kg and travel about 20 km a day. A caravan is usually composed of from 10 to some tens of llamas (Fig.6).

Alpacas are smaller than llamas. The quality of alpaca wool is superior to that of the llama in its strength, warmth and texture. Therefore the purpose of alpaca herding is for wool production (Fig.7). Wool was once an important article in trading with farmers for agricultural products, but as alpaca wool began to be exported abroad, it has come to be sold mainly for cash since the 1960s.

In Puica, the pastoral people tend to form extended families, each of which keeps about 300 to 400 domestic animals (up to 2,000 as a maximum), 70 or 80% of which are alpacas, with the rest being llamas.

Native herders in the Andes have never milked their domestic animals. They eat the meat of the animals, but it is not their principal food. Their principal foods are agricultural products, such as potatoes and maize, just like those of the neighboring farmers. They have two traditional ways of gaining agricultural products, which I will mention in the next section.

Pastoral people on the high plateau of Puica mostly live in the U-shaped valley, which has a scattering of rich alpine moors, best suited for pasturing alpacas (Fig.8). Their houses together with surrounding pastureland are called "estancia". The average size of each estancia is about 20 km<sup>2</sup> in Puica. People recognize the boundaries by natural indexes such as rivers, rivulets, ridges, big rocks, etc.



Fig.2 Geomorphic features of Puica and its surroundings (made by Kariya, Y.)



Fig.3 Puica Valley



Fig.4 Puna (U shape plateau) of Puica with alpine moor, where alpacas are pasturing.



Fig.5 Farmers in the terraced field



Fig.6 Llamas carrying agricultural products



Fig.8 Alpacas are pasturing at alpine moor



Fig.7 Herders are cutting wool of alpaca



Fig.9 The main domicile of the estancia Chukipuallu

Pastoralists usually have two domiciles within their estancia. *Chuquipuallu* is an estancia at 4,500 meters (Fig.9). The main domicile of it is located near the rivulet, which flows from the slopes of the U-shaped valley, so it is easy to get water for daily life. The rivulet sustains the alpine moor plant community throughout the year, upon which the alpaca is dependent for optimum health and reproduction<sup>1</sup>. There are six stone houses and some big and small stone corrals for livestock at the main domicile. The big corrals, called *waran*, are for keeping the livestock at night and the small corrals, called *rutuna cancha* (corral for cutting), are used for cutting alpaca wool, loading and unloading the freight of the llama-caravan, or for rituals involving livestock. These corrals are small so that the herders may control the movement of the domestic animals inside of them.

In addition to the main domicile, there is a sub-domicile called *astana*. There is only one house there but there are many corrals for the livestock. The sub-domicile is on top of a swell (gently sloping hill). The distance between domiciles is only a little more than 1 km, and between these places, some of the family members and all of the livestock engage in seasonal migration.

This seasonal migration is far different from the pastoral transhumance practiced by Himalayan yak herders, and is limited to the area of one "estancia". There is hardly any difference between the altitudes of these places. During the dry season (May to October), they move about every month for grass rotation between these two houses. During this season, the domestic animals sleep inside a half opened corral called *waran*.

During the wet season from November to April (it is summer, but it often snows on the plateau), the livestock are kept inside a corral at the sub-domicile, which is located on a well-drained swell. The wet season is the time of lambing of domestic animals. For protection of the newborn animals from

<sup>1</sup> Efficient mastication, fine fleece, and resistance to disease are attributed to pasture composed primarily of 'k'unkuna (*Distichia muscoides* and *Plantago rigida*), found in the high altitude moors (Webster, 1973: 120). Llamas, with their broader tolerances of forage and terrain, are sometimes pastured in the intermediate or lower zones when their services in burden bearing are needed locally (Webster, 1973:121)

foxes or condors, the livestock are all kept in a big, neatly closed corral called a *chaupi cancha* (central corral) at night time. There are four central corrals and the herders rotate them. They also rotate the three small corrals called *rutuna cancha*.

Andean camelids have a habit of leaving their dung in the same place, so in the wet season the ground of the corral gets muddy with the mixture of dung and there is a risk of pollution with contagious bacteria. Newborn domestic animals have a high mortality rate during the wet season, so it is important to maintain well-drained corrals in order to reduce the death rate. This is the reason why there are many corrals for rotation at the sub-domicile.

Thus the seasonal movement of the Andean herders is of a micro-scale and its most important object is to secure better conditions for the corrals in the wet season. So we can consider the Andean pastoralism as sedentary, as I will discuss later.

### *B. Agriculture in Puica and the Relationship between Herders and Farmers*

In the valley of Puica District, there are two types of traditional field for cultivation: *Laime* and *comunidad*. *Laime* is the communal land which has a system of rotation of crops and fields. Each village has its own *laime*, which is divided into six or seven sectors. The most important product is the potato. Potatoes are planted in one sector (here we call it sector A) which has been fallow for a few years. The next year potatoes are planted in another sector (sector B) which has been fallow, too. And in the sector A where potatoes were harvested, *olluco* or *oca* is planted. In the third year, potatoes are planted in the sector C, and broad beans or quinoa are planted in the sector A. In the fourth year, barley is planted in that sector A. According to this system of rotation, among six or seven sectors, four are in use and the others are out of cultivation and are used for the pasture of cows, sheep and horses raised by farmers. Each sector is wholly surrounded by a fence made of stones. Before planting potatoes, the farmers repair the fence so that animals may not enter into each sector of the *laime*. In every sector each farmer has his own terraced field, which is handed down from parents to children and cannot be sold freely. In *laime*, all the farmers plant and harvest on the same days.

The *laime* is located between 3,500 and 4,000 meters above sea level, and the major part of it is without irrigation. Below the *laime*, there is the other type of communal farmland or *comunidad*. Like *laime*, all the territory of a *comunidad* is surrounded by a stone fence and farmers plant and harvest crops at the same time, but in the *comunidad* they plant mainly maize every year without rotation and fallow. The system of land tenure is the same as that of *laime*; each farmer occupies and uses his or her own field, but cannot sell it.

Andean herders in the high plateau do not use the milk of camelids. They eat the meat, but they cannot eat much meat because of its value. Therefore, their main diet is agricultural products as with farmers. Then how do the full-time herders, who do not have farmland, obtain crops. There are two traditional ways. One is the service of transportation of the crops of farmers from their terraced field to their houses in the village. The other is some kinds of exchange of products.

In the valley, the farmers harvest potatoes and other tubers in April and maize in June. At the time of harvest the herders go down to the village and stay one or two months there. The herders carry the crops on the back of their llamas, as requested by some farmers. If the herders carry ten sacks of crops, representing the work of a whole day, they usually receive one sack of crops. Thus, if they provide transport for several farmers, they can get considerable quantities of crops. They can obtain a complete range of agricultural products, exchanging the meat of camelids for the crops. Farmers practice these activities mainly in the Puica valley, but some go to other valleys, even to distant places which are rich in the agriculture.

The relationship between herders and farmers is not limited to economic aspects but also social aspects, one of which is the network of friendships between them. The exchange of pastoral and agricultural products is realized through that network, not in the open market. For herders it is very important to be friends with farmers who provide the lodging and spaces to keep llamas temporarily in



Fig.10 Catholic procession of a saint accompanied by llamas

villages to get crops. Herders offer gifts of meat and fat, that are important not only as food but also for offering in rituals, medicinal plants, etc.. The friendship once established is passed on from father to son. Also it often converges to *compadrazgo*, that is the fictitious kinship relationship which is formed by catholic rituals such as baptism and marriage. *Compadrazgo* is the relationship (Fig.10)



Fig.11 Qaperu with their llamas

between a godfather and the father of a godchild.

Some herders engage in complimentary agriculture. There are considerable rates of intermarriage with farmers among herders in *Cuspa* and *Sairosa* (these two annexos compose *Uchuy Aillu*) which are near from farmland in the valley, but little among herders in *Sairosa*<sup>2</sup>.

The feasts of catholic saints are important occasions to strengthen these social relationships. Each year they nominate persons called *carguyoq* or cargo holders who assume *cargos* or roles in the feasts. There are four main cargos; *alferez* who organize masses, requesting the services of a priest and organizing the procession, *torero* who carries out a

bullfight using farmers' cows, *altarero* who arrange temporary altars in the plaza of the church and the streets where the procession passes, and *qaperu* who bring their own llamas to accompany the procession (Fig.11). The system of cargos is a kind of 'redistribution', because a *carguyoq* does not receive any remuneration, but on the contrary should spend a lot offering a banquet at the feasts, and in return he can gain prestige and influence in the community<sup>3</sup>.

Herders assume the cargos, except that of *torero* which is carried out only by farmers, in the feasts which are held in the village of Puica. When a herder assumes a cargo, he should come down to the village and offer a banquet, inviting all the inhabitants, too. The *carguyoq* have many friends who participate in the banquet and help him with some contributions of money. Herders have many friends among farmers in this way.

### C. Agro-pastoralism: the Case of Q'ero and Marcapata in the Eastern Cordillera Flank in Peru

The Q'ero region is located along the *ceja de montaña* (eyebrow) of the high Cordillera, which overlooks the upper reaches of the Amazon basin to the north and east (Webster, 1973: 118). In Q'ero a form of agro-pastoralism can be observed, which is entirely different from the case of Puica (Fig.12).

The distance between the east and west of Q'ero is 60 km and the altitude of the living zone ranges from 4,800 meters to 1,400 meters<sup>4</sup>. At the four valley heads of Q'ero, there are hamlets of stone houses with about 370 inhabitants (Fig.13) (Webster 1983: 32). People call these main domiciles *Qatun wasi* (big house), though the houses themselves are not big. Each of them is composed of a permanent house, a storehouse and some stone corrals for the livestock.

Where the four valley heads converge (at 3,400 meters), there is a central settlement called *Qatun* (large) *Q'ero*. There are stone-pile houses, a small Catholic church and a school. However, this village is usually deserted. People stay in *Qatun Q'ero* only for the work involved in temporal agriculture. It serves also as a gathering point for meetings, feasts and rituals at certain times of the year and is characteristically silent and vacant the rest of the year (*ibid.*:120). In these intermediate altitudinal zones, potatoes are the most important product.



Fig.12 Q'ero agro-pastoralist

<sup>2</sup> Some researchers provide information that intermarriage between herders and farmers is rare, for example, the case study in Provance of Cailloma, Department of Arequipa (Casaverde 1977: 178)

<sup>3</sup> The detail of the cargo system in Puica is discussed in my previous articles (Inamura 1986)

<sup>4</sup> Núñez del Prado, 1983:14-15; Webster says that the altitude of the living zone ranges from 2,000 to 4,800 m (Webster, 1983:35-39)

Besides these settlements, there are cottages 25 km away from *Qatun Q'ero* down in the tropical zone, called *Pushkero*. The area between *Qatun Q'ero* and *Pushkero* is a very steep canyon and there are few cultivated fields. In *Pushkero*, maize is the main product and other tropical products are also cultivated. The wooden houses in *Pushkero* are used only when needed, and there are simple tools for daily life in them but no foods are stored (Núñez del Prado, 1983: 16-17).

Thus, the people of Q'ero make use of three different ecological zones, each family owning different houses in each. They move quite actively among these three zones. It should be stressed, however, that this vertical movement is made for the purpose of agriculture and is done only by some members of the family. They establish their primary domicile in a hamlet in the herding zone, and move their family to a camp around the intermediate and lower zones as necessary to maintain their cultivation regimes. The routine tasks of herd supervision are usually assigned to women or children (Webster, 1973:119).

As llamas have good adaptability to foods and environments, they are used for carrying the potatoes or fertilizer between the valley heads and *Qatun Q'ero*. Also, as the way to *Pushkero* is rather steep, the llama is indispensable as the only means for transporting the maize (Webster, 1983: 37). However, the purpose of the movement of llamas is for transportation and not for pasturage. The pastoralism is basically sedentary and the vertical movement of the domestic animals (llamas) is done in accordance with agricultural cycles.

The case of Marcapata is similar to Q'ero, though the village at the middle altitude is occupied by misti or mestizo people who are permanently there. Yamamoto provides us with detailed data about the form of utilization of the environment, especially with agriculture, in the Marcapata district, that I summarize below (Yamamoto 1982: 41-47).

The effects of altitude on temperature and moisture produce various ecological situations as well as natural resource assemblages. Within the area of the District of Marcapata are six principal ecological zones. The alpine rain tundra (5000-4200 m) is the highest life zone of this district where temperatures are too low to support agriculture. The vegetation consists of alpine sedges and grasses which provide natural pasture for llama and alpaca. The alpine moors in the valley bottom, in particular, are well-suited to the alpacas, owing to the animal's narrower habitat requirements. The llama is more tolerant of varied pasture and rugged terrain, so that it can be pastured over a wider altitudinal range, from the alpine rain tundra to the *ceja* vegetation zone. Of these herd animals, the llama is important in agricultural activities as the indispensable beast of burden available to transport the harvested maize and potatoes in the steep valleys.

The subalpine wet paramo (4200-3600 m), which is characterized by *ichu* grass (*Stipa* sp.) and some shrubby areas, lies below the alpine tundra zone. It is somewhat warmer than the higher zone. Since snow or frosts occur sometimes in the upper part of this zone, frost-resistant species of potato, such as *papa ruki* (bitter potato) are grown toward the upper limits of agriculture.

People process *papa ruki* to make *chuño* or frozen dried potato. The way of making *chuño* is as follows: They leave potatoes in the open air for a few days. The potatoes get frozen at night, get thawed in the daytime by the strong sunshine of the high plateau, and then turn spongy. People step on the spongy potatoes to press them and leave them in the open air, and then they become very small and dry.

*Papa puna* (puna potato) is the general term for a wide variety of potatoes grown in this zone, except for *papa ruki* grown in the upper zone. The category *papa puna* contains at least 5 distinct species (*S. ajanhuiri*, *S. phureja*, *S. goniocalix*, *S. stenotomum* and *S. andigena*), and as many as 100 local varieties. The other tubers, *oca*, *oiluco*, and *isaho* also include several varieties. These tubers, plus potatoes, provide the bulk of the year-round dietary staples for the people. Potato fields in fallow are used frequently for grazing llamas and sheep. Most *campesinos* live in dispersed settlements in this zone.

The *ceja de montaña* (3,600-2,600 m), characterized by small trees and shrubs, is a zone of cloudiness which leads to the formation of moss forest in the lower parts. Pueblo Marcapata is



Fig.13 Q'ero main settlement

located at an intermediate altitude (approximately 3,100 m) in this zone and is situated just between the zone of maize cultivation and that of potato.

Potatoes grown in this zone are grouped under the general term *papa maway*. This category contains fewer varieties than *papa puna*, but *papa maway* is characterized by early maturation, by virtue of cultivation in the lower and warmer zone. As with the potato, the people of Marcapata divide most local varieties of maize cultivated from this zone to that of the subtropical rainforest into three groups which are adapted to separate altitudinal environments. The three groups of maize are *llaqta sara*, *wari sara*, and *yunka sara*.

The data from Marcapata shows us that, not only are a wide variety of species domesticated in the Central Andes, but also that an extremely wide variety of breeds of agricultural products have been created, especially of potatoes and maize adapted to the variety of altitude.

#### *D. Sedentary Pastoralism and Mobile Agriculture in the Andes*

In the Old World, pastoralism is practiced mainly in dry or cold areas and it is commonly assumed that such traditional forms of pastoralism imply movement. In the Central Andes, however, sedentary pastoralism has been established. While pastoralism is sedentary, agriculture is mobile in the Central Andes<sup>5</sup>. On the other hand, in the Himalayas, vertical pastoral transhumance is an important element in pastoralism. What makes for such a difference between these two areas?

In the Andean highlands, there is little change in temperature throughout the year, though there is a big daily change in temperature. The ecological conditions are rather favorable and stable for domestic animals adapted to low temperature. In the Himalayan highlands, on the other hand, there is a big temperature change over a year and there is a distinct cold winter.

The Andean pastoralism has two unique features, its sedentary nature and absence of milking. In the Central Andean highlands, there is little change in temperature throughout the year. On the other hand, there is a remarkable dry season, but alpine moors are maintained by glacial seepage throughout the year. The strong sunshine promotes the growth of grass there. For these reasons pastoral transhumance is not required and it is possible for the livestock to stay firmly in a limited place throughout the year.

Being tropical highlands, the Andes have a great diversity of ecological conditions according to the elevation within a small horizontal distance. This condition rather encourages the farmers to move vertically and maximize the use of the different elevations to produce a variety of crops.

The agricultural zone and pastoral zone are substantially divided, and yet they are adjacent to each other. This ecological factor has created a stable relationship between pastoralists and farmers (or pastoralism and agriculture), reinforced with other factors; llamas as means of transportation, alpaca wool for exchange and dung as fertilizer. Andean pastoralists have been able to get agricultural products for use as a staple in their diet because of all these conditions. It seems to be the reasons why they haven't needed to use milk for their diet. The characteristics of Andean pastoralism mainly result from ecological conditions.

The Central Andes lie between extreme eastern wet and western dry climates, which have created two types of pastoralism. The dryness of the western plateau affects the 'division' more. Concretely speaking, in the case of Puica in the western highlands, the plateau area is separated from the valley by barren dry land, which forms a clear ecological and social barrier between the pastoral society and the agricultural society. In contrast, the humidity of the eastern slope of the Andes brings about environmental continuity between the agricultural and pastoral zones, and it affects the 'adjacency'.

The characteristics of Andean pastoralism result from these two basic factors of 'division' and 'adjacency' between the plateau and the valley. In the case that 'division' has a strong effect, it results in a form of full-time pastoralism and in the case that 'adjacency' has a strong effect, a form of 'agro-pastoral complex' results.

Ecological stability made it possible to establish sedentary pastoralism. The transportation function of the llama established a close relationship between the full-time pastoralists and the farmers in the western highlands, while on the other hand, it developed an agro-pastoral complex on

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<sup>5</sup> As for the seasonal movement in the Andes, some researchers have suggested pastoral transhumance (Custred, 1977: 68; Flores, 1975:7-8; Orlove, 1977a: 84, 1977b: 20). However, there is no detailed case study reported regarding it. The results of my research showed that there was no evidence of a clear type of pastoral transhumance in the Central Andes as in the Himalayas, except the movement of llama caravans for transporting and trading.

the eastern slope of the Central Andes, where the llama was used for transportation of agricultural products for the farmers (agro-pastoralists) themselves. In addition to the 'llama's transport potentiality', the 'production of alpaca wool' strengthened economic relations between the full-time pastoralists and the farmers in the western highlands. Moreover the 'adjacency' and 'sedentariness' of the pastoralists created a close relationship between the full-time pastoralists and the farmers, which led them to form a structural relationship through various social activities (Inamura 1986). In the Andes, the ecological difference between the east and the west brought about two forms of adaptation. But in both cases, the pastoralism is sedentary, and the vertical movement of the agro-pastoral complex is required only for the sake of agriculture<sup>6</sup>.

### 3. *Chacu*: a Kind of Collective Hunting without Killing Animals

#### A. *Chacu in the Ancient Inca Empire and the Process of its Revival*

It is known that a kind of driving and enclosing hunt called *chacu* was practiced under the rule of the Inca emperor. It is recorded in the chronicles of El Inca Garcilaso de la Vega (Garcilaso de la Vega 1966:325-326).

"At a certain time of the year, after the breeding season, the Inca went out to the province that took his fancy, provided that the business of peace and war permitted. He bade twenty or thirty thousand Indians present themselves, or more or less according to the area that was to be beaten. These men were divided into two groups, one of which went out in a line to the right and the other to the left, until they had made a great enclosure which might consist of twenty or thirty leagues of land, or more or less according to the area agreed on. They followed the rivers, brooks, and valleys that had been fixed as the limits for the year's hunting and avoided entering the area set aside for the following year. They shouted as they went and observed all the animals they started. It had already been arranged where the two lines of men were to come together to close the circle and shut in the game they had collected. They also knew from observation where the beasts had stopped, and the country they chose was clear of trees and rocks so as to facilitate the chase. Having enclosed the game, they tightened the circle forming three or four rows of men, and closed in until they could take the game with their hands.

With the game they caught lions, bears, many foxes, wild cats, which they call *ozcollo*, of two or three kinds, genets, and other similar creatures that do harm to game. They were all killed at once in order to rid the country of such vermin. We do not mention tigers because they were found only in the dense forests of the Antis. The number of deer of various kinds and of the large sheep they call *huanacu*, with coarse wool, and of the smaller vicuña, with very fine wool, was very considerable. Naturally in some areas they were more plentiful than others, but often more than twenty, thirty, or forty thousand head were taken, a very fine sight which gave rise to much rejoicing. That was in former times. Those in Peru can say how few have escaped the destruction and waste caused by the arquebus, for guanacos and vicuñas are now hardly to be found except in places where firearms have not reached.

All the game was taken by hand. Female deer of all kinds were at once released, as there was no wool to be got from them. The old ones which were past breeding were killed. They also released such males as were necessary as sires, picking the best and largest. The rest were all killed and their

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<sup>6</sup> Some types of pastoral migration may exist in the Central Andes, for example, as Orlove says "The pattern of movement of the herd animals corresponds to the availability of pasture. The herds are moved to a lower area (3,600-4,100 m) early in the rainy season; coinciding with the appearance of the new low grasses and plants in moist areas and around *ichu* clumps. . . . These plants all begin to dry up after the rain ends. The animals spend the dry season at higher altitudes, between 4,100 and 5,200 m, where pasture can be found in the *bofedales*. This pattern of movement allows the animals and the herders to escape the hailstorms and heavy snows in the high country during the rainy season. The exposure to the hard, dry, rocky surfaces in the upper zones also lowers the frequency of certain hoof diseases and parasites (Chuquibambilla, 1939:11; Moro and Guerrero, 1971: 54-56)". But we should pay attention to the difference between this case and the cases of the Himalayas. Orlove says that the herders and their livestock go down in the rainy season (warm season) and go up in dry season (cold season), whereas in the Himalayas the cycle of the seasonal movement is the reverse. I do not deny any possibility of seasonal pastoral movement in the Central Andes, as I have discussed the small scale migration in the Puica's case, mainly to secure the corrals of good condition. I characterize the pastoralism in the Central Andes basically as sedentary, because ecologically it is possible to keep the livestock within a limited area in the plateau or valley heads stably throughout the year.

meat was divided among the common people. The guanacos and vicuñas were shorn and then also released. A tally was kept of the number of wild sheep as of the domesticated, and recorded on the *quipus*, the yearly accounts, noting the different species and the number of males and females. They also kept the score of the animals they killed, both noxious and useful: knowing how many head had been killed and how many released alive, they could tell at what rate the game had increased at the next hunt. ”

After the wool was cut, vicuñas were released alive and the number of captured animals was recorded in *quipu*, an Inca method for counting using knots in ropes. As for deer, male deer were usually killed for eating, but female deer and a fine kind of male deer for breeding were released alive. Thus, under the control of the Inca emperor, the wild animals were not only used rationally, they were also protected and preserved.

In the Andean region in old times, it was inhabited by a far greater number of wild animals. After the Inca Empire was conquered and destroyed, the number of wild animals decreased drastically due to excessive hunting. In 1965 the number of vicuñas inhabiting Peru was less than 10,000 and it was pointed out that they were on the verge of extinction.

Government planned to establish a national reserve at Pampa Galeras (land at a height of 4000 meters) and in 1967 the national reserve was established. Then, other communities joined the project for the preservation of vicuñas and the reserve was extended to 75,000 ha (Wheeler et al. 1997:284).

From 1972, Germany supported the project by equipping infrastructure and an observation system in the reserve. However, the conflict between the government and people who had raised domestic animals and were forced out of the reserve, got worse, and the German supporting group stopped its support in 1981 (ibid). Moreover, the ultra leftist group, ‘Sendero Luminoso’ attacked the reserve and control was totally lost. In the latter half of the 1980's, ‘Serdero Luminoso’ expanded its power and illegal hunting of vicuñas was practiced to gain funds. General illegal hunting also came to be practiced more and more and the number of vicuñas decreased.

Thus, in the 1990's, under the Fujimori government when the public security of the country recovered, the rational use of vicuñas came to have legal foundation. Peru had ratified the international treaty of CITES (Convention on International Trade in Endangered Species of wild fauna and flora). In 1987 however, category I (the commercial trade in endangered species was prohibited) was admitted to be changed to category 2 (the commercial trade is allowed but an export license or certification is necessary). Thus international trade was opened to vicuñas wool.

In 1993, President Fujimori was invited to the national reserve of Pampa Galeras and a festival with *chacu* and traditional folk music and dance was held. Since then, the *Gran chacu* festival has been continued every year on June 24. In 1994, IVS (the International Vicuña Consortium) was established through the cooperation of Italy and Peru, and the vicuña wool was sold to IVC through SNV (Sociedad Nacional de Vicuñas).

#### *B. The Chacu Revived in Modern Times and Gran Chacu, the Festival of Vicuñas at Pampa Galeras*

By taking the Pan American highway, Nazca, a place famous for gigantic ancient pictures on the ground, is 430 km along the coast of Pacific Ocean to the south of Lima. After a 2 hours drive from Nazca, one gets to the Andean plateau in the Department of Ayacucho with a height of 4000 meters. The distance from Nazca is 90 km, and the place is called ‘Pampa Galeras’, the famous vicuña reserve.

I stayed in the Lucanas village near Pampa Galeras in June of 2002 and could observe the actual *chacu*. Capturing of vicuñas on June 24 is called *Gran Chacu* and is carried out as one of the events of the festival.

*Gran Chacu* began in the evening of June 23 as the eve of this festival in the public square of Lucanas village. A temporary stage was built for the performance of various Andean folk music. Stalls were lined up in the square and it became more and more crowded towards the evening. The most impressive event was the joint performance of a young people's rock band and the traditional acrobatic dance of Department of Ayacucho called ‘Danza de tigras (Dance of



Fig.14 Inca performed by a teacher

scissors)'.

On June 24, at 10 o'clock in the morning, people left by car one after another from Lucanas village to attend the festival. Driving in the direction of Nazca for 30 minutes, the pivot of the fan, a round-shaped trap (fence) was seen, which had been set up as a capturing point to gather the vicuñas. 4 km ahead was a place to begin driving the animals. Soon, a crowd of people began to move toward the trap to gather the herds of vicuñas. After about one hour, some hundreds of vicuñas were gathered inside the nylon net fence.

After a while, young boys and girls disguised as Inca soldiers or maiden servants for the *Inti* (Sun God) began to dance inside the round enclosure. Then the "Inca emperor" appeared and climbed up to the stone altar which had been made at the center of the enclosure (Fig.14). Then after him, the empress also went up to the altar. A pair of vicuñas were carried to the altar and their ears were cut. The blood was then poured into a cup. 'The Inca emperor' took the cup and lifted it up to the *Inti* and drank it up. Then they caught some vicuñas, cut their wool and offered it to the Inca emperor (Fig.15).

This ceremonial performance was played by teachers and students of Lucanas *colegio* (junior and senior highschool) and the costumes were handmade by the students' mothers. When the ceremony was over, the spectators went toward the headquarters of the Pampa Galeras reserve. The vicuñas whose wool had not been cut yet were left inside the enclosure until the next day, when they were sheared and then released alive. There were also stalls around the reserve's headquarters. A special stage was also set up in the courtyard and they played folk music and people danced in a circle till late at night.

I asked a teacher questions regarding the participation of the students. She answered, " I came to this *colegio* as a teacher in 1999. From that year, Lucanas school began to participate in the performance of the Inca ceremony in the *Gran Chacu*. The students are doing better and better each year. They are studying the Inca culture little by little and are adding new elements to the ceremony. By participating in this festival, children began to love their community much more than before and came to feel that they were members of the community. When they perform the play at the time of the *Gran Chacu* festival, no one complains about the thin costumes, though it is quite cold up at the high plateau. Before the *chacu*, teachers teach the students about the history of this region. Then the students really learn with great zeal. They themselves go to see the older people to get more information and talk about their new findings. It really amazes me. They are trying to revive the Lucanas traditional customs. They would like to collect the legends and mythologies of Lucanas and try to pass them on to the next generation.

### C. The Chacu for the Village School

Three days after the *Gran Chacu*, a special *chacu* for the Lucanas *colegio* took place. The three trucks arrived carrying the students arrived at Pampa at 9:20. The nylon made net trap had already been placed the previous day. Looking from above, the trap looked like a gigantic V form or a Japanese fan half-stretched. A lot of pillars were set up on the ground and the nylon net was put on them.

After the leader explained the position of the groups that would drive the vicuñas into the enclosure, the driving groups departed in 2 different directions in 2 separate trucks along the outside of the net that was stretched in a fan shape. Pampa is flat and one can get to most places by truck. One group which would be driving the vicuñas from the center point went by foot. I joined the walking group and could observe the scene of the gathering of vicuñas.

I waited for the students to come driving the animals behind the rock outside of the middle part of the net. Soon the vicuñas appeared on the pampa from



Fig.15 Inca and the empress offering Vicuna wool to the Inti (Sun)



Fig.16 People driving vicunas

the far hill, coming from the opened side of the fan. After about one hour, when the teachers and students came approaching, the herd of vicuñas also came running around. They drove the vicuñas, holding the colorful pieces of cloth tied by rope among them (Fig.16).

At 12:10, vicuñas were gathered in the black nylon net (Fig.17). Teachers began doing *tinka* with wine. The Quechua word *tinka* refers to the Andean custom in which liquer is offered to Pachamama, the Goddess of the land and people drink liquer together.

At 12:45, wool cutting began. By the side of the enclosure, three sets of electric clippers using a gasoline electric motor, were prepared. The students held vicuñas and carried them to the wool cutting area. One of the “engineers” who had been trained specially, checked the health condition of the vicuñas and measured the length of wool. The vicuñas with wool less than 2.5 cm were immediately released. The vicuñas with wool long enough were pushed down on the ground and the wool of their back part was cut (Fig.18). They were released immediately when the cutting was finished. It took about 2 minutes for one vicuña and the wool cutting was continued one after another.

Once wool is cut, it takes 2 years for the hair to grow 2.5 cm again. That means the wool cutting is done in a 2 year rotation for the same vicuña. Therefore, the wool cutting is done for less than half of the total numbers of vicuñas captured.

A teacher told the following story when I asked about the school *chacu*. “The *chacu* for the *colegio* began in 1999. This place was promised for *chacu* use to the *colegio* for 15 years. In this area, by capturing vicuñas and cutting their wool, an income of around 15,000 dollars is made. 900 vicuñas were captured last year but this year, it will be less. As it rained less this year, the number seems to be decreasing.”

As she said, the Lucanas community offers a part of their pampa land to the school. This is an established system devised to help to defray the school expenses. The students enjoy this cooperative work, which creates a consciousness of solidarity in the community, producing a good educational result. Moreover, acting out the Inca ceremony and learning their own ancestral ancient history, they are recovering the dignity of their own indigenous culture, which has been discriminated against throughout the history of the conquest and the colonization.

#### *D. Economic Effects of the Chacu*

According to my fieldwork, in 2001, *chacu* was carried out 49 times on land amounting to 70,000 hectares in the Lucanas community and 11,026 vicuñas were captured. From 3,890 vicuñas among them, 890 kg of the wool was cut and produced. After removing dirt and “cerda” (hard wool), 700 kg were shipped and the income was about 150,000 dollars.

The full time employees for *chacu* consisted of 4 engineers and 23 laborers in Lucanas. At the time of capturing, 4 guards came to help from the sanctuary. So, the capturing was done with a total number of 31 people. The 27 engineers and laborers set up the trap. The trap with two wings of 2 km each was set up, taking about 2 hours.

One of the purposes of *chacu* is to provide work for villagers. The members of the community are 410, and the work of laborers is mainly given to the young people. For the laborers, a monthly salary of 630 soles (about 200 dollars) was paid from May to October in 2002. 8 guards were employed and their salary was a little higher.

Besides these employees, 40 women were engaged in the work to take off the *cerda*. 5 soles was paid for the work on one vicuña in 2001. Depending on the skills, women can do the work on 2 to 4 vicuñas.

Thanks to the income from *chacu*, various types of infrastructure have been able to be provided in the community, because the main part of the income is used for such infrastructure. Electricity



Fig.17 Vicunas driven to a circle



Fig.18 Vicunas are cut their wool, then released alive

was able to be introduced by themselves, the village square, school and office were reconstructed and a truck was bought for the village. They could also buy computers for schools and public offices, although until recently, the facilities had been very poor due to a lack of finance.

In 2000 at the national level, 151 farmers' communities captured 35,637 vicuñas and 3,427 kg of wool was produced from 16,956 vicuñas. In Peru in 16 prefectures, there were 841 groups engaged in capturing vicuñas in 2000. According to the statistics, the total number of vicuñas increased from 67,000 in 1994 to 141,000 in 1999.

#### *E. Factors for Revival of Chacu and Resulting Changes in the Andean Indigenous Communities*

Ancient *chacu* itself is very interesting as a unique effective system to control, use and preserve wild animals. The revived modern *chacu* is also interesting as a successful case of the reorganization of traditional "local knowledge" about the environment. The preservation of the vicuñas on the verge of extinction was made possible by revitalizing the traditional knowledge of the Inca period.

Then why could such an epoch-making "modern version of *chacu*" be revived and spread rapidly? Let us give some general thoughts on the factors.

An ex-head officer of the Lima office of CONACS (Consejo Nacional de Camélidos Sudamericanos) told me the process of the technical development for the actualization of the "modern *chacu*", as follows; the study of the use of vicuñas began already in the 1960's and in the 1970's, the study of *chacu* also began. It is not possible to call out so many people today as in the ancient times, so the trap using a net was devised. In 1970's, the experiment was carried out using jute net. In 1980's nylon nets were used experimentally and were successful. Today, most traps are made using nylon nets.

The Andean people learned the traditional wisdom of Inca, and, by utilizing new technology, they reorganized it to create a new system for the use and preservation of wild animals. This system however must be quite different from that of the Inca period when vicuñas' wool was used for the emperor. For this new system to be realized, it was essential to have a market and its distribution system for the products of vicuñas' wool. In short, one of the primary factors is integration with the capitalist world system that was referred to by Wallerstein (1974, 1980). According to him, the historical expansion of capitalism is a process where capitalism is expanded from the center to the surrounding areas while the new surrounding areas are being integrated. This process is still progressing in the Andes. Surely, it is possible to regard the revival of *chacu* as the process of the Andean indigenous society being integrated into the capitalist system by the commercialization of vicuñas' wool to be exported to Europe, where expensive high-class clothes made of vicuña wool are produced. The Andean indigenous society gained the legal right of the "control and use of wild animals", and then through acquiring the new technology and re-interpreting the old tradition by themselves, they could build a new and unique system for the use of wild animals. In the background of this, there was the movement for the preservation of the environment, and the Washington Treaty was related to this. The demand for the regional development of the Andean highland and the promotion of the practice of regional development under the Fujimori government should also be accounted as background factors. We can also consider other factors such as the strong expectation for the promotion of tourism in connection with the ancient culture of Peru. As stated before, the solidarity among the local indigenous communities and public security were essential for the prerequisites of the revival of *chacu*. The revival of *chacu* can only be understood by taking all these compound factors into account.

The revival of *chacu* was realized in the process of the change of Andean society and we have discussed the factors for the revival. On the other hand, *chacu* is bringing new changes to the indigenous society. Then, what kind of impact would *chacu* have on the Andean society?

By its large income source, the infrastructure of the indigenous society could be equipped. The production of vicuña's wool has not only brought an economical income source to the people of Andean highland but it is also giving a great incentive to the preservation of vicuñas. 'The rational use' of the Andean wild animals has brought a profit to the people and it has been bound up with the preservation of the environment. By such "Inca wisdom", the Andean indigenous society is changing greatly now.

Due to the revival of *chacu*, the tie between community members was strengthened and a new type of leadership emerged. Indigenous communities, which had characteristically been isolated from each other since the colonial period, have now been being linked by such organizations as SNV, which is a national organization to put the vicuña's wool on the international market and CONACS,

an organization for the control and use of camelids. The unification of the Andean indigenous people was seen in some degree before Fujimori came to power through the practice of universal suffrage after the end of military regime in 1980. Fujimori was mainly supported by the indigenous people and his government promoted local development of the Andean indigenous societies. The unification of the Andean indigenous people is one of the factors for the revival of *chacu*, but on the other hand it is one of the changes which the revival of *chacu* has caused.

Some negative influences are now being pointed out such as the emergence of a bureaucracy in the commercialization of the vicuña wool. Also, there is now the boundary conflict between farmers' communities and they are facing a new kind of friction that they did not have before. The number of vicuñas differs greatly among the different areas. The problems in the future will be the difference between areas with vicuñas and areas without vicuñas.

#### 4. Diverse and flexible control and use of environment in the Andes

As I have mentioned, the Central Andes, being highland situated in the tropics, has the greatest diversity of natural environment, related to the altitude. I have demonstrated the form of control and use of environment in the Central Andes. They created biodiversity mainly through the process of domestication, and the vertical use of environment is an important element of the Andean indigenous knowledge related to the biodiversity.

They have created this diversity not only by domesticating many species but also by creating many breeds within a species. The largest variation of breeds is of potatoes. An especially interesting class of potato is the bitter one, which has maintained a wildness which is resistant to coldness and illness. It contains a poisonous element of prussic acid, so it is bitter, and it is resistant to worm attack, too. They devised a process to remove the poison, through making *chuño* or frozen and dried potato. The process of making *chuño* eliminates the poison from potatoes. The *chuño* is also good for transportation and conservation.

Andean people have been raising domesticated animals on the high plateau situated over 4000 meters above sea level. The Andean pastoralism of camelids has unique characteristics that is its sedentariness and absence of using milk, being completely different from the pastoralism in Asia, Africa and Europe.

The coexistence of the pastoralism (use of domestic animals) and the *chacu* (system of control and use of wild animals) is also another unique characteristic of the Andean indigenous knowledge related to the biodiversity.

There is a common idea of clear opposition between hunting and pastoralism<sup>7</sup>. Such an idea of clear distinction between wild animal (object of hunting or predation) and domestic animal (object of pastoralism or protection) is accepted by many researchers, but the *chacu* makes the idea invalid.

The ancient *chacu* had the aspect of hunting which kills animals to eat. However, it was not just simple hunting, because the wild animals were not only used rationally, but were also protected, controlled and preserved. The number of captured animals was recorded in a *quipu*, an Inca method for counting using knots in ropes. Female deer were released alive. Male deer were usually killed for eating, but males classified as sires were released alive, too. This is a kind of control in reproduction that is an important element of domestication of animals. Furthermore, the useful wild animals are well protected.

The *chacu* reminds us of the diversity of ways for the utilization of animals, not only the opposition between predation and protection but the continuity between predation and protection.

The continuity between wildness and domestication is also the case with plants, as we saw in the case of the bitter potato. Andean people have conserved indigenous knowledge, or basic ideas and technology, for the diverse and flexible control and use of environment. They have been securing biodiversity and sustainability, by way of retaining and maintaining the continuity between wildness and domestication, much different from the modern way of exploitation of biological resources. We should and can learn much from such an idea. <sup>8</sup>

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<sup>7</sup> For example, Ingold opposes hunting to pastoralism, relating this to the binary opposition between predation and protection, in his triangular model of hunting, pastoralism and ranching (Ingold 1980: 4). Also Clutton-Brock says, "As soon as animals are herded or domesticated, humans become protectors rather than predators. The relationship ceases to be one of simple predation and becomes a form of symbiosis in which individual animals benefit from the association until the moment of their death, and the species benefits genetically by becoming much more widespread than it was in the wild." (Clutton-Brock 1989: 279)

<sup>8</sup> Such an idea of flexible control and use of natural environment can be adapted not only for the biodiversity but

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also other aspects of our modern life. For example in Japan, rivers have been separated from human life by bank protection walls constructed with concrete, but recently new technology is being adopted to recover the natural environment in some cases so as that people could have a close relationship with riversides again.