Chapter 6

Making a Living

The purpose of this chapter is to show how completely a Matsigenka household is able to meet its needs for food, shelter, clothing and tools on its own, requiring only a division of labor by age and sex to organize production and consumption. That households do not always choose to be self-sufficient should not distract us from their real ability to do so. Along with descriptions of how men and women accomplish their tasks, I have included quantitative data on production and consumption within the household, with the goal of compiling an input-output analysis demonstrating that their observed levels of production are adequate to meet the consumption needs of the household. I have provided many tables so that readers who wish to do so may statisfy themselves as to the empirical basis for my conclusions. But, recognizing that tables can impede the flow of argument, I have described the main findings of the tables in the text, and where possible, compiled tables into groups at the end of discussions so that readers may skip tables without missing key points.

The Use of Time: An Overview

The Matsigenka household, in its division of labor by sex and age, and between co-wives in polygynous households, potentially comprises the complete array of skills needed to supply its basic needs. We do not find the Matsigenka of Shimaa much engaged in multi-household collaborative work. Nor, although this is starting to change, do wage labor or commercial activities count for much--in 1972-3 commercial activities amounted to only 0.3% of adults' daytime activities.

Major Activities--. My description of Matsigenka time use is based on instantaneous random observations of individuals, sometimes called "spot checks" (A. Johnson 1975; 1996). These observations are ideally made completely at random, and for the most part they were. On occasion we failed to make observations at the randomly selected time for practical reasons, as when the trails were flooded, and once we skipped a scheduled observation at Santiago's house because we were angry with him for failing to reciprocate our generous gifts. Fortunately, we were not so touchy all the time--or, at least, not both of us at the same time. The randomness of the observations has the advantage of providing an unbiased overview of how Matsigenkas spend their time. The full dataset is available in A. Johnson and Johnson (1988).

Sexual Division of Labor. A Matsigenka marriage is a partnership of two skilled individuals, each with a separate domain. Their behavior tells a story of clear and thoroughgoing differentiation, one that leads not to segregation and discrimination between the sexes but mutual respect and interdependence (Johnson and Johnson 1975; cf. Rosengren 1987a: 341-2). Figure 6.1 gives a summary of how adult men and women allocate their time to different activities. In the figure, one hour is roughly 8% of the total daylight time covered by the observations, that is, the 13 daytime hours from 6 am to 7 pm. The main differences between men and women are that men are involved in food production nearly three times as much as women (nearly four and a half hours a day), whereas women are engaged in food preparation far more than men are (about two and a quarter hours). This reflects a larger pattern recognized by the Matsigenka when they describe house as the woman's domain and garden as the man's. Because men's activities tend to be outside the house on steep trails or in heavy garden work, men expend about one-third more energy per day than women do (Montgomery 1978: 63).

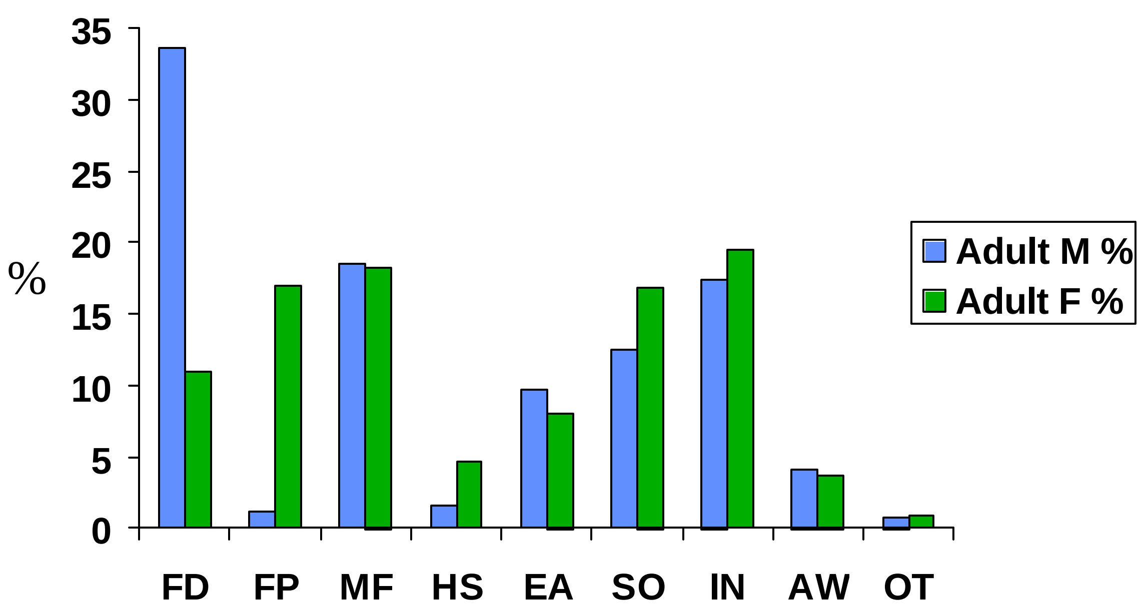

Figure 6.1. Adult Division of Labor by Sex: Major Activity Categories FD food production, FP food preparation, MF manufacture, HS housework, EA eating, SO social, IN individual, AW away, OT oth

The Matsigenka make almost everything they use, and men and women are equal contributors in manufacture. They also spend roughly equal amounts of time eating and at activities somewhat vaguely labeled "Individual" and "Social." Individual activities occupy over two hours a day, including personal grooming and hygiene, as well as a most popular activity, "doing nothing." Social activities include paying visits, gossiping, attending beer feasts and some rare community events like the Columbus Day ceremony arranged by Maestro. Women spend more Social time than men, but that is primarily because of the child care activities that were included in this category.

The self-sufficiency of the Matsigenka household depends particularly upon the division of labor between husband and wife. Because gender is such a fundamental division in social life, and because certain tasks "entail" others (Burton and White 1984), the division of labor becomes as much a matter of gender identity as of efficiency. Many of the tasks assigned to one sex can be performed by the other. Women make the clay bases of their spindles, for example; there is no reason they could not also make the slender wooden shafts. Indeed, I have seen one woman do so in a matter of minutes. Yet this and similar tasks with wood are clearly male activities, as the time allocation data show (Table 6.1).

I consider an activity to be predominantly associated with women if they spend at least five times as much time on that activity per day as men do; the same applies to men's activities. In many cases the preponderance is far greater. Between food preparation and cloth manufacture women are occupied more than four hours a day on average. Child care adds another hour, but this is an underestimate since women are often "on watch" over young children while they perform other tasks. The other exclusively female tasks--plaiting mats and baskets from cane or palm leaves, cleaning house, and washing clothes and pots--account for another half hour of a woman's daily time. Altogether, nearly six hours of her day is taken up with tasks associated exclusively with women.

The men's domain is spread somewhat more evenly over a number of tasks. Men dominate in all aspects of agriculture except harvesting. Since the observations in Table 6.1 are a random sample, a zero in a column does not mean that no man or woman ever performs such a task. Women plant "women's crops," for example, but so few and infrequently that the random sample missed them. Similarly, only men were observed hunting, but women occasionally capture bullfrogs, which might be seen as a form of hunting although it does not appear in the sample. What the time allocation data can show reliably is that, on average, men greatly predominate in planting and hunting. Men also predominate in building houses, manufacturing wood objects of all kinds, and making net bags and other artifacts requiring fiber twine. More than four hours of a man's day will be taken up with tasks associated exclusively with men.

The rest of the time men and women are involved in activities that both men and women regularly engage in, many of them involving collaboration or companionship between husbands and wives. The most common of these are leisure activities, including doing nothing (sitting idly or lying down), chatting, visiting other Shimaa households, and recreational idleness like spinning a top or attending a beer feast. Altogether, these restful activities occupy men more than two and a half hours a day, and women three. Both men and women add another hour eating and snacking.

In three food procuring activities men and women participate fully: harvesting garden foods, collecting wild foods, and fishing. Although it is common for a division of labor to appear between a husband and wife when they work alongside one another, and certain specific activities like climbing trees (men) or using small fishnets (women) are regarded as sex-specific activities, these three areas of the food quest are more integrated by gender than any others. Women and men equally know how to harvest crops or to find grubs without the differences in skill that characterize the other productive activities.

Activity	Minutes Per Day	
Women's Activities	Men	Women
Food preparation	18	141
Cloth manufacture	1	108
Child care	3	63
Plaiting (mats, baskets)	0	13
Housecleaning	0	11
Washing (clothing, pots)	0	8
Subtotal	22	344
Men's Activities		
Weeding	54	1
House construction	47	1
Hunting	43	0
Woodcraft	40	4
Fiber twine and netting	32	1
Planting	29	0
Garden preparation	10	0
Subtotal	255	7
Women and Men Both		
Doing nothing, resting	76	112
Eating	61	59
Visiting in community	65	53
Harvesting	61	42
Fishing	44	21
Traveling outside community	33	29
Collecting wild foods	26	20
Idle recreationally	28	15
Ill	23	18
Personal care	15	9
Care of others (not child care)	10	8
Chatting	7	8
Sleeping	8	4
Yard care	5	6
Beads, ornaments	2	8
Other	39	17
TOTAL	780 min	780 min

Table 6.1. Summary Division of Labor by Sex: Allocation of Time (Min/Day) during Daylight Hours (6:00 a.m. to 7:00 p.m.).

Division of Labor by Age. Before the age of six, children of both ages are very much alike in their use of time. Their contribution to the household in the form of useful tasks is small. The time allocation data show that they spend nearly 10 of the 13 daylight hours in idleness (sitting, being held, carried in a sling, sleeping) and another nearly two hours eating (Table 6.2). In the remaining hour or so, they are bathed and cleaned up 30 minutes' worth, they play for about 25 minutes, and spend the remaining minutes sick, crying, or doing some useful task. For older children (toddlers) in this age group, the figures differ predictably from those of infants: idleness decreases while time spent eating and playing rises. Only toddlers were ever observed to be performing useful tasks.

Behavior patterns differentiating boys and girls of this age do not stand out in the data. The main difference in the Table 6.2, the sharp drop in idleness among female toddlers, is not a function of gender but of age: the average age of girls in this category is quite a bit older than that of boys. It is true that boys seem to be bathed less than girls, and to play less, while being ill more often, but the numerical differences are not very large and could result from chance. The major patterns in the table--the large amounts of each day spent in idleness or eating--are clearly shared by all young children.

This situation changes, predictably, with older children (ages 6-14). In this age group, idleness is well above the adult norm, but is far lower than among young children, accounting for something over 7 hours per day. Older boys make a much greater contribution to food production, just as their fathers do. And, older girls contribute substantially more than boys to housekeeping and child care. The older boys, however, are not completely like grown men:

they do not hunt, and they spend much more time than men in food preparation tasks, primarily collecting firewood and fetching water. They are also a bit active as babysitters.

	Infants		Toddlers	
Activity	m	f	m	f
Idle	613	602	604	525
Eating	106	96	110	133
Being bathed, cleaned	23	55	11	46
Playing	8	14	22	43
Ill	23	0	15	5
Productive task	0	0	9	19
Other	7	13	9	9
TOTAL	780	780	780	780

Table 6.2. Time Allocation Patterns of Infants and Toddlers. (Average age: infants, m = 0.5, f = 0.7; toddlers, m = 2.3, f = 3.8 years. [Averages are weighted by no. of observations.])

Activity	Male	Female
Idle	434	454
Eating	78	104
Food Production	97	21
Manufacture	22	9
Food Preparation	35	67
Housekeeping and Hygiene	16	47
Child Care	11	24
Other (Sick, Travel, Visiting)	87	54
TOTAL Min/Day	780	780

Table 6.3. Patterns of Time Allocation of Older Children. (Average age: males = 9.0, females = 7.8 [weighted by no. of observations])

The Daily Round--. Men and women spend about half of their daylight hours working, especially in food production, food preparation, and manufacture. They spend the rest of the day eating, grooming, resting, chatting, or simply sitting idly. They generally begin to wake at first light, around 5:30 am, but often do not rise until 6:00 or 6:30. Women are up before men, building up the fire or going early to the river to fetch water. In the time allocation data, between 6:00 and 8:00 a.m. women's major activity is food preparation, whereas men's major activity is “resting.” But women rest a good deal during these early hours as well, and both women and men spend some of this time eating.

The transition to work is abrupt. A man, whose work usually takes him out of the house, simply says, “I'm going,” and rises in one motion from a sitting position to walk out the door. If he has decided to hunt this day, he will walk to the home of his hunting companion, who immediately arises and joins him. They then start off at what seems to me a fast march and will walk with very few pauses until reaching their destination in the forest. Since the hunting areas are two or more hours away, such trips are generally all day affairs leaving little time for other activities. When the whole family goes along, the trip is primarily for gathering, locations are closer to home, the pace is slower and the mood is festive, like a family hike and picnic.

If the man has chosen to work in his gardens, he leaves the house equally abruptly and goes immediately to his garden, starting to work the moment he arrives. Here also he will work virtually without pause well into the afternoon. For men, from 8:00 am to 2:00 pm is the peak period for food production, when agriculture and foraging dominate all other activities. The other common activity during these hours is manufacture. Some manufacturing, like house building, will dominate a man’s daylight hours for days or weeks, when he may do very little foraging and neglect his gardens. Other manufactures, like bows and arrows or net bags, can be done indoors and are favorite activities for rainy days and in the evenings when stories are told. Men who have been working several days in their gardens, however, will also give themselves some relief and remain home to make things, even on a sunny day.

Matsigenka men are steady workers, working briskly and with few breaks. They tend to taper off production activities by mid-afternoon. Thereafter, idleness, bathing, and eating begin to predominate. The later part of the day is also a time for social activities like visiting, drinking beer, and recounting the events of the day. The house casts a long shadow as sunset approaches, when the whole family tends to gather on mats in the comfortable shade outdoors, eating, grooming, making artifacts, and chatting.

A woman’s day has a rather different rhythm. She is far less likely than a man to be idle in the early morning, but her rate of idleness remains constant, at about 15%, until the late afternoon, when it rises to over 20%, similar to a man’s rate. Thus a woman starts work earlier but work does not dominate her mid-day period to the degree it does a man’s. Furthermore, a woman’s day is more varied, with more tasks than a man’s, each task taking less time. Women will go to the garden, but will remain only an hour or two to plant women’s crops. Having usually nursing infants or small toddlers to care for, they tend to garden in the morning, accompanied by their young children, and return home before the midday heat becomes intense.

Women are often alone at home with their children, occupied with many tasks: food preparation, child care, housekeeping, and manufacture, especially of cotton cloth, which after food preparation is their most time-consuming activity. At any given moment, women may be doing almost any of their usual tasks, at any time of the day, without the pattern discernable in the men's daily activities. Men sandwich intense work between periods of light work and rest, whereas women work at a less intense level but evenly throughout the day. This pattern is especially evident in their expenditures of energy, for the men's work in agriculture and foraging are the most energy-expensive activities we measured among the Matsigenka (Table 6.29).

At dusk, around 6:00 pm, the level of productive activities drops off sharply. Visitors tend to return home, and men rarely work after dusk. The most common evening scene has the household members gathered near the fire, sometimes in the company of close relatives from an adjacent house. Women may be spinning cotton thread, the comfortable whirl and knock of their wooden spindles punctuating the evening calm. Men work on net bags or other crafts that can be done in the dim firelight. If some manioc or ears of corn remain warming over the fire, individuals snack. Quiet conversations reporting the day's events, discussing social problems, laying plans for the next day, and re-telling folktales fill this important time of the day. Children begin to doze off soon after dark, and by 8:00 the household is settled for the night. Individuals may carry on conversations later, but they speak so softly that they cannot be overheard from the other side of the house.

People generally do not leave the house during the night. The main exception is that men sometimes build hunting blinds in their gardens. During bright moonlight they hide in the blind hoping to surprise peccary or other animals bent on nocturnal raids. Many men try this strategy, but it has a low rate of return and they devote little time to it. The family generally spends the night together, gathered near the fire when it is cold. Occasionally, someone will get up to stir the fire and add wood as needed. Women often tie pieces of cooked manioc to lengths twine hung from the rafters as late night snacks; in the morning, only empty loops of twine remain.

Food Production

Adult men spend about a third of their daylight time, and adult women about a tenth, in food production (Figure 6.1); youths contribute at about a third of the rate of their adult counterparts. The main types of food production are horticulture, fishing, and foraging, with a small effort in care of domesticated animals (Table 6.4). Gardening dominates all other options, accounting for more than half of all food production time, the remainder being divided between foraging and fishing. Yields for both foraging and fishing are low and we will want to examine why the Matsigenka would spend precious time, and great amounts of energy, for rather meager rewards.

	Gardening	Foraging	Fishing	Other	TOTAL
Male Adult	56.5%	26.4%	16.6%	0.5%	100.0%
Male Youth	63.0	8.6	22.9	5.7	100.2
Fem Adult	47.7	21.5	23.8	6.9	99.9
Fem Youth	35.7	21.4	28.6	14.3	100.0
TOTAL	**53.5%**	**23.4%**	**20.2%**	**3.0%**	**100.1%**

Table 6.4. Proportions of Food Production Time Spent in Gardening, Foraging and Fishing.

Gardening--. Considered strictly from the standpoint of quantity of food energy, its gardens are by far a household's most important source of food. Matsigenka gardens are remarkably productive and guarantee that starvation is a distant, perhaps insignificant, danger. Garden production is complex and dynamic, a flow of gradual transformation from first clearing to final abandonment of a garden. At any moment a household will have access to gardens in various stages of this transformation, and the household itself is in a longer-term cycle of migration and resettlement.

Despite the inherent fluidity, the Matsigenga break garden production down into of discrete stages. Table 6.5 represents this classification, compared to a general model of "phases of shifting cultivation" developed in a world-wide frame of reference.

MATSIGENKA DESCRIPTION	TRANSLATION	HANEY'S PHASES
nonkogakerora kametiri kipatsi	I will want (seek) good land	Selecting the site
nonkarasetakerora	I will clear it	Clearing the site
nompotakerora	I will burn it	Burning the slash
nompankitakerora	I will plant it	Planting
nontsamaitakotakerora	I will cultivate (weed) it	Weeding
nogakerora shinki	I harvest maize	Harvesting
nompireatakerora nogakerora ovatsa nogakemparora	I will cut and harvest manioc	
nompankitairo pashini sekatsi	I will plant more manioc	
tera nompankitairo aikyiro	I will not plant any more	Fallowing

Table 6.5. Stages of Matsigenka Garden Production. (Source: Johnson 1983: 31; Haney 1968: 7).

Selecting the Site. One of several attributes considered in selecting a new homestead is availability of good garden land. Land is evaluated both in terms of its perceived agricultural potential and its availability in light of potential conflict with others seeking land.

Agricultural Potential. At the broadest level, the Matsigenka distinguish kipatsi "soil" from mapu "rock." Imvaneki "sand" and imperita "shale" are generally considered infertile, but imvanekipatsa "sandy soil" and soil with much shale in it (shimentyakipatsa) are highly prefered soils because they are soft and easy to work.

In the vicinity of a homestead may be a wide range of kinds of land. Along the inside bends of the river are small flat patches created by silt deposited during high water. Away from the river, forest lands vary in slope, soils, and aspect. Some, like ravines or cliffs, will be too steep for cultivation. Otherwise, any piece of land will be considered on its merits in the decision whether or not to clear a garden. Since population density is low, typically there is more cultivable land available than the household will use before moving on to its next homestead. A husband and wife have much to consider before deciding where best to invest in clearing a new garden.

The Matsigenka view soils as determining two key attributes of a garden: its ability to sustain production of important crops and how hard it will be to work (Table 6.6). The first criterion is indicated by the color of the soil: potsitapatsari "black soils" are good, kiraapatsari "red soils" are debatable, and kitepatsari "yellow soils" are no good. The second criterion is judged by texture: the easiest soils to work are full of sand and gravel, whereas the hardest soils are thick with silt and clay. The relative simplicity of this classification is typical of tropical horticulturalists, but does not mean that complex knowledge and practices are not derived from it (Wilshusen and Stone 1990: 107-8).

	metsopatsari **'soft soil'**		**kusopatsari** **'hard soil'**	
	imvaneki **'sand'**(3)	**shimentya** **'gravel'**(6)	**potsitari** **'black'**(4)	**kiraari** **'red'**(10)
Nutrients				
Organic Matter[1]	3.3%	8.0%	5.2%	5.2%
Nitrogen[1]	0.16%	0.38%	0.26%	0.24%
pH	5.7	6.2	6.4	5.2
Phosphorous[3]	14.2	14.3	7.6	9.5
Potassium(K+)[2]	.54	.57	.59	.48
C. E. C.[2]	12.35	25.36	16.94	17.66
Texture				
Sand/Gravel	61%	51%	32%	27%
Silt	29	31	40	43
Clay	10	18	28	30

Table 6.6. Matsigenka Soil Classification and Soil Characteristics (n = 23).

[1]percent
[2]m.e./100 gr
[3]parts per million

Table 6.6 indicates that the Matsigenka criteria of color and texture correspond to qualities that soil science also considers important (cf. Johnson 1974; Behrens 1989). Color relates to nutrient availability, as seen especially in organic matter, nitrogen, and cation exchange capacity (C.E.C.). The highly prefered soft black soil, shimentyapatsari, ranks highest on all three indicators, and the hard black soil (potsitapatsari) ranks slightly higher than red soil (kiraapatsari) on organic matter and nitrogen. The tan-colored 'sand' soils, well-drained and under cultivation for several years, had largely been leached of nutrients by the time I took these samples.

Except for sandy soils, the values in Table 6.6 for nitrogen, organic matter, pH, phosphorous, potassium and C.E.C. would be considered good to excellent for tropical soils (Young 1976: 285-303; Landon 1984: 106-144; Sanchez et al 1982: 821; Carneiro 1964: 16). Calcium and magnesium are also available in acceptable quantities ($Ca^{++} > 10$ m.e./100g; $Mg^{++} > 0.6$ m.e./100 g). Aluminum levels are too low to affect crops except in two samples of red soil, where a combination of low pH (3.9) and high aluminum (8.5 m.e./100g) would pose serious problems for some crops.

In Table 6.6 soft sandy and shale-rich soils score high in sand and gravel content, whereas hard black and red soils score high in silt and clay. My experience working in soft soils is that a single blow of the digging stick leaves a deep hole suitable for planting grains like maize and rice, a few thrusts of a short palmwood spade softens a pad for manioc planting, and weeds pull out easily with their roots intact. By comparison, hard soils call for many blows, the digging stick becomes wedged and hard to pull out, and weeds must be torn from the thick soil, often breaking off to regenerate quickly. From the standpoint of the man who does the bulk of this work, the distinction between hard and soft soils is highly salient.

Though least fertile in these measures, sandy soils are much sought after. They were the first to be cleared at Shimaa in 1968 and by 1972 all available pieces of sandy land were either in cultivation or had already been abandoned. Because of their limited distribution in pockets at the bends of the river, plots tended to be quite small, about 600 m^2 on average (one-tenth the size of an average hillside garden). Their primary attraction is that they are relatively easy to clear and very easy to work. They are also well-drained, or "dry soils" oropatsari, which is seen as an advantage over "wet soils" toapatsari. But because sandy soils quickly lose fertility, are only available in small amounts, and are likely to be destroyed by floods, such gardens constitute only a fraction of any household's total cultivation. Migration histories suggest that these kinds of gardens played a larger role in the past, when local population densities were lower, total garden investments were lower, steel tools were more scarce, and abandoning a garden after a year or two was more likely than it has become today (Shepard 1999: 48).

Out of necessity, Matsigenka gardeners turn to the abundant hillsides. Their preference would be to find a piece of shimentya soil and clear it. At Shimaa, however, the only shimentya soils were across the Rio Kompiroshiato, requiring passage that was challenging in low water season and truly dangerous in high water. Despite this definite disadvantage, a third of the 33 gardens for which I have soil classification were shimentya plots from across the river.

While everyone agrees that black soils can sustain production of all the main crops except maize for at least two to three years, much disagreement exists about the fertility of red soils. Some claim red soil "isn't any good," while others say it is as good as black soil. In Table 6.6 we can see that the red soils around Shimaa are only a bit poorer in organic matter and nitrogen than black soils, and that they are somewhat "harder." Because they were more abundant, especially around the downstream hamlet, twice as many gardens were cleared in red soil as in black.

Soil hardness and travel distance are probably more influential criteria than fertility in choosing a garden location. In avoiding yellow soil, the Matsigenka do show that they believe soil fertility (as indicated by color) to be a critical element in garden selection, and they recognize the idea of <u>matsanti kipatsi</u> "weak soil." But they are more likely to blame a crop failure on a weakness in seed. They also recognize that here, as elsewhere in their world, unseen elements and forces can have unpredictable effects. The community that settled Mantaro Chico, for example, cleared and planted many new gardens before they discovered that all their crops, nearing maturity, had begun to wither and become disfigured. The soils had appeared normal, yet yields were so poor that most of the community migrated to Camaná after a few years. Many suspected spiritual factors in the crop failures.

Conflict Avoidance. Once an attractive piece of land has been identified, men are careful to make sure no one else has a prior claim to the site. The first question is whether anyone in the vicinity ever farmed that plot before. Commonly, given the very long fallows, the previous farmer is unknown. When Javier discovered an old avocado tree while clearing his new garden, he said, "it belongs to <u>magashipogo</u> 'secondary forest.'" On the other hand, when Carlos wanted to reclear a plot abandoned by his brother-in-law Mariano, he asked him for it and Mariano <u>ipakeri</u> "gave it to him." The general rule, as explained to me by the schoolteacher at Shimentaato, is that you do not have to ask for permission once an abandoned garden is classified as magashipogo (some years after abandonment). If there is any possibility a man may have plans to reclear an abandoned garden, however, you must ask and, at the very least, give him the opportunity to be gracious about allowing you to clear the land.

Once this negotiation is complete, you, as the new owner (shintaro) will announce your intentions to the world at large, to lay claim and forestall possible disputes later. This fastidiousness about claims to land is pervasive. When brothers Ricardo and Tito cleared a large piece of land together, working side by side throughout, they could still show me when it was complete just where they divided the field into their separate parcels. By contrast, when brothers Felipe and Mariano jointly cleared a large garden, also working side by side, both understood from the outset that the entire garden belonged to Felipe. This, however, led to their big fight when Mariano resented pouring all his labor into Felipe's garden (Chapter 5).

We can best understand the idea of shintaro "owner" if we think of it not as legal title to objects like land or trees, but as a form of respect for the individual (the difference is obviously not clearcut). For example, after I left Shimaa in 1973, I left behind a number of banana trees in my garden near Aradino's house. There was no certainty that I would return, and Aradino saw no reason to let my investment go to waste. When I returned in 1975 he spontaneously led me to where he had been cultivating my banana trees as well as some new ones he had planted. He pointed out which ones were mine, and described how he had cared for and harvested them during my absence. He wanted me to know that he had not stolen my banana trees and that they were waiting for me.

Another example also involves Aradino, who is one of those I have described as "loners." One day he and his wife, Rosa, went downstream to harvest manioc from her brother Felipe's garden, but Felipe's family was away. Rather than help himself, even though he had harvested manioc from Felipe's garden on other occasions, Aradino returned home empty handed, explaining simply, "He wasn't there." Although it is inconceivable that Felipe would have refused him manioc from his garden, to have taken it without Felipe's express permission would have been an ambiguous act, disrespectful on Aradino's part and something that could have led Felipe later to gossip disparagingly about him.

Clearing. Men try to clear a new garden every year, most commonly at the start of the low water season, from April through July, so there will be time during the least rainy part of the year to let the field dry for burning. They divide garden clearing into two distinct tasks. First, they cut brush (nonkarasitakero itiomiani inchato "I cut little trunks") and then make another pass through the garden felling trees (nontogakero omarani inchato "I fell large trunks"). The two phases together will require about 200 hours of labor per hectare. There is an inverse relationship between the two tasks in that the more time spent in cutting brush, the less spent in felling trees, and vice versa, because where trees are small, much sunlight reaches ground level and the brush is thick, whereas a high canopy of large trees cuts sunlight and brush is light. The difference can be seen in the rates of clearing Carlos's brushy field in contrast to Felipe's patch of tall trees (Table 6.7).

Worker	Brush Rate	Tree Rate	Total
Carlos	147 hr/ha	72 hr/ha	219 hr/ha

Felipe	67 hr/ha	119 hr/ha	186 hr/ha

Table 6.7. Varying Rates of Clearing Brush and Trees. (From Johnson 1983: 36)

As men begin to clear their gardens, they appear to work haphazardly, turning this way and that, but after an hour or two the straight edges of the garden begin to emerge. The finished product will be a fairly regular rectangle, its sides running parallel to the river and perpindicular to it in alignment with the everyday compass (Fig. 2.1). Forest clearing is hazardous. Working barefoot in thick forest, men must watch out for poisonous snakes and insects, the sharp spines of some trees and bushes, and falling debris dislodged from tall trees by their activities below. Men in Shimaa had had their eyes poked, toes and ankles sliced by sharp-edged cuttings, and arms broken by falling deadwood.

The forest is so tied together by vines that smaller trees, cut through at the base, will not fall. Of necessity, a man cuts all the small trees in an area of several hundred square meters, leaving them dangling, then cuts wedges facing downhill in the trunks of the large trees just to the point where they are close to falling. Finally, by felling the largest tree in the group, he causes them all to topple together with a thunderous crash--an exciting moment that makes everyone laugh, whistle, and jump.

Garden clearing is man's work, often a lonely, grinding, day-in day-out labor that is a relief to finish. His wife and children may join him, foraging in the slash for insect larvae and palm hearts. Occasionally brothers work companionably side by side, although, except for short periods to rest or chew coca, very little conversation interrupts the steady flow of work. The companionship is there, though. Once, for example, I happened to be timing Felipe and

Mariano felling trees and for some reason I counted the number of axe blows each struck. For the several minutes I counted, each struck exactly 21 blows per minute in perfect syncopation, one after the other.

Burning. In the forest around Shimaa rain falls in every month and the ground beneath the forest canopy is always damp. In the less wet months of low water season, however, the intense sun for days on end will dry the slash despite episodic rains. Still, exactly when to set the fire is a subject of much discussion and anxious second-guessing. A good burn requires little labor and cleans most of the rubbish out of a garden, leaving only the tree trunks and larger branches lying on an expanse of fertile ashen soil. The Matsigenka call this ash tsimenkito or samampopane, and correctly believe it is good for some crops, like squash, although in large quantities it may "burn" others.

To burn well, a field should dry for two or three months, capped off by several straight days of bright sunshine and steady winds. Several men and boys work together, using firebrands to start fires at the downwind border of the garden. There is no danger of starting a forest fire: even intensely hot fires with flames leaping twenty meters in the air barely singe the wall of forest bordering the garden. There is some danger of being trapped by fire, but I knew of no one who was seriously burned in a garden fire.

But men become nervous that the rainy season may start early, and they also believe that burning a garden brings rain. So, when someone burns his garden after just a day or two of bright sun and strong wind, most others will follow suit and gardens all around the area will go up in smoke in a matter of hours. This sometimes leads men to burn gardens that are not ready. A bad burn leaves a garden so cluttered with brush that it must either be abandoned or laboriously prepared for a second burning. And a bad burn fails to kill weeds that have grown up while the field was drying, increasing the future labor of weeding. A field that has burned badly will probably be abandoned a year or two before a well-burned field.

The resulting bad burn puts them in a foul mood, for they fully appreciate what unpleasant work awaits them. A second burn requires mounting rubbish into piles and burning each separately, several days of hot and dirty work. The best strategy is to place as much thick brush as possible toward the bottom of a pile, with large branches and logs leaned alongside or layered on top, bonfire style. My recollection of reburning is of hot days wrestling awkward logs, made hotter by walls of flame, eyes and lungs filled with smoke, and skin covered with a film of sweat, ash and sweat bees. Bathing afterwards in the chilly river never felt better.

Planting. The day after burning, while logs are still smoldering in the new garden, a man begins planting manioc followed by maize. Their planting is hardly haphazard, despite common misunderstandings to the contrary (cf. Anderson 1952: 136-42). Spaced equidistant from each other, the manioc and maize form a grid in which other crops will be planted. Women then make a series of short visits to the field to plant cuttings throughout the grid (Figure 6.2). Although their crops bring to seven the average number of distinct cultigens in a new garden, maize and manioc truly dominate the first year of a garden's life.

```
      X       X       X       X       X
                                        §
    ‡       ‡   ¤   ‡       ‡       ‡
                                   ±
X  §    X       X       X       X       X
                    ±
‡       ‡       ‡       ‡       ‡       ‡
                                        §
     X       X       X       X       X
                                                ±
```

‡ ‡ ‡ ‡ ‡
¤ ±
X X X X X X

Figure 6.2. Example of a newly planted garden. X = manioc, ‡ = maize, § = cotton, ± = cocoyam, ¤ = pineapple.

Although Matsigenka gardens are examples of true intercropping and not the serial monocropping reported for some tropical horticulturalists (Hames 1983), the main purpose of a first-year garden is to grow as much maize as possible and to establish new manioc plants that will only begin producing after the maize has been harvested. The other crops certainly add to the diversity of the diet, but the mix of crops found at the outset is less diverse than that found in older gardens that lack maize (Tables 6.8 and 6.10).

The Matsigenka keep track of and can tell which plants in a garden were planted by which family member. The act of planting creates a respected element of ownership, as discussed Chapter 5, and no one should harvest what they did not themselves plant without getting permission first. In this way, it is possible for the Matsigenka to know and acknowledge the individual contributions to the family food supply, including those of children.

Cultigen	#/ha.
maize	7650
manioc	3915
pineapple	760
cocoyam	625
cotton	285
yam	240
papaya	120

Table 6.8. Average Frequency of Cultigens Planted in 5 New Gardens.

Men’s Crops. In addition to manioc and maize, bananas and plantains are identified with men's labor, as are the newly introduced crops, coffee and rice. Manioc and maize are dietary staples planted in large quantities, bananas and plantains are heavy work, and rice is planted with a man’s tool, the digging stick. Coffee has been introduced deliberately as part of a development scheme to bring the Matsigenka into the market economy.

manioc (Manihot esculenta): In Shimaa, sweet manioc is far and away the major source of food energy in the diet. There is no bitter manioc, an exception to Sauer's (1949: 508) generalization that in Amazonia “sweet manioc is nowhere the staple” (cf., Beckerman 1987: 59). In fact, the Matsigenka word for sweet manioc, sekatsi, derives from the root -seka-, “eat,” and is best translated as “that which is eaten,” or simply, “food.” It accounts for two-thirds of all calories of food energy available from garden foods, and is produced in such abundance that much is simply lost in abandoned gardens.

The usual method of planting manioc is to use a spatulate palmwood spade, about the size and flatness of a straightened boomerang--it could be an old weaving batten--to soften the soil and make a flat pad a half-meter or so in diameter. Once a number of these pads have been made, stalks of manioc are cut into pieces about 15 cm long that are are partially inserted into the soft soil of the pad, so that one end of each cutting is exposed to daylight. There are tiny axillary buds on the sides of the stalk, and these should be pointed toward sunlight, as I learned when a man visited my garden and told me that I had planted several cuttings backwards, with the buds pointing down.

In Shimaa, the pattern is to plant two pieces, or sometimes three, side by side several centimeters apart. This is evidently a local tradition: when Alejandro Camino visited me from

Monte Carmelo on the Rio Alto Urubamba, he demonstrated the method of two pieces together, touching each other. The next day, when Oscar visited my garden with me he pulled up short before Alejandro's demonstration pad and said, “Who planted those?” Small variations in technique are noticed and signal local differences in style.

On a steep hillside, the flat pads and softened soil help catch and hold rainwater and give the manioc an opportunity to take root without being washed away. On an average, it takes 50 seconds to plant each pad. As in other tasks, individuals vary in the amount of care they use. Javier, for example, who requires 65 seconds per pad (even while using a shovel borrowed from Maestro), is a most fastidious worker. Even before leaving for the garden, he carefully cuts 50 or so stalks to exactly the same length, so when they are rolled together and tied they make a neat cylinder that he carries on his back with a tumpline. In the garden, he prepares many pads in a carefully laid out uniform distribution, so that each plant will be equidistant from its neighbors. Then with sure strokes he cuts pieces of equal length from several stalks and, in almost assembly-line fashion, firmly presses two pieces of stalk in each pad. Then he begins preparation of a new set of pads.

In large gardens, manioc will be spaced rather widely, leaving ample room for the plant to grow and spread its branches, with bare spots in between where other crops may flourish. Roberto told me that in smaller gardens, men crowd the manioc closer together, so as to have a large number of separate plants, despite less land. He was right: of seven new gardens, three over 1 ha in extent averaged only 2500 manioc plants per ha, whereas four under 1 ha averaged 3500, or 40% more plants per ha (but, compare Baksh 1984: 193-5).

Manioc plants differ in appearance: some leaves are dark green, others are shot with red; some plants have short, thick stalks, others long thin ones; some roots are short, others long; in some the edible tuber is white, in others yellow. My records contain 15 named varieties of manioc, primarily terms given to me by farmers as we walked in their gardens. There are certainly more such terms because, although some are universally known, others are idiosyncratic, being reported by only one individual. The more people you ask, the more names you will get. Although different names do not necessarily mean different varieties, the Matsigenka themselves relish this diversity and are happy to borrow a few cuttings from someone else's garden to try out in their own.

As a simple matter of taste, some people prefer white manioc to yellow, for its delicate flavor and fine texture (I agree), whereas others deny any preference. Since women also prefer to harvest short-rooted manioc, as it is less work, we might expect that short-rooted white varieties would dominate their gardens. But the fact is that many different varieties are planted in every garden. When I asked men why, their answer was usually, "because we like to." Matsigenka farmers prize diversity in their gardens, and seek to ensure it. One man even told me, "I plant these varieties because I am afraid otherwise they will die out." To plant only one or two favorite varieties would reduce diversity and would be maladaptive under highly variable conditions of soil, drainage, and predation (Johnson 1972; Hames 1983). Diversity of named varieties is characteristic of all Matsigenka cultigens, even the minor ones.

maize, (Zea mays): Although maize shinki is second to manioc as the most important food crop, it is the dominant crop in first year gardens, accounting for well over half of all plants in the field. But maize is only planted once in a garden and is harvested first, so that older gardens take on a much different appearance, dominated by root crops and a variety of herbs until the garden is abandoned. The Matsigenka believe that a newly-cleared field has the fertility to sustain only one crop of maize. Since they desire a regular supply of maize, perhaps for good dietary reasons, they must plant new gardens every year. If not for this, it would be possible to sustain a family at much lower cost on root crops from old gardens.

Once a deep conical hole is made with a pointed digging stick, the planter drops in five to eight kernels of maize, leaving the hole uncovered. After the seeds sprout, the buds grow within the shelter of the hole for several days before breaking the plane of the garden surface. Perhaps this manner of planting maize offers some protection against predation, both of the seeds and the young sprouts. Most maize is planted in September and October, at the end of low water season. But we were regularly given sweet (green) corn to eat as early as October and as late as January, a result of its extended planting season from August through November. By April or May the bulk of the mature ears have been harvested, dried, and stored.

As with manioc, many named varieties of maize exist. The most meaningful distinction is between maize and popcorn, each with several named varieties. In any garden, although a favorite variety of maize may prodominate, other varieties will be found also. When I asked for maize seed to plant my new garden, men were immediatly willing to give me some seed, even a dusty and insect-riddled handful of grains Omenko had kept around as seed for years. I also planted some hybrid corn I had brought with me from a garden store in Massachussetts. When they learned I had my own seed, men offered me all sorts of gifts of food in exchange for some. I was startled by the great differences in growth of individual plants of the hybrid corn in different parts of my garden. Knowing that all seeds of a given variety of hybrid corn are genetically identical, I could only conclude that highly variable soils in my garden accounted for the vast differences in plant growth.

Yet, the Matsigenka did not see it my way. The idea of genetically identical seeds of maize being unknown to them, they explained these differences on other grounds. In addition to the overall typology of soils discussed above, they had two main explanations for variations in the productivity of maize. First, they believe magical and spiritual forces are at work: intrusions of women or strangers into the garden, failure of a farmer to observe taboos, a drift of smoke from a fire where peccary is curing--all these can cause crop failures. The magical effects are quite specific: Maestro had no time to plant his own garden, and so hired three different men to plant for him. When I asked him why maize in only one part of his garden was doing badly, he said, "Eriso [who planted that part of the garden] ate shito monkey meat while the plants were still growing."

Second, and of considerable interest, they believe that the reason one plant does well while another nearby does poorly is a difference in the seeds themselves. It is for this reason that they place several seeds in each hole: not all the seeds will sprout, and of those that do, the hope is that one or two will be strong and produce abundant ears. They must be right to some degree, of course: walk in any Matsigenka garden and you can easily see how some maize plants are robust and others sickly, even those growing from the same hole.

Other men's crops: Two other important crops are associated with men, bananas (poseiro, Musa sp.)/plantains (parianti, Musa paradisiaca), and coffee (kapiki, Coffea arabica). Most men plant a number of banana and plantain trees in their gardens. Although not indigenous to the New World, Marcoy reports seeing them among the Matsigenka in the mid-19th century. In Shimaa, however, an average household plants fewer than twenty banana and plantain trees, a much smaller number than found in Matsigenka communities at lower altitudes. This may have to do with growing conditions at higher altitudes; the bananas and plantains in Shimaa were poor in size, flavor and variety compared to those found in lower elevations like Camisea and Camaná. Still, they made a small but steady contribution to the family diet.

Coffee was just being introduced to Shimaa at the time our research began. Among the purposes of the school communities was to bring indigenous peoples into the orbit of a modern Peru, and coffee was seen as a place to begin production of a cash crop that would introduce money into the Matsigenka way of life. Men were encouraged to clear large gardens, and after the maize harvest, to plant coffee seedlings. Since they grew shade coffee, the young coffee plants could shelter beneath mature manioc plants for a year or two. Thereafter, taller trees would be allowed to grow to shade the grown coffee trees, and this would make production of other crops impossible. Thus, over the years of my research I found a growing number of cafetals, fields devoted to coffee production. Often, the shade trees in these fields were of useful species like balsa, used for making rafts, or pashiroki, a kind of tree whose bark provides preferred fibers for heavy-duty tying and lashing.

Certain other crops at Shimaa were considered men's crops, including rice (aroshi, Oryza sativa) and peanuts (inke, Arachis hypogaea) . But these were very minor in the scheme of things, grown more as curiosities than as serious contributions to the diet. Most other crops are thought of as women's crops, although in many cases the gender distinction blurs.

Women's Crops. A fair characterization would be that Matsigenka men plant a few cultigens in large amounts, whereas women plant many cultigens in small amounts. The men's contribution is the staple food supply, the women's a diversity in taste and nutrients. When a woman goes to the garden to plant, she carries a grab bag of bulbs and cuttings. When she gets there, accompanied by her younger children (including her infant, if she has one, who may nurse even while she is planting), she pokes about for appropriate openings in the manioc-maize grid. She is selective, to a degree: for example, a small pocket of ash is favorable for cotton. She will move around quite a bit, scattering her planting over an extent of garden, so that the density of women's crops is very low. Because her net bag is filled with bulky cuttings, she finishes it rather quickly and returns home, avoiding long exposure of her younger children to the sun.

When you ask men or women, "what do women plant?" their most common answer is onko "cocoyam" (Xanthosoma nigra; similar to taro and arrowroot) and magona "yam" (Dioscorea sp.) It makes sense to summarize women's crops in these terms, for, after manioc and maize, these two crops are among those most frequently found in the gardens. Other popular crops generally associated with women are tsirianti "pineapple" (Ananas comosus), tinti "papaya" (Carica papaya), impogo "sugar cane" (Saccharum officinarum), and ampei "cotton" (Gossypium sp.). All of these crops are in evidence around the household for much of the year, important to the household economy.

Men know these crops well in general, but when I began to ask questions about specific named varieties in the garden, men often did not know and told me to ask their wives (which I did). On one occasion, when I went to watch Aretoro's wife Pororinta plant women's crops, Aretoro kept identifying them wrongly and Pororinta would correct him (this did not embarass him at all). She corrected him in about half of the cases. Just as in the case of men's crops, there are many named varieties of each of the women's cultigens, and these are reflected in substantial differences in color, taste, and texture of the foods they produce. There are so many varieties, each with a history that is considered important, that someone who does not work directly with the crops is unlikely to know exactly what they are.

Housegardens and Diversity. Many other crops are planted here and there, with low frequency. They appear rarely or not at all in my random samples of gardens, and appear equally sporadically at mealtime. Among these are many crops that in other tropical regions are of major importance, like bean, pepper, squash, peanut, sweet potato, avocado, lemon, onion, orange, cacao, and tobacco (Table 6.9). Despite their rarity, most people like these crops, although some refuse to eat lemons and all treat tobacco as a sacred substance to be used carefully.

Why many of these crops are not grown more abundantly is an interesting question. It is not conservatism on the part of the Matsigenka. Rice, cacao, and coffee are being encouraged for development and have caught on quickly. On the other hand, Marcoy (1872) saw peanuts, lemon, and avocado in Matsigenka gardens over a century ago, so they have certainly had time to overcome any cultural resistance they may have had. The answer may lie in the comparative efficiency of these crops. As we will see, the Matsigenka obtain a very satisfactory diet out of their current mix of crops. Peanuts, beans, and other crops require much labor and may not always produce well under local conditions. Orange or avocado trees may not start producing before the household is already thinking about relocating, making it unlikely that they would be planted in any significant numbers. None of them add elements to the diet that are not already provided in other ways that work well under present circumstances.

The trend as a garden ages is to become smaller but to contain a greater diversity of crops (Table 6.10), unless it is being abandoned altogether, which frequently happens after the second year. Typically, the housegarden (novankireshi "my plants") is that section of the original garden in which the new house was built upon first settlement. Often, several pathways radiating away from the house pass through the housegarden, allowing members of the household to keep tabs on anything they may have growing there. Julio, for example, always used to pause while walking through the housegarden to pull weeds as they sprouted, with the result that his housegarden was as free of weeds as any formal garden.

The housegarden serves a number of purposes. It remains, quantitatively, an important source of food energy by virtue of the root crops grown there. In housegardens, the density of .35 manioc plants per square meter is not much lower than the .39 found in new gardens, although it is much lower than the maximum density of .60 found in second-year gardens. But the frequency of cocoyam in housegardens (.36 plants/m^2) is five times higher than new gardens (.06), and 40% higher than second-year gardens (.26). In the housegarden a family has a good supply of starchy staples growing literally outside the door.

In housegardens all family members are liable to plant a few of this or that. There, the distinction between men's and women's crops is not especially important, and does not keep anyone from planting something they are interested in. Having these diverse foods ripen from time to time livens the standard diet: they are often sweet or bitter, sour, nutty, or piquant. They are objects of intrinsic interest to the gardeners who tend them. The housegarden is also a medicine-chest of herbal remedies. Lemon grass, moonflower, hibiscus, coca, tobacco, and cedar are common parts of the garden pharmacopoea.

Of special interest are varieties of ivenkiki (sedge), including Dichromena ciliata and Cyperus sp. A class of medicinal herbs known widely throughout the Peruvian Amazon as "piripiri" (Rutter 1990: 184-6), ivenkiki is a good example of how the Matsigenka label and group objects in the natural world. The sedge family (Cyperaceae) is one of the larger ones in the Plant Kingdom, including as many as 4,000 species in 90 genera. Generally, these are perennial, grasslike plants with flowers aggregated into heads or spikelets of various kinds (Taylor 1983: 1). Most Matsigenka housegardens contain ivenkiki plants that serve a number of purposes in health and magic.

Judging from the wide diversity of appearance--ivenkiki plants differ in height, leaf shape, and flower form--there is considerable varietal diversity among the sedges of Shimaa. Each individual plant has a history that is known and discussed. One is for headache, a nearly identical neighbor is for nausea and a third is to improve hunting success. What differentiates one ivenkiki plant from another, in the Matsigenka view, is not its physical appearance but its lineage: each plant has been obtained from someone else, and its history includes who it came from and what it was used for.

Both men and women have many ivenkiki plants growing in their housegardens. Table 6.11 lists the plants growing in Teofilo's garden in Camana in 1976. A few points deserve emphasis: first, Teofilo cannot say much about his wife's ivenkiki, because he cannot tell what a plant is good for just by looking at it, and only his wife knows its relevant history. Second, the names do not indicate classification into groups, but the individual purpose the ivenkiki is believed to serve. This elaborate specificity is characteristic of Matsigenka naming of natural phenomena.

As Teofilo talked about his ivenkiki, he would pause to study the plant, to remember what it was for. The variations within the category in his field alone were substantial, from narrow to broad stems, from small, flowery tops to broad, frond-like ones. In other gardens I learned of ivenkiki for easing childbirth, inducing abortion, and treating flu, diarrhea, wounds, pneumonia and snakebite (many varieties specific to different snakes). Specific ivenkiki can also help manioc grow, dispel the fog caused by demons, render jaguar harmless, and so on. Each possesses its useful property by inheritance, and this can only be known by knowing where the plant came from. For example, when I asked Margarita (Camaná 1976) about an ivenkiki in her housegarden, she told me it was for making babies be born faster and with less pain. How did she know? Because she got it from Navidad's wife in Shivankoreni. Was it also good for curing flu? "No, only babies. Maybe others are for flu." Each plant also has its own manner of application: one, you chew and spit where you want demons to flee; brew another into a tea for pneumonia; apply a third to the eyelids to help catch dozens of fish.

Possibly, distinct pharmacological effects will be found among subvarieties of these sedges (Shepard 1998). But whether or not this is so, it is unlikely that such effects determine in every case the use to which ivenkiki is put. For ivenkiki would appear to be a magical plant par excellence. Whatever powers it possesses are not evident from direct inspection. It is of no value to take some ivenkiki encountered along the trail home to plant: unless someone can tell you what it is for, it would be foolish, and perhaps dangerous, to use it.

The individualism inherent in the classification of ivenkiki characterizes their approach to plants in general, and even more broadly to all living things. It is the viewpoint that each individual is unique and potentially surprising. This is why they enjoy so much exchanging seeds and cuttings, to be planted experimentally in their housegardens. This practice is at once evidence of their particularistic outlook toward individual organisms and a method of preserving genetic diversity among the plants of most utilitarian value to them.

Housegardens also contain tree crops. In addition to a few bananas and plantains, there will often be an avocado, orange, or lemon tree. An important subcategory of trees are various palms, including kuri (Bactris gasipaes), valued for a fine hardwood used to make bows and arrowheads, and three species used in house construction, kamona (Iriartea sp.), tsigaro (Scheelea cephalotes), and kompiro (prob., Phytelephas microcarpa). All these trees also provide an edible palm heart. They are not domesticates. They grow wild in the forest and are among the first species to disappear within an hour or two of a settlement because of their extreme usefulness. Sometimes they are left standing in a garden clearing and survive the fire to continue growing until they are harvested. But others are sprouted from seeds and thus constitute a form of cultivation of wild species.

Finally, housegardens are places to experiment with new crops before investing heavily in them (cf. Johnson 1972). Not only did they ask for seeds I had brought with me to the field, but whenever a “care package” reached us from thoughtful SIL workers with fresh fruit or vegetables in it, the Matsigenka asked for the seeds to try out. Sometimes when I visited men in their gardens, I would ask, “What is that plant?” and be told, “I don't know; I just got it and am trying it out." That is, they knew what it was called and where it came from, but they could not know what it <u>was</u> (its individual nature) until they had tried it out themselves.

In a bit of a natural experiment, the knowledge of rice appeared only to have reached Shimaa around the time our fieldwork began in 1972. Some people had eaten Peruvian rice that had been brought in by SIL members or purchased downriver by Maestro, but they did not know how to grow it. During 1972-73, Maestro experimented with a small plot of rice, and Tito (upstream Shimaa) had a few scattered plants growing in his housegarden. So little was planted that rice did not show up in my crop samples at all that year, and I would not have known about it had someone not mentioned it during an interview about the crops men and women planted.

By the end of 1973, having had a modest success, rice was being planted in a small plot maintained by the students behind the school, and Aretoro had started a rice experiment in his housegarden. When I returned in December of 1974, I asked Aretoro how his rice had done and he replied, "delicious." He had planted rice extensively in his newest garden. So had others: my field notes during that brief visit say, with regrettable vagueness, "rice is everywhere!", signalling my surprise at how quickly this previously little-known, or little-valued, crop suddenly became a local favorite. Even so, it was not planted at once in a great rush, but in small amounts, experimentally, following Maestro's lead and with everybody watching to see what would happen.

There is no way to know in advance how crops will do in any given locale. We may think of housegardens, therefore, as garden supply stores or nurseries where Matsigenkas go to find new plants when their old ones fail to do well. Continually debriefing neighbors and visitors about their crops, in order to satisfy their great appetites for such information, men and women keep their knowledge current and their options open, which includes, no doubt, learning about crop varieties that may not have been grown in any quantity for a generation or more.

English (Spanish)	Matsigenka	Scientific	Comment
achiote	potsoti	Bixa orellana	cosmetic, dye
arrow cane	chakopi	Gynerium saccharoides	
avocado	tsivi	Persea americana	
balsa	paroto	Ochroma lagopus Sw.	
banana	poseiro	Musa paradisiaca	
barbasco	kogi	Lonchocarpus sp.	
barbasco	kogi kiripeshianiri	Tephrosia toxicaria	
bean, kidney	maroro tyongipa	Phaseolus vulgaris	
bottle gourd	piarintsi	Lagenaria siceraria	
cacao	kakao	Theobroma cacao	
calabash tree	pamoko	Crescentia cujete	
chonta (pijuayo)	kuri	Bactris gasipaes	
coca	koka	Erythroxylon coca	
cocoyam	onko	Xanthosoma (nigra?)	
coffee	kapiki	Coffea arabica	
cotton	ampei	Gossypium barbadense	
daledale	shovnaki	Calathea allouia	
gourd	tsota	Lagenaria siceraria	
granadilla	tsimoritoki	Passiflora cuadrangularis	
guamo	intsipa kepiripari	Inga sp.	
guava	komashiki	Psidium guajava	
hibiscus	ashi merentsi	Hibiscus sp	"for flu"
lemon	irimoki	Citrus limon	
lemon grass	kasankari	Cymbopogon citratus	herbal tea
maize	shinki	Zea mays	
mango	manko	Mangifera indica	
manioc	sekatsi	Manihot esculenta	
mint	menta	Mentha sp.	
moonflower	saaro	Brugmansia sp.	
ojé	potogo	Ficus sp.	medicinal herb
onion	seboya	Allium sp.	
orange	naranja	Citrus sinensus	
papaya	tinti	Carica papaya	
peanut	iinge	Arachis hypogaea	
pepper, red	tsitikana	Capsicum sp.	
pigeon pea	miminkoki, tsitsita	Cajanus cajan	
pineapple	tsirianti	Ananus comosus	
plantain	parianti	Musa paradisiaca	
rice	aroshi	Oryza sativa	
sedge (piripiri)	ivenkiki	Dichromena ciliata, Cyperus sp.	
soursop (chirimoya)	anona	Annona sp.	
spearmint	ivinishi	Menta spicata	aphrodisiac
squash	kemi	Cucurbita sp.	
sugar cane	imvogo	Saccharum officinarum	
sweet potato	koriti	Ipomoea batatas	
tangerine	mandarina?	Citrus reticulata	
tobacco	seri	Nicotiana tabacum	
tomate del monte	mananeroki	Solanum sp.	magical plant
yam	magona	Dioscorea sp.	
yarina	kompiro	Phytelephas microcarpa	
?	koviriki	Spilanthes ocymifolia	medicinal herb

(pifayo)	manataro	Bactris chaetochlamys	useful palm
(oncocha)	onko makato	Anthurium sp.	rel. arrowroot
(pandro)	pashiroki	Trema micrantha	lashing fiber
?	poe	Phaseolus sp.	fruit/tuber
?	shimasheri	Cassia sp., Caesalpinia sp.	dec. flower
?	tivana	Bromelia sp.	net bag fiber
?	tsigaro	Scheelea cephalotes	useful palm

Table 6.9. Plant Species Identified in Shimaa Gardens, 1972-1975*

*In addition to the species listed in Table 6.9, garden surveys turned up another 25 named plants for which I lack identification. They include some minor edible species, many medicinal herbs, and some magical or decorative plants: choritoshi, inchoviki (leaves for steaming fish), iratsipini (protects males from female pollution), iseka ataava ("chicken food"), kepina, kokama, korama, korinti (fruit), kuro (manioc magic), pankogiririra poreatsiri (flower), pantiariki (seed; Span. "pan de arbol"), pao (tubers, "calabaza"), pocharoki (fruit), porenki (fruit, "palillo"), porotoki (bean), sankonka (medicinal herb), santari (medicinal herb), sarioki (bead), sharovantareki (gourd), shikovana (medicinal herb), shimanteki (fruit), shinti (medicinal herb), shirina (tuber), tamviapini (ornament), tareko (dye).

Age of Garden	Av. Size (Ha.)	Av. #. Species
First-year (5)	0.67	7
Second-year (2)	0.44	11
Third-year + (2)	0.18	22

Table 6.10. Age of Garden and Species Diversity (n = 9).

ivenkiki name	purpose	comments
ivenkiki ashi pigitoku	headache	wife; pigito = your head
ivenkiki otovairo		wife
omanivenkiki		wife; omani = fish (Span. "sóngaro")
ananekivenkiki	stomachache	wife; ananeki = child
oshetovenkike	hunting magic	osheto = spider monkey
shimaivenkiki	fishing magic	shima = fish (Pruchilodus nigri cans)
tsagarontsivenkiki	fishing magic	tsagarontsi = fishhook
kepigarivenkiki	water-on-the-knee	kepigari = poison, hallucination
komaginarovenkiki	hunting magic	komaginaro = monkey (Span. choro)
shinkivenkiki	garden magic	shinki = maize; plant's head like corn silk

Table 6.11. Ivenkiki (Sedge) in Teofilo's Housegarden (Camaná, 1976)

Weeding. The Matsigenka word for weeding, notsamaitakotakerora, might as easily be translated "cultivating" or "gardening" because it derives from the word for garden, tsamairintsi. It is apt that weeding, of all activities, should be designated as the generic garden work, for the quantity of energy expended in weeding far exceeds that in any other garden activity. Starting a few weeks after the garden is planted, men must weed gardens continuously until they are abandoned: "We are always weeding; weeds don't wait."

The easiest weeding is in soft soils when the weeds are less than six weeks old. This is one of the main reasons for prefering soft soils, but whatever the soil, it is important to weed frequently. In my experience, when weeds are young they are easy to pull by hand and require little machete work. Such weeding is less strenuous and accomplishes much more than work in old, entrenched weeds. With young weeds a single man can weed several hundred square meters per hour; in gravel (shimentya) soils I have timed men at over 500 m^2 per hour, which means a one hectare garden could be weeded in only 20 hours.

On the other hand, in hard soils and with entrenched weeds, work is tedious, demanding, and slow. With developed roots weeds are difficult to pull by hand, and they often have tough stems and sharp thorns or nettles. At times the plants break off, leaving the roots behind to re-sprout almost immediately. It becomes increasingly necessary to use a machete to cut tough weeds, and the rate of work can drop well below 50 m^2 per hour, or one-tenth the faster rate.

For this reason men make an effort to weed their gardens thoroughly at least once every six weeks. Illness and other commitments may intervene, but at great cost. As Roberto explained: "The next day after you burn your garden, the weeds are beginning to sprout. The fire doesn't kill them. Weeds must be controlled: let them get out of hand and go to seed and you've got trouble." This happened to Mariano, who let his large new garden go without weeding while he built his house. Other men would comment on this to me, for they foresaw problems. About the time he finally began to weed, with the help of kinsmen, I had rated the weed growth in his field as "moderate" to "heavy." Their work proceeded at the rate of about 120 m^2/hr and would have taken over 80 man hours to complete, several weeks' work considering other demands on their time. Instead, Mariano started weeding at the center of his garden and worked his way toward its borders. But he never completed the job and ended up harvesting crops from a much smaller garden than he had originally cleared. Two years later, he had abandoned this garden completely, after roughly three years of crops (about average).

As a rule, men are meticulous about weeding. Standing in one place (usually, leaning uphill in a hillside garden), they sweep with one arm, pulling all the weeds within reach clear out of the ground. Those they cannot pull they cut very close to the ground. They gather all this refuse and dump it outside the garden, leaving the ground clear except for crops. By weeding early and thoroughly, a number of valuable goals are achieved: the work is easier; weeds pulled up by their roots do not regenerate; weeds picked before they germinate do not reproduce; the next weeding will largely involve new growth rather than stubborn, entrenched old weeds; and the overall danger of snakes is greatly reduced.

Nonetheless, over time weeding becomes more difficult and men get discouraged. Old gardens, like the one I had been given when I first requested a plot to learn in, produce an abundance of tough grasses and vines. Weeding these is grueling work and, when you have younger gardens capable of meeting all your food needs, it is easy to neglect older gardens, or to weed them only occasionally to permit a few fruit trees or barbasco shrubs to keep growing. Of 19 gardens that I rated for weed growth, 8 of 9 of the first year gardens rated “none” to “light/moderate” in weed density, whereas 8 of 10 of the older gardens rated “moderate/heavy” to “abandoned.”

This is strong evidence in support of weed growth as a major factor in the Matsigenka decision to abandon an older garden. Since a hectare of new garden can be cleared in roughly 200 hours, why continue to weed an older garden several times a year when each weeding can take 100 or more hours of muscle-knotting work per hectare? Given that the fertility of the soils also drops (Table 6.13) and maize can no longer be grown, we can understand better the motivation that leads the Matsigenka to abandon substantial numbers of manioc plants to peccary when a certain point in the cost-benefit curve of weeding old gardens has been reached.

Harvesting and Replanting. A new garden is usually weeded twice while the maize is ripening. A man then completely weeds again as he moves through the garden harvesting maize, removing the weeds and maize stalks to the edge of the garden. Apart from the newly introduced coffee and rice, maize is the only major crop that is harvested at one time. After this, the garden takes on a distinctive appearance and is managed quite differently.

Even the maize harvest is a protracted affair. Some green corn has been harvested and eaten as roasted corn-on-the-cob for many weeks before the main harvest. Then, since a man is weeding during the harvest, he, or members of his household, harvest just the maize found in the weeded area. That is brought home, some to be cooked and the rest to be hung in the sun to dry. When a man and wife collaborate in the harvest, the man does the weeding and pulls or cuts the maize stalks and tosses them into a pile; his wife and perhaps other women remove and husk the ears. The whole process may last two months if the garden is large. And, since different gardens were planted at different times, maize appears at least occasionally in the diet much of the year, although concentrated from October through May.

With root crops, which characterize the garden after the maize harvest, the pattern is different. They do not ripen suddenly but may be left in the ground to mature until needed. Every two or three days, women, occasionally men, will go to a garden and harvest just the plants they need to provide a few days' food for the household. Manioc tubers will begin to discolor and taste bad a few days after harvest, so one brings home only 10 to 20 kg at any one time.

To harvest root crops, men use machetes or palmwood spades and women use their long kitchen knives to loosen the earth around the tuber, which is best removed with its outer skin unbroken. Manioc tubers grow in a star pattern from the base of the stalk, so each tuber will be located and loosened in place by hand until, with a deft pull of the stem, the whole cluster of tubers emerges at once. Mature tubers can be a meter in length, but are frequently only a third as long. A single plant may provide 10 kg or more of tubers, enough to feed a household for a day or two. Although the timing varies depending on the soil and whether men or women are doing the work, it should be possible on average to harvest a kilogram of manioc per minute. Ten to twenty minutes digging tubers plus travel time every few days is usually enough to supply a household with manioc.

When manioc, cocoyam, and yam are harvested, the area around the plants is also thoroughly weeded and new cuttings are replanted in the same hole, where the soil is now soft.

Other weedings will be necessary before these new plants are again ready for harvest, but the replanting assures that the garden, as long as it is being weeded, will remain a secure source of food for the next year.

All Matsigenka crops suffer some losses due to pests. Many of the crops I brought with me to experiment with, like watermelon, zucchini, and tomatoes were decimated by insects. Matsigenka crops, even squashes, fared much better, presumably because they have been selected for local conditions. Maize was attacked by insects and field mice, and the root crops were attacked by mammals, expecially peccary, paca, and agouti. As we walked their gardens, Matsigenkas would always point these predations out and complain, but my estimate is that, if all pests were eliminated, their garden productivity, with the possible exception of maize, would not increase over 20%.

A household's gardens are like a huge market where fresh produce is always available. Harvesting from Matsigenka gardens has much in common with household shopping in market economies: perhaps twice a week you fill your bag with staples and some tasty specialties and go home to get dinner ready. For special needs--cotton for weaving, barbasco for fishing, fiber for manufacturing--you go to that specific garden where these materials are growing in abundance and harvest what you need. Throughout the year a few hours of work each day, steadily applied, is all that is required to maintain this abundance indefinitely. I measured gardens for all the households of the downstream cluster in 1972-73, and estimated their total food production. This is summarized in Table 6.12. As we shall see, this productivity--roughly similar in returns per ha to other native Amazonians--is ample, in company with wild food production, to meet the needs of the household.

While visiting Shimaa, Alejandro Camino suggested to me that gardens serve as lures attracting peccaries, thereby increasing the supply of meat to the household. I asked Maestro and other men what they thought of this idea and they rejected it (Maestro even laughed), saying in effect, “Peccary eats much more manioc than we ever get back from hunting him.” I am in general reluctant to disagree with my Matsigenka mentors, but in this case I credit Prof. Camino’s hypothesis, for two reasons. First, peccaries do often raid Matsigenka gardens at night, and most men have a hunting blind in their garden where they go on moonlit nights to wait for peccaries. And, second, in the folktale Peccary, the shaman sends the men to hunt peccaries in their gardens with the cry, “Defend your manioc!” These cultural artifacts imply an awareness of the garden as a lure for game that contradicts my informants’ denials. Of course they may ultimately be right that peccaries take more than they give back in meat, and that by hunting them men are just making the best of a bad situation.

Fallowing and the Evolution of a Garden. If it is the case that it may require “on the order of half a millennium to reestablish true climax forest in an Amazonian swidden plot” (Beckerman 1987: 72), a purist could argue that all Matsigenka gardens are planted in fallow, or secondary forest, since their region has been occuppied continuously, probably for millenia. Nonetheless, the system practiced in Shimaa in 1972-1973 employs some of the longest fallows to be found in any horticultural system. As early as the second year, and certainly after four or five years, gardens are abandoned to fallow indefinitely. These fallows were so lengthy that men rarely could say anything at all about who might have last farmed the land they were about to clear. The forests they cleared had most likely been fallow for more than 20 years, although patches may have been farmed more recently by unknown families who had left the area and were not known to any of the present inhabitants.

The first garden cleared at a new homestead will most likely be in primary forest next to a stream of clean water (i.e., no upstream neighbors). By the time it is producing maize, the household will have built a new house in the middle of this garden and have begun to live there regularly. After the maize harvest, a new garden will be cleared nearby. The ideal pattern here is to make each new garden adjacent to the last so that they slowly encircle the original garden, which has transformed into a housegarden, with the changes that entails.

A further change is the decline in soil fertility over the life of a garden. In Table 6.13 we can see a decline in key indicators of roughly one-third from primary forest to abandoned garden. Other indicators, including pH, phosphorous and potassium do not vary with garden age and remain within acceptable limits. Primary forest and a first year garden have virtually identical scores, and a second-year garden represents only a small drop-off in fertility. But a sharp drop separates second-year gardens and older gardens. The traditional pattern of garden use, whereby gardens tend to be abandoned during their third or fourth year correlates with the sharpest drops in soil fertility.

How much the Matsigenka are aware of this decline in fertility is unclear. We already know that they believe older gardens cannot sustain maize, but several men I talked to believe that older gardens are fine for all other crops. Certainly, second year gardens show a robust planting of tubers and other valued crops. Men have a tendency, however, to plant their crops less densely in housegardens than in second-year gardens, although a smattering of maize is found and cocoyam is an exception to the pattern (Table 6.14). When I first noticed this lower density in older gardens and asked the reasons for it, the men denied that it was true. The evidence suggests that the Matsigenka show their awareness of declining fertility in their actions even as they deny it in words.

A garden is liable to be abandoned anytime after the second year. The process begins as a state of semi-abandonment referred to as <u>ashi shintori</u>, "it belongs to peccary." The garden still has much manioc in it, along with other viable crops like bananas, plantains, papaya, and barbasco, and may be reclaimed through weeding. Only one or two weedings per year may be enough to get some value out of these hardy crops.

Peccaries cause enough damage that some men pile up walls of brush around the garden in hopes of discouraging them from entering. I was taught that, after I had entered such gardens to take measurements, I should repair the breach I had made in the brush fence. If there is a silver lining to predation by peccaries, it is that by damaging so many plants at once, peccaries can force a large sudden harvest of manioc, an overabundance that can best be turned to advantage by making manioc beer. This was second only to the full moon as an explanation offered for why people were having a beer feast.

But the remaining crops in a semi-abandoned garden will not survive long without weeding. I abandoned my garden when I left Shimaa in 1973 when it still had many crops growing in it. When I returned 18 months later, it was completely overgrown and hardly any crops were recognizable. There were a few manioc plants, but when I dug them up they had no edible tubers; in a weeded garden, manioc of such maturity would have yielded many kilos of tubers. The only plants of mine that were still producing were the bananas that Aradino cared for during my absence. Because of this constant need for weeding, therefore, when a man has all he needs growing in the gardens near his new homestead, he has no motivation to invest further in his old gardens and will finally abandon them to the wild.

Crop	1st-Yr. Hill (0.56 ha)	2nd-Yr+ Hill (0.36 ha)	Riverside (0.06 ha)	Total (0.98 ha)
Manioc	1149	4687	526	6362
Pineapple	443	780	0	1223
Maize	731	0	0	731
Plantain, banana	207	380	0	531
Papaya	35	274	0	309
Cocoyam	21	210	11	242
Sugar cane[2]	17	201	0	218
Yam	12	26	0	38
Cacao	0	22	0	22
Pigeon pea	2	9	0	11
Guava	0	0	11	11
Beans	0	6	0	6
Coffee[3]	0	0	0	0

Table 6.12. Food Crop Yields by Type of Garden, Av. Downstream Household, 1972-3[1] (Source: Johnson 1983: 55)

[1]In kg edible [2]In liters of liquid [3]Immature

Age of Garden (n)	Organic Matter (%)	Nitrogen (%)	Cation Exchange Capacity (m.e./100gr)
Primary Forest (4)	6.8	0.32	19.4
First-Year (12)	6.7	0.31	21.4
Second-Year (2)	6.2	0.30	19.4
Third-Year+/Hsegrdn (5)	4.3	0.20	16.1
Abandoned (4)	3.2	0.14	13.8

Table 6.13. Decline in Soil Fertility with Garden Age.

Garden Age	Size (ha)	Species (#)	Densities/ha (selected crops) Maize	Manioc	Cocoyam		Cotton	Pineapple
First Year	0.67	7	7650	3915	625	285	760	
Second Year	0.44	11	0	6020	2615	680	1305	
Housegarden	0.18	22	280	3470	3610		140	280

Table 6.14. Crop Densities in Older Gardens.

Garden Productivity. As tropical regions go, the soils around Shimaa are good (cf. Inventario 1987: Mapa 2), sustained traditionally by long fallows. The Matsigenka of Shimaa have an effective technology for producing ample supplies of basic foodstuffs from their gardens with a modest work expenditure by household members. The members of the downstream hamlet, which includes 37 people in five households (Table 6.15), had a total of 4.9 hectares of garden land in production in 1972-73, roughly one hectare per household. Over half of this (0.56 ha per household) was in new gardens, and over a third (0.36 ha) was in older hillside gardens; only 6% (0.06 ha) was in riverside (usually, sandy) plots.

Adult males contribute by far the greatest amount of labor in agriculture (Table 6.16). They are the only ones who clear and plant gardens, although they are helped considerably in burning and weeding by older boys. Women also contribute in a minor way to weeding, but their major contribution is in the harvest, where women and girls contribute about 40% of the total work, as measured by calories of energy expended. Overall, however, men and boys provide 75% of the hours of labor devoted to agriculture, and over over 85% of the work energy.

How productive is all this work? An average downstream household, with a total of about one hectare of gardens in production, produces over 13 million calories per year (Johnson 1983: 62), or about 20 calories of food energy for every calorie of energy put into gardening. This is a good return to labor that, as we shall see below, results in an overabundance of food energy compared to household nutritional needs, and an abundance of most other dietary essentials.

Age	Males	Females	Total
15+	6	11	17
6-14	3	8	11
2- 5	2	1	3
0- 1	4	2	6
	15	22	37

Table 6.15. Composition of the Downstream Hamlet (5 households).

	Task (1,000 kcal/yr)						
Age	Clear	Burn	Plant	Weed	Harvest	Other	TOTAL
Males							
15+	49.7	10.9	65.1	271.5	86.9	20.7	504.8
6-14		8.3		68.2	24.9		101.4
2- 5					0.5		0.5
Females							
15+				9.2	68.1	13.3	90.6
6-14					7.8		7.8
TOTAL	49.7	19.2	65.1	348.9	188.2	34.0	705.1

Table 6.16. Work Contributions by Household Members (kcal/year)

Foraging--. We turn now to the production of wild foods. We begin with foraging, which takes slightly more time per day than fishing (Table 6.4). Foraging includes both hunting and collecting, activities that for the Matsigenka are in one sense inseparable and in another sense entirely distinct. They are distinct in the sense that real hunting is a serious business for one or a few men with game as a goal, whereas when a man leaves home accompanied by his wife and children, perhaps along with a neighboring family, the purpose of the trip is primarily collecting, and the mood is one of a hike and picnic. But the two activities are inseparable because trips into the forest always include the possibility of both. A man brings his bow and arrows on family expeditions and his broadknife and other collecting equipment on serious hunts. Despite the different emphases of the two kinds of trips, the Matsigenka are nothing if not expedient in their food production, and are always prepared to take advantage of whatever bounty nature provides.

Hunting. The hunt is a central focus of Matsigenka life. Essentially a man's activity, it is core to a man's view of himself, his relationship with his wife and family, and his place in his social network. All of these levels are activated most dramatically when he brings in large game, when everyone in his immediate social network will enjoy a share of the prized meat, and all will quietly acknowledge the man who provided it.

The world of animals, defined as aityorira iraniane ("has breath [animate]," Chapter 2), includes many species of which relatively few are of use to humans. Edible land animals (mammals and birds) are piratsi "game." For the most part, these are refered to by specific names and not grouped into classes. There is no standard cover term for the category "monkey," for example, just terms for howler monkey, spider monkey and so on. Each species is believed to have a spirit ruler, itinkame, who watches over the productivity of the species and can be engaged by a shaman to ensure abundance and to discern locations for good hunting. Folktales like Yaniri and Osheto (Chapter 3) chronicle the origins of these spirit rulers and describe their very different characters.

The Matsigenka pursue many strategies of hunting and collecting, but, since a typical hunting trip also involves much collecting, a description of it can serve to introduce the subject. A man's average allocation of time to dedicated hunting is less than 45 minutes per day, one does not hunt every day. Some men hunt rarely or only make short excursions close to home: they are primarily looking for small game, like parrot or cock-of-the-rock. Other men are more serious about hunting and take long trips in search of large fowl, monkeys, peccary, and tapir. They go hunting only once or twice per week but spend most of the day at it when they do.

The hunting party is usually small, from two to four men and boys, the latter to serve as bearers. Starting in the mist of early morning, they strike out on a main trail that will take them far from the crowded vicinity of Shimaa. For perhaps two hours they hike steadily without serious intentions of hunting, crashing through underbrush, talking, joking, and singing as much as the strenuous pace of the march permits. There was little reason for stealth, because by 1972 the game within one to two hours of Shimaa had already been depleted to such a degree that short hunting trips ended up with no game at all or at most a small bird or two.

This degree of scarcity reflects the atypical length and density of human settlement at Shimaa. When Karoroshi and I visited his rarely used second house two hours from Shimaa, for example, we startled a number of fowl and monkeys as we walked vicinity. And when I visited the settlement at Camaná as it was starting up in 1976, I recorded sightings of game right at the edge of the airstrip, the environs of which had been completed depleted by the time of Michael Baksh's study in 1980.

The hunters would usually take only one break during the initial stage, a five minute pause to chew sugar cane or coca. I suspect often it was my own exhaustion that led them to take even such brief respites. The Matsigenka are in outstanding physical condition and make these treks seem easy, even though they are predominantly up steep slopes on muddy trails, often obstructed by low-hanging limbs, dense brush, and large fallen logs.

> Fieldnote 5-4-73 - One of the most difficult experiences for the stranger here is walking in the forest. Even where the trail is good--i.e., where the brush has been cleared away to a height of 5 feet or so

(someplaces I can walk without stooping for long distances, but generally this is not so) and a width of some 3 feet--a host of difficulties present themselves. The trails are always on a slope, usually steep with a vertical angle of 20º - 40º, compounding all other problems.

Nor are these problems minor: the ground is so rough there is rarely a good spot for a hiking boot. The Indians solve the problem by wedging a toe or more into crevices and tiny depressions, and using other toes for leverage. Here, as always, balance and weight distribution are the keys. The trail is a mass of loose earth, rocks (of varying degrees of firmness for support) and exposed roots, all laid over with a slimy film of moisture and rotting vegetation. All trails are muddy most of the time.

This slipping and falling are not merely potential hazards: everyone, even the most adept, takes a fall on the trail now and then. Roberto, for one, takes a fall about once to every three of mine.

Finding handholds is tricky. Many saplings and trees have spines, and those that don't may have ants. I have suffered several painful stings, some lasting until the next day, from grabbing too quickly for an infested trunk.

Occasionally, trails are dangerous, as when I nearly slipped over a 5-meter rock cliff into a mass of jagged rocks below. But more often the trail simply presents an endless series of obstacles: fallen logs more than a meter in diameter, that must be scaled; spider webs in the face; less-used trails with low hanging brances and overgrown with thickets (I have crawled for long distances on hands and knees, even on my belly); stinging nettles; and the like.

The Matsigenka deal with these hazards seemingly automatically, with their minds on other things: game, and forage, for example. Experience after a while teaches which trunks have spines, how to spot ants, where the best footholds are, where the slippery exposed root is to be avoided, etc.

Physical conditioning is also important. In being able, for example, to step gracefully up onto a waist-high log and over it in one smooth motion, as if it were a footstool. The muscles of balance in the lower body, legs, and feet, are continuously involved in shifting weight from an

> awkwardly placed foot or loose stone or slimy root. Some of this must take place in advance, by perceiving that a problem is likely and shifting weight and rhythm a few steps before the hazard is reached. The novice learns this by noting how unknown muscles have become sore and stiff after much forest walking.
>
> A thin, light body like the typical Matsigenka is probably advantageous. They are slender and supple and can sustain high levels of energy expenditure over long periods without food or drink, and without showing particular fatigue.

Matsigenka men always seemed to me to remain relaxed and alert to their surroundings. They appear to shut little out, to receive on several channels simultaneously. They walk through the forest with eyes intent on the ground, for example, while most of the wild food is up in the trees, relying on hearing and smell to inform them of the presence of quarry outside their range of vision. You keep your eyes on the ground because barefoot hunters must be alert to such hazards as huge black poisonous ants (maiini, Grandiponera sp), deadly snakes, and any number of sharp spines, rocks, or half-hidden roots, and to detect such spoor as hoofprints, feces, or the refuse from feeding that indicate game on the ground or overhead. On sighting fresh spoor, hunters turn silent and wary and begin to hunt in earnest. Nonetheless, hunters regularly glance up quickly to scan the forest around them and identify food sources. Once on a forest trail Roberto suddenly stopped, turned 180 degrees, and pointed to a large cluster of caterpillars about four meters up the trunk of a tree. Since they were completely invisible (to me) from the direction we were walking, I can only assume his peripheral vision detected some clue, or that he smelled something.

On another occasion when he and I were hunting, he spotted spider monkeys hurrying through the canopy. He lept off the trail down a slope to our right and, after taking a moment to react, I rushed after him. I reached my hand out to a sapling to steady myself when Roberto, who was running ahead of me with his eyes up on the monkeys overhead, turned his head and called to me: "watch out for the ants on that tree!" I looked, saw the red ants swarming, and pulled my hand back in time to avoid all but a few painful stings. He hardly interrupted his pursuit and I looked after him in wonder as I tried to figure out how he had done it.

On any hunting trip there will be pauses to collect whatever food presents itself: insect larvae, bird nests, ripe fruit, palm hearts. For this reason a hunter leaves home equipped for generalized food-getting. In addition to his bow, he carries 10 or 12 arrows of various types: broad-bladed bamboo-tipped arrows for large game, jagged-edged palmwood-tipped ones for monkeys and large fowl, and knob-headed ones for smaller birds. Around his neck he will drape a length of sturdy cord, looped like a many-stranded necklace, that he will wrap around his ankles to help him scale trees should the need arise. Across his shoulder will be a net carrying bag, and in it a broad knife for lopping off branches full of fruit or felling palm trees to get at their fruit and hearts. Thus equipped, he can hunt every animal he encounters and collect all but the least accessible wild fruits, nuts, insects, and vegetables the forest has to offer. For magical aid, in his cloth bag (tsagi) he is also liable to carry a hawk's talons or some other charm to ensure good hunting.

The main species of game in the Shimaa area, those actually eaten or hunted, are listed in Table 6.17. Otter and jaguar are on the list even though they are considered inedible. Otter is hunted for its pelt, but jaguar is on the list, because Oscar had some puma smoking alongside venison once. While hunting he heard the puma attacking the deer and he stalked and shot them both. When I asked him what kind of meat was smoking, however, he only mentioned the venison. Only when I recognized the puma hide did he somewhat shamefacedly admit he was planning to eat its meat.

Matsigenka	English	Spanish	Scientific Name
Mammals			
etini	armadillo	carachupa	Dasypus novemcinctus
kemari	tapir	sachavaca	Tapirus terrestris
maeni	bear	oso	Tremarctos ornatus
maniro	deer	venado	Mazama americana
matsontsori potsonari	puma	tigre	Felis concolor
megiri	squirrel	ardilla	Sciurus sp.
oati	tayra	zorro negro	Eira barbara
osheto	spider monkey	maquisapo	Ateles paniscus
parari	otter	nutria	Lutra longicaudis
samani	paca	majaz	Agouti paca
santaviri	white-lipped peccary	huangana	Tayasu pecari
sharoni	agouti	añuje	Dasyprocta sp
shiani	anteater	oso hormiguero	Myrmecophaga tridactyla
shintori	collared peccary	sajino	Tayasu tajacu
shito	capuchin?	mono negro	Cebus sp.?
yaniri	howler monkey	cotomono	Alouatta seniculus
Birds			
chakami	pale-winged trumpeter	trombetero	Psophia leucoptera
chompari	snowy egret	garza	Egretta thula
kanari	guan	pava de monte	Penelope sp.; Pipile pipile
katsari	crested oropendola	paucar	Psarocolius decumanus
kentsori	white-throated tinamou	perdiz	Tinamus guttatus
kintaro	scaly-naped parrot	loro	Amazona mercenaria
mamaro	owl	lechuza	Otus choliba ?
mamviro	pigeon	paloma	Columba sp
marini	Amazonian black-tyrant	papamosca	Phaeotriccus poecilocercus
oe	Andean cock-of-the-rock	pajaro de roca	Rupicola peruviana
pareto	parakeet	loro pequeño	Aratinga mitrata
pishiti	Cuvier's	tucán grande	Ramphastos cuvieri

	Toucan		
sankati	Spix's guan	pucacunga	Penelope jacquacu
shirinti	tinamou	perdiz pequeña	Crypturellus (bartletti?)
shiromega	white-tipped dove	paloma	Leptotila verreauxi
tetsini	brown man-dibled aracari	?	Pteroglossus mariae
tsamiri	currasow	paujil	Mitu mitu
tserepato	Amazon kingfisher	martin pescador	Chloroceryle amazona
tsivini	fasciated tiger-heron	martin pescador	Tigrisoma fasciatum
yonkororoni	red-winged tinamou	perdiz	Rynchotus rufescens
yotoni	channel-billed toucan	tucán grande	Ramphastos vitellinus

Table 6.17. Major Game Species (Spanish names are those used locally). [ID’s from Eisenberg 1989; Meyer de Schauensee 1970]

The Matsigenka do not readily classify animals into higher order categories like mammals or birds. They do have shorthand ways of talking that effectively group species that they regard as similar, but these are often context specific, so that the same species can belong in one group in one context and in another group in another context. In the context of hunting a good eliciting frame is, tiara ipaigeta piratsi timatsirira inkenishiku "What do you call game that live in the forest?" This elicits the names of species that are hunted, and even edible insects that people would not otherwise consider piratsi (game). The contrasting category is "inedible," as in, parari inti piratsi "Is otter game?", tera, inti tera ironkenkani "No, he's inedible."

Inti piratsipage "These are game."

kanari (fowl): chakami, kanari, kentsori, kintaro, sankati, tsamiri, yonkororoni, yotoni

tsimeri (sparrows): many small species occasionally hunted with slingshot

koshiri ("thieves," refering to monkeys): osheto, shito, yaniri, and many others (kiteshichari, komaginaro, tsigeri)

piratsi not grouped into higher categories: kemari, maniro, samani, sharoni, shintori

other edible not strictly piratsi: grubs, caterpillars, termites

Inti terira ironkenkani "These are inedible animals."

Matsigenka	English	Scientific
otsiti	dog	Canidae
maranke	snake	various
matsontsori	jaguar, puma, ocelot	Felis onca, F. pardalis, F. concolor
mishi	cat	Felis domesticus
moritoni	smooth-billed ani	Crotophaga ani
oati	tayra	Eira barbara
parari	otter	Lutra incarum
shiani	anteater	Myrmecophaga tridactyla
soroni	sloth	Choeloepus hoffmani
tisoni	turkey vulture	Cathartes aura
tsentsevitoni	vampire bat	
tsikantatsirira	bat	

Table 6.18. Categories of Frequently Mentioned Animals.

Although many animals (peccary, tapir) are not lumped into groups, birds are often classified as either kanari "fowl" or tsimeri "sparrow." In both cases the cover term is the name of a particular species that stands for the category in conversation. Sometimes koshiri "thieves" was used to refer to monkeys as a group. Otherwise, discussions of animals (as of plants) reveal an enthusiastic profusion and diversity of names.

Fowl are highly desirable game, less subject to food restrictions than most others. Guan, currasow and tinamou are commonly flushed during hunts and, although most arrows miss their mark, over the course of a year fowl provide about as much meat as monkeys do. Birds like heron, egret, trumpeter, and cock-of-the-rock were bagged sporadically, as were no doubt other birds that could have been consumed by a single family at one sitting while I was busy elsewhere.

What hunters talk about most, however, are shintori "collared peccary" and osheto "spider monkey." When you ask a hunter where he is going, he is most likely to answer, "I am going to hunt peccary," although everyone understands he will take whatever wild food he finds. When describing another place, the highest praise is, "They have are peccary there." In fact peccary does contribute the greatest amount of meat of any game animal to the Matsigenka diet, keeping in mind that the supply of game altogether is remarkably poor in their area and peccary yields are skimpy at best.

The Matsigenka believe peccary to travel in small family groups identical to human nuclear and extended families (see Peccary tale in Chapter 5). If one member of their group is killed, the others are thought to run for up to four days and nights without stopping to sleep. Although the young of some animals can be raised as pets, peccary young are always dead within a day of capture. Peccary feed during the day and sleep at night, except on exceptionally bright full-moon nights, when they will travel and forage. From observation the Matsigenka have concluded that peccary eat a large variety of seeds and fruits, especially palm seeds and ripe fruits that fall to the forest floor, but also some small fish and "soft earth."

Peccaries secrete a strong smelling substance (ishamakite) from a gland on the lower back, and this smell is evidence that they have been nearby recently. New moist feces and still-muddy footprints are other promising signs. Since peccaries frequently abandon the forest paths, such spoor is impetus for the hunter to do the same and explore the neighborhood. If spoor is old no one bothers, because peccaries are always on the move and do not linger in one spot. Peccaries may charge a hunter when wounded, as happened to Julio's father, who was badly bitten in the leg but survived.

Other large mammals are desirable but rare, including santaviri "white-lipped peccary," maeni "spectacled bear," maniro "deer," shiani "great anteater," sharoni "sloth," and kemari "tapir." Of these, I have only actually seen white-lipped peccary, deer and tapir cooking over the fire. But men have stories to tell of their own or their relatives' encounters with the other large game in the past. They have a good idea of what these animals look like, the sounds they make, their feeding habits, and the dangers they pose to a careless hunter. My sense is that a man could go through life without killing some of these animals, but that he is bound to come across their spoor, have encounters with some, and perhaps enjoy their meat as a gift from some other hunter.

A number of other smaller mammals are known to exist in the forest, but are rarely found. These include armadillo (etini), squirrel (megiri), paca (samani), agouti (sharoni), and tayra (oati). Of these, paca and agouti are known to feed on manioc and other garden crops, and so are likely to be hunted from garden blinds rather than in the forest.

Monkeys are more important than most larger mammals, especially osheto "spider monkey," killed as often as peccary but providing much less meat in the diet because they are much smaller than peccaries. They are believed to subsist on much the same diet as peccary, finding fruits and seeds high in the forest canopy. Their presence can be detected by the refuse falling as they eat above. When they spot the hunters below, they flee at great speed and it is difficult to keep up with them on the ground. But their meat is a favorite and worth the effort of the hunt. The origin of osheto is described in a folktale of brother-sister incest (Chapter 3).

Yaniri "howler monkey" is frequently encountered but much less eagerly sought. Compared to spider monkey, howler moves sluggishly in the trees and will sit still and peer down at hunters who were taking aim at them, only moving off slowly after the first arrow is released. The difference relates to diet: howlers eat large quantities of low-nutrition leaves, unlike the high-nutrition fruits and nuts of the spider monkey diet. Although this attribute makes howlers easier to hunt, the Matsigenka of Shimaa complain that its meat has an unpalatible smell, and many refuse to eat it on the grounds they "don't know how." Some claim that eating howler monkey meat gives them chest pains, and it gave both Orna and me indigestion. But others say they know how to eat it and have no ill effects.

Male howler monkeys are believed to have the capacity to become shamans (seripigari). The shaman's singing and the howler's roar are called by the same term, imarenta. Eating howler monkey when one's new maize plants are still young is believed to stunt their growth. Howler monkey is described as lazy (inti peranti, tera irogote ivantavagetera "he's lazy, doesn't know how to work hard;" see folktale [Chapter 4]).

The long and short hunting trips to the forest are the main hunting methods, but several others are also significant. Most dramatic is the group peccary hunt, represented repeatedly in the Peccary folktale (Chapter 5) but rare in Shimaa. Someone discovers a herd of peccary and runs to tell other men, who rush directly to that spot, where they separate and try silently to surround them. When the peccaries become aware of the men, wherever they run there are hunters. Here it is important to observe very carefully the direction taken by wounded animals, for it is almost always necessary to track them down and finish them off after the furious activity of the first few moments is over. In the one case I observed, about ten men and boys managed to kill four peccaries, the whole event taking less than an hour and a half. This was the largest kill I observed or heard about during my research.

Another common technique is the use of hunting blinds. These may be placed in trees (kutorintsi) or alongside trails (mankorarintsi). Often, the area in front of the shooting hole is strewn with manioc or fruit to habituate game for days before the hunter actually occupies the blind. Blinds in trees are aimed at getting birds, those on the ground at mammals like peccary and majaz (Figure 6.3).

[Figure 6.3 about here]

It is also common to set snares (iviri) in the forest in the vicinity of the homestead. These are of two types. The first, tameshirintsi, consists of one or more tamarotsa twine nooses draped between two tightly-strung, adjacent horizontal cords (Fig. 6.4). The cords can be strung between two stakes straddling a trail, or between two upright twigs growing on the

Blind --->

<----------------

Shooting

Aperture

----> Trail ----> **Manioc**
Bait

Stakes

Figure 6.3. Hunting Blind in Garden.

branch of a fruit tree. An animal runnng along the trail or a bird landing on the branch to peck at fruit will run its head into the noose, which will tighten as it struggles. The other type of snare is a noose tied to the end of a bent sapling. This samogarintsi is more complex, requiring a tripping mechanism (Fig. 6.4). A naturally-growing sapling is bent over under great pressure and tied to a noose that is held in a delicate balance until tripped by an animal attracted to the bait in the center of the noose. Both types of snare can be made in smaller or larger versions, depending on the size of the game being sought.

[Figure 6.4 about here]

Finally, boys and some men always keep a slingshot with them. Most common is the Y-slingshot with a rubber sling (konoritsa). While sitting idly alone or with companions, they will practice on nearby targets. On trails or in gardens, they take potshots at whatever birds they see, occasionally hitting them. At night, men take a flashlight (when they can get it) and stalk birds in fruit trees in the housegarden. Many men also know how to make a bola-type slingshot (varakatsa), but I have not seen them in use.

Matsigenka men like to hunt: as Maestro put it, “I don't work on Sundays, I go hunting.” If a man hears a bird near the house, he will quickly grab a slingshot or bow and bird arrow and try his luck. If, while gathering materials in the forest, he hears a bird song, he will with uncanny precision imitate its song and try to lure it within range. Hunting is something Matsigenka men do continuously and in every way that presents itself. They vary widely in their aptitude for the hunt. Some, like Oscar, are powerfully-built and fearless hunters who will go to great lengths and face any adversary, confident in their skill with bow and arrow to protect them from injury. Others, like Aretoro, tend to stay closer to home and to pursue

tivana **stake**

twig

noose

============== **cotton** ==================

cotton

string

string

tivana nooses

branch

| 6" |

6.4a) Ground Snare (Birds) 6.4b) Tree Snare (Birds)

bent
sapling

B

A

hoop **snare**

bait

6.4 c) Ground Snare (Mammals). A = holding stick. B = trip.

Figure 6.4. Snares.

smaller game, using a slingshot as often as bow and arrow; but they are crafty hunters and keep a steady flow of small game coming into the household. Still others, like Evaristo and Santiago, seem ill-at-ease hunting and are generally somewhat ineffectual in the male role. Julio, struck by polio as a young man, has such a bad limp he no longer hunts; he is respected instead for his highly productive gardens and deep knowledge of lore.

There is no really satisfactory way to measure the yields of hunting trips. Because I owned a shotgun I was an attractive hunting partner, but my shortcomings in savvy and endurance certainly affected the strategy of the hunt, and the shotgun affected the outcome. I recorded every case I saw of game coming into the community, but people were furtive about game in general, not being eager to share beyond their own hamlets.

There were two other shotguns in the vicinity of Shimaa, and most of the larger game I recorded was killed by shotgun: ll of ll monkeys, 17 of 20 fowl, 11 of 12 peccary, and 1 of 2 tapir. Altogether, shotguns brought in an estimated 539 of 666 kg, or 81%, of all large game animals I know about. Yet of the thirteen households in the time allocation sample, none owned a shotgun. As my fieldwork progressed, I came to feel that I, as an outsider, had no business killing animals in the rainforest, and Maestro increasingly took over use of my shotgun.

Despite these uncertainties, my best estimate is that the supply of meat from hunting to the average household in Shimaa during the period of my study amounted to only about 16 kg per year (dressed weight), or about 0.2 kg per person per month (equivalent to two or three hamburgers). This estimate is based on the many hunting trips I went on, on interviews with men after their hunting trips, which usually resulted in no game whatsoever, on frequent random visits to households for the time allocation observations, during which I noted the presence of meat being prepared or eaten, and on living with the downstream household cluster for extended periods during different seasons of the year. Meat was always treated like a precious commodity to be eaten in the tiny portions, so that even a spider monkey yielding 5 kg of edible meat could last a household several days, smoking over the fire and being doled out in nibbles with each meal. When finished, it could be the last game meat eaten in that household for weeks.

Men speak with nostalgia of the pre-school past when the big three, shintori, osheto, and kanari were common. They blame Italiano and his shotgun for scaring off the game. They are no doubt partly right, but this explanation of resource scarcity (and the related one that the fish are hiding [see below]), is--like the belief that crop variations are due to seed vitality--linked to a general outlook that the behavior of living things arises from their willfullness or agency (i.e., animals are staying away by choice, rather than being killed off). But the facts are that local human population density is much greater and residence more permanent than in the past and the shotgun is much more effective than the bow and arrow once game have been sighted. Both hasten rates of depletion near school communities.

It is likely, therefore, that people saw more game in the past, and the distribution of meat was more equal when everyone had to rely on bow and arrow. It is likely also that, with gardens smaller and the population more mobile in the past, game and all wild foods made up a greater proportion of the diet than today. On the other hand, Julio had never killed a peccary in his life, even though he was in his mid-twenties before polio struck, and that was before contact and the coming of school communities.

Collecting. The returns to hunting are so meager they hardly seem to justify the heavy expenditure of energy involved. Game, however, are not the only rewards of hunting trips. For those who know where to look, the forest is a storehouse of desirable foods, and a hunter's return at day's end is anticipated with excitement by his family, even if he has bagged no game. Whole families often spend the day in the forest, collecting rather than hunting. A man will bring his bow and arrows, and may have snares in the area that he will check, but the goal of such trips is to locate seasonal sources of wild food, and to draw on the labor of the whole family to harvest as large a fraction of this supply as possible before some other family shows up on the scene and, courteously but inevitably joins the harvest.

The three main collected foods by quantity are larvae, palm hearts, and fruits/seeds. Of these, the most important nutritionally are caterpillars (larvae of butterflies and moths), and grubs (larvae of beetles). The Matsigenka use the name of a particular caterpillar, poroshito, as a cover term for larvae that imashitaka "cocoon" and are believed to eat leaves. They distinguish at least 46 different caterpillars, each of which tends to be very abundant for a short period of time, sometimes in groups of many hundreds clustered together on a tree or marching in columns along the forest floor. The months of April and May, at the end of the rainy season, were a time of particular abundance of caterpillars, when a new one would come into abundance just as another's reign ended. Many species are covered with spines or have poisonous entrails requiring special preparation before being smoked, roasted, or steamed in leaves.

The name of a particular grub, tsuro, serves as a partial cover term for grubs that live on the inside of trees and eat bark and wood. In appearance, grubs have soft white corrugated bodies with a small brown head. The largest grubs, pagiri, are 6 cm long and weigh 10 to 15 g. They can be found in rotten logs that are detected by a foul odor from ten or twenty meters away by a forager walking a forest path. Smaller grubs are found in a living trees, sugar cane and caña brava. The Matsigenka distinguish nine such grubs, varying greatly in size from pagiri down to tegyoki at less than 2 cm long and weighing only a third of a gram. They are eaten raw or boiled.

Other insects make a minor contribution to the diet. Adults and children will fish a termite hill with a blade of grass moistened with saliva, either eating the termites raw or taking them home to share. Of particular interest are the tiny larvae, kaun, which weigh only about 0.1 g apiece but can be raised in large quantities in the fibrous mash that remains after manioc beer is strained. Kept in a trough or gourd, after a week it is swarming with kaun that can be harvested and served as a side dish with manioc, blurring the boundary between wild and domesticated food.

Other consumption of insects occurs opportunistically. Children will use brooms to bat down swarming butterflies and eat them on the spot. In general, when someone is engaged in a task that leads to the discovery of an edible insect, they immediately eat ir or wrap it to be cooked and eaten later. Thus, apart from major collections of larvae eaten at mealtimes, other insects serve not infrequently as small, occasional between-meal snacks. Altogether, insects as food amount to about 30 kg per household per year.

The second main source of collected foods is heart of palm, the tender white shoot at the top of the tree that will become its next leaf. Whenever a palm is felled to supply raw materials for manufacture, its heart is removed and saved for a family meal. But foragers will frequently fell a palm tree only for its heart, leaving the tree to rot even though the men at Shimaa continually complained about the scarcity of palms for their various construction needs. Once, on my first visit to Shimentaato, I passed a clearing with dozens of palm trees rotting after being felled for their hearts. Such profligacy may have been less costly when families lived as scattered homesteads and hamlets and the Matsigenga had no cultural means to prevent such short-sighted resource management (A. Johnson 1989). Palm hearts individually weigh from 0.25 kg to 1.0 kg and together add nearly 60 kg of vegetable food to the household diet each year.

Many other fruits and vegetables appear in the forest at different times of the year. Most common are sweet or sweet-sour fruits and palm fruits. Palm fruits come in many varieties, several of which--for example, tsigaroki (Scheelea cephalotes), kompiroki (Phytelephas microcarpa), and chorinaki (Euterpe ensiformis)--are like coconuts in having hard shells that contain a milky liquid and a white edible meat. Mostly consumed opportunistically as snacks, when they are available in large quantities they can form the basis for a soup for the whole family. Apart from the occasional walnut tree and seeds that may be consumed in the course of eating fruit, other nuts play almost no role in the Matsigenka diet.

Some wild fruits and vegetables common in the vicinity of Shimaa include:

etsiki ("acerola," Fam. Malpighaceae), sweet-sour when a ripe yellow, bland but enjoyed for its crunchy, light-brown seeds when green, harvested from trees in January and February;

intsipa, (Pentaclethra filamentosa?) a tamarind-like fruit in pods harvested from trees;

keta (walnut, Juglans neotropica), white meat covered by black skin in a particularly hard shell, available from February through June;

koriti, a sweet potato found in the forest and considered wild;

magoki ("ground cherry," Physalis angulata), a sour fruit that grows on bushes in the secondary growth of abandoned gardens;

meronki, a cherry-sized red fruit with a sweet flesh and a slightly sour, fuzzy but edible skin, harvested in season from trees in October;

pochariki (lit., "sweet seed"), several small black or red sweet fruits harvested in season from trees;

porenki (Canna sp.?), a wild fruit with an odd flavor (perhaps "soapy" describes it best) that is cooked up in "pepper pot," and is possibly related to the cultigen porenki;

savoro ("caña brava," Generium sagittatum, a cane widely used in manufacture that has a tender shoot like a tiny palm heart);

tsimoritoki, a crunchy black seed in a sour white flesh, edible after the rubbery skin has been discarded.

When fruits are in season, it is not uncommon for a family to return from foraging with their net carrying bags (tseoki) stretched to capacity. At other times, however, their hunger while collecting may cause them to consume most of what they find. In estimating yields, I have taken into account the quantities consumed while foraging. A household consumes nearly 90 kg of wild fruits and vegetables each year, of which only 7 kg are nuts and seeds (Table 6.19).

Altogether an average household takes in a total of 194 kg of foraged foods in a year, or about 30 kg for each member, well under a kilo a week. Although game, insects and nuts are nutritionally rich, the whole package of foraged foods provides a household with only 171 kcal of food energy per year. Yet the labor cost of this package is 223 kcal/year. That is, the package costs more energy to produce than it provides in return, perhaps the lowest returns found among any Amazonian peoples (Hames 1988: 55). It is not calories that the Matsigenka seek from foraged foods, but good taste, most probably provided by fats, protein, and general dietary diversity.

Although their use of the forest is eclectic and pragmatic, the Matsigenka also see it as a place full of spiritual forces and beings. On balance, Matsigenka beliefs in spirits and magic have little effect on their opportunistic use of available wild resources (Johnson and Baksh 1987). However, the general refusal to consume snakes and other koveenkaripage "dangerous animals" probably represents the most significant loss of nutrients that can be credited to spiritual beliefs, Oscar's willingness to eat puma notwithstanding. And there are many beliefs that will occasionally lead a forager to pass up wild foods. For example, once on a forest trail a small fine black bird (marini, Amazonian black-tyrant [Phaeotriceus poecilocercus]) burst out of a thicket and Roberto located its nest. He showed me the four small red-spotted white eggs but did not collect them, even though he assured me they were edible. When I asked him why, he replied that their parents would be very sad if he took them. Later, I learned that marini is believed to be capable of taking human form and causing spiritual harm. In that light Roberto was being prudent in not making the marini "sad."

Source	(kg/year)	(kcal/kg)	(kcal/year)
Game	15.8 kg	1.93 kcal	30.5 kcal
Insects	30.3	0.93	28.2
Palm Heart	59.0	0.26	15.3
Fruit	82.0	0.76	62.3
Nuts	7.0	4.96	34.7
TOTAL	194.1		171.0

Table 6.19. Foraging Returns, Average Household, Shimaa 1972-1973

Fishing. Fish have a central place in Matsigenka life. On meeting a stranger, the most likely question to you, after the obligatory ainyo piniro "Is there your mother?," will be "Are there fish in the river where you live?" The name of the Rio Shimaa itself derives from the most common fish in their diet: shimaa = shima "boquichico" (Pruchilodus nigricans) + a "water." The two most popular methods are poison fishing, accounting for about 45% of fishing time, and hand fishing, accounting for about 30%; nets and hook-and-line account for the remaining 25% of fishing time. Poison fishing is much more productive than the other methods, but the methods are complementary rather than competitive and together make full use of meager resources (Table 6.20).

Fish poisoning employs two cultigens of the general class known as "barbasco:" kogi (Lonchocarpus sp.) and kogi kiripeshianiri (Tephrosia toxicaria). Their roots when crushed release into the water poisons (primarily, rotenone) that stun the fish and inhibit their ability to breathe, causing them to float or swim dazedly along the surface. Although lethal to humans when ingested in concentrated amounts--kogi was reportedly used in one Matsigenka suicide attempt--it is harmless when used in fishing.

Since the Matsigenka live in mountainous terrain, however, their rivers tend to be fast moving. To use barbasco they must dam a portion of the river to slow its flow. The usual method is to locate a channel next to a bank of the river, partially separated from the rest of the river by a sand bar (Fig. 6.5a). Men build a log dam upstream from the sandbar to divert the current, and a second dam of logs backed by dirt and leaves running from the riverbank to the upstream end of the sand bar to slow the water flow of the channel to a trickle. The crushed

Rio
Kompiroshiato

poles
Rio Shimaa
sand bar **leaves**

rock dams **House 3**
ties

6.5a) Single Family Effort, 2--731

6.5b) Caña Brava Mat for Dam

---

to Rio **weir** **Rio Shimaa**
Kompiroshiato **flow**

dam
anchor

6.5c) R. Shimaa Weir, 4-19-73. Side View

---

sand bars **Rio Kompiroshiato**

III
IV **II** **I**
poison area

6.5d) R. Kompiroshiato, 7-26-75

Figure 6.5. Poison Fishing Dams and Weirs.

barbasco roots are washed in the trickle and as the milky poison spreads downstream, stunned fish begin to surface and can be collected.

[Figure 6.5 about here]

Meanwhile, at the downstream end of the channel, women begin work on their own dam. Since the water has by now been slowed, it is enough for the women to use small rocks, dirt and leaves to channel the remaining water in the stream toward a mid-point where a woman's net (shiriti) is placed. Stunned fish that get past the parties working the channel will drift into this net, where they will be removed into gourd containers. Owing to this division of labor by sex, before the fish collecting starts, the upstream end of the channel is all males while the downstream end is all females.

After the introduction of the barbasco, two things can happen. One, the participants begin to forage more or less at random, so that the men gradually wander downstream as the women wander upstream. As the two groups intermingle, households aggregate out of the flux, each focusing on a different section of the channel. Or, the participants will have agreed ahead of time on particular parts of the channel where they will collect. In that case, after the barbasco is in, they will move to the places they have staked out and immediately begin collecting as a family. The latter outcome is only likely in large multi-household expeditions.

Building a dam is heavy work. Few natural channels in the river are small enough to be exploited by a single family, so barbasco fishing fosters multi-household cooperation, the largest cooperative ventures we saw in Shimaa. A dam cannot withstand a very strong current and even after a dry period when the river has receded, efforts to build a dam may fail. Owing to the need for cooperation and the uncertainties, barbasco fishing calls forth an unusual degree of leadership from the independent-minded Matsigenka. Timing must be coordinated, there may be a division of labor by task directed by the leader ("You men bring logs, you others pile up rocks there"), and there are many opportunities for dispute over the harvest as families take up positions for collecting the stunned fish. Although the leader does not absolutely rule in every facet of this complex project, he does offer guidance and people listen to him.

The need for leadership, and its limits, were illustrated in one major venture that went seriously awry. Several households came together to enact Maestro's bold plan to construct a weir of rushes in three sections that, when installed side-by-side, would be wide enough to span the entire Rio Shimaa near its mouth, about 8 meters wide at the time. Although the river was relatively low in April (1973), at the end of the rainy season, its depth was still a meter or more in places and the current was swift. The weir consisted of three large mats woven from the leafy tops of caña brava (Fig. 6.5b). These were attached to frames that had been constructed of saplings and set in the river, fortified by large rocks mounted around their bases. The mats were set at an angle almost parallel to the surface of the river, so that the upstream edge of the mats thrust down about 30 cm into the rushing current. (Fig. 6.5c)

The idea was to introduce barbasco about a kilometer upstream from the weir and harvest the whole stretch of river at one fell swoop, a technique once observed by Farabee (1922: 4-5). The stunned fish would be swept down river and, floating near the surface, would be caught on the weir. To this end, four men had been up since midnight, joined by nine others as dawn broke, pounding about 20 kilos of barbasco roots into a coarse mash. It takes about an hour to pound a kilo of barbasco root, using a rock of about 1.5 kg and crushing the root against a boulder with repeated blows. It is hard work, and men change the rock back and forth between their left and right hands as they work. With rest breaks, the men put in a total of about 20 man-hours preparing this large quantity of barbasco.

As the mats for the weir were being put in place downstream, two men packed the crushed barbasco upstream to the place where they were to spread it in the water when they received word from Maestro that all was ready. While they were en route, however, one of the three mats--in the heaviest current along the far shore of the river--broke loose. Then suddenly, as the men wrestled with the broken weir, stunned fish began to float by. Without waiting for the signal, the men upstream had already put the barbasco in the river. For a moment, the people were as stunned as the fish that were being swept away downstream (into the R. Kompiroshiato). Then, with furious activity, men and women jumped into the gap and tried to catch as many fish as they could. But because the intact two-thirds of the weir acted like a wall funneling the current and its cargo of fish into the open third of the river, the greater part of the catch was lost. Still, the effort paid off with a good yield of 1.3 kg of fish for every hour of labor invested (including women and youths). The scale of the project, however, was too much for the collaborative skills of the Matsigenka.

The largest cooperative effort I ever knew the Matsigenka of Shimaa to make was a barbasco fishing expedition (Fig. 6.5d):

> Fieldnote - July 25, 1975: We arrive at 8:30 am downstream along the Kompiroshiato River, where a large channel has been exposed between shore and two sand bars in the middle of the river. Along are four men and one woman of Felipe's extended family. Immediately a big discussion breaks out, with Felipe saying the river is too high, there are not enough big rocks, it cannot be done. Mariano says yes we can. At 8:40 they start cutting caña brava to make mats.

Only those with long leafy tops are selected. Some cane bottoms are cut, bent in half, then laid out parallel .

Aradino finds a wormy cane and tosses it to his wife, Rosa. He misses, gets up, picks it up and hands it to her. She opens it, extracts a 2 inch grub and hands it to him with a smile. After a minute she borrows matches from her brother, Felipe.

Now they carefully cut leaves of caña brava and lay them across the bent canes.

Rosa makes fire from dry rotten wood, then piles sticks on top. Aradino sings, working at her side. Felipe and Geronimo chat, working together on the other side. I cut leaves with them for an hour. On their fires they roast the otsova (the top sprout, like a tiny palm heart) of the caña brava. The fire also strengthens or makes flexible the upper leaves, which are then used to tie the bottoms of the bent canes. After the leaves are laid and the poles folded over and tied, the loose leaves at each end are neatly cut to make a straight edge (Fig. 6.13b).

Fieldnote - July 26, 1975: 9:30 am, men still working at mats. At 10:30 Maestro arrives, begins to lay rock foundation for dam. This is the biggest group effort we have yet observed: about two-thirds of the river, involving perhaps 55 meters of dams, is being diverted. Layout (Fig. 6.6d)

The work is a lot of fun; people are enjoying themselves. There is playfulness everywhere: rolling the rocks along the river bottom, bringing logs downstream by riding them bucking-bronco style. Many men are now working, and by 3:30 they have installed the mats and slowed the water enough to add the barbasco. The women's dam is about a kilometer downstream.

Now family groups and other clusters form to work particular stretches of river (these appear to have been agreed on in advance). One group centers on Felipe's household, another on Maestro’s (a beautiful deep pool below an overhanging tree).

By now, the joyous exuberance has given way to subdued disappointment. Altogether thirteen men and nine women have invested 123 hours of labor. But this time the yields are quite poor: a total of 6.3 kg, mainly of small fish. That works out to about 50 g of fish per hour of labor.

Thus, the yield of this expedition was only 4% of that of the big Shimaa expedition two years earlier. Although some of the difference can be accounted for by the differences in method--the Kompiroshiato venture included diverting most of the water (and hence, probably, most of the fish) before the barbasco was added--the major difference was that, with permanent settlement, the same convenient stretches of river were being exploited over and over with barbasco, which wipes out virtually all fish in that stretch of the river. For the river fauna, a barbasco expedition is a catastrophe from which it requires months, if not years, to recover. By stepping up the pressure with frequent use of barbasco, the Matsigenka were depleting all the available fishing opportunities in the vicinity of Shimaa.

We know from Baksh's careful studies at Camana that this process is inevitable in this region wherever there are permanent settlements and populations larger than an extended family hamlet. He found that between September 1979 and November 1980, as local fishing spots were depleted, the efficiency of fishing (kg/hr) dropped by more than half, travel time to fishing spots quadrupled, the daily take of fish dropped by two-thirds, and daily consumption of fish dropped more than half (Baksh 1990). In Shimaa, just as the game within two hours walk had disappeared by 1972, so the fish in the area were disappearing by 1975. Unlike Camaná, however, there were no "virgin" fishing areas far from Shimaa, only other communities upstream equally equipped with barbasco, and acculturated communities downstream whose use of dynamite had destroyed the fishing even more efficiently than barbasco. Even on the smaller niatenis upriver you could find barbasco dams and weirs. My notes of 12-24-74 say of barbasco: "The impact is devastating--nothing escapes."

None of the Matsigenka made this connection to over-exploitation and resource depletion. Consistent with their general beliefs, they described the fish in 1975 as “hiding,” placing the responsibility for scarcity on the willful fish, rather than on human use of the environment. Of course, they recognize that it is humans (and their technology) that the fish are hiding from, but they do not also recognize that they are, at least temporarily, wiping out their food supply. And it did not occur to them that they would have to manage their resources more carefully if they were to enjoy future harvests at anything like the productivity of their early days at Shimaa (Johnson 1989).

Net fishing is a complementary technique that takes place in high water, in the muddy turbulence following heavy rain. The advantage of these conditions is that the fish cannot sense the fishers approaching, nor can they see the nets until they are caught in them. Men and women use different types of nets and different techniques. The men's net, kitsari, is a broad rectangular net strung between two poles that a man holds in front of himself as he works slowly upstream waist deep against the current, scooping his net forward against the bottom then up to the surface. His net is somewhat coarser than a woman's net, and is geared to catch fish that dwell in the river current (oakunirira). The woman's net, shiriti, is smaller and round. She uses it in shallow water and works close to the bottom, usually in tandem with children or other women who walk backwards upstream from her, loosening rocks and sending the creatures hidden around them scurrying, to be carried into the net by the current. She is geared to catch minnows, amphibians, and other water creatures that live in the shelter of rocks (mapukunirira).

The remainder of fishing time is split between “hand fishing” and hook-and-line. Hand fishing takes place under the same conditions as net fishing and at times contributes to it. The method of hand fishing is to prowl close to shore in muddy, turbulent water, feeling for small fish and water creatures around and under rocks. It requires no equipment, and is a frequent occupation of children and adults during or after the rain. Although the yields are low, the effort is rarely without some reward. The Matsigenka attitude toward it could be summed up as, “it beats sitting around doing nothing.”

Hook-and-line fishing occupies only about 16% of fishing time, and its yields are poor. Like net and hand fishing, however, it remains relatively popular because it occupies a niche of time that is not in competition with other food procurement strategies. Line fishing generally exploits the main current of the river unsuitable for other methods, and is done in low water season of long enough after a rain that the water has clarified enough for fish to see the baited hook. This is a relaxed sort of fishing one can combine with bathing to end the day on a pleasant note.

Fishing with dynamite was common downriver along the Urubamba River, but was new in Shimaa when Maestro used it several times during the month of September 1972. At first his yields were very good, bringing in 40 or 50 fish at once. But by the end of the month his last two ventures with dynamite brought in two fish and no fish, respectively. Again, the explanation was that “the fish are hiding.”

The most important fish in the diet is <u>shima</u>. These fish get up to 0.5 m long and can weigh over a kilo. They are bottom feeders that cannot be caught by hook and line, but tend to make up the bulk of the catch in barbasco and men’s net fishing. <u>Mamori</u> (“corvina”) is also common, similar in size to <u>shima</u> but catchable with hook and line. Many men make bracelets of the bark called <u>kamavikyompana</u>, to make their wrists hot and increase their likelihood of catching mamori. Both shima and mamori have firm, fine-tasting white meat and are much beloved. Mamori and shima are so full of small thin bones, however, that they must be eaten very slowly and carefully. Since, like all meat, fish is eaten in very small quantities at any given meal, this need to linger and eat carefully is no real annoyance.

Next in importance are the “rock-dwellers” (mapukunirira), of which etari (“armored fish”) is most abundant. A small green catfish-like fish with an exoskeleton, it is the major quarry of hand fishers and, although only around 10 cm in length, abundant enough on occasion to make the main meat dish for a family dinner. Many other species live around or under rocks or in cavities in the riverbed, such as kito (shrimp) and kempiti (“carachama”), but they make up a small proportion of the catch compared to etari. These creatures may also be caught in a trap made by cutting holes in large bamboo poles and leaving them in the river for days, until animals have settled in them.

Large fish, like omani (“zongaro[?]”), kayunaro (“doncella”) and charava (“achacova”) are rarely taken. The Matsigenka believe they come up the Kompiroshiato during the rainy season and retreat to the Urubamba with the return of low water. Other fish ranging in length from .1 m to .5 m are caught sporadically, including koviri (corvina), shivaigi (“bojorque”) and the coveted segori (“vagre”), the object of a dispute between fishers described in Chapter 5.

Method	Yield (kg/hr)	% Time	Hours/Year	Total (kg/year)
Poison	.635 kg/hr	43%	330 hr	210 kg
Hand	.228	30	230	52
Hook/Line	.136	16	123	17
Net	.228	11	84	19

TOTAL	100%	767 hr	298 kg

Table 6.20. Fishing Time and Yields, Average Household/Year

Domestic Animals--. Domesticated animals are minor in the household economy in Shimaa, and probably played an even smaller role in the past. Many households raised a few chickens (ataava) and muscovy ducks (pandyo), but since many others did not, the average numbers per household were 5.5 chickens and 1.0 duck, including chicks and ducklings. Fowl are allowed to forage in the vicinity of the household during the day, feeding themselves on insects and seeds, and will be fed an ear or two of maize in season. At night they are protected in chicken coops that are frequently broken into by wildcats or, perhaps, humans. The amount of labor involved is minimal and is usually handled by a child.

Dogs (otsiti) and cats (mishi) were occasionally brought into the community during 1972-1973, but all died despite affectionate care. The cats had an unfortunate tendency to eat a kind of lizard that left them paralized, and the one dog was bitten by a wildcat and died after Maestro applied insecticide to the wound to keep the flies off. In other Matsigenka settlements we saw parrots and monkeys that were leashed and appeared tame, but in Shimaa only Kasimira kept pets, two birds (segoigi and putiokiti) that flew in and out of her house freely and were handled affectionately by all members of the household. Perched on a rafter or outside in the papaya tree, they sang different songs, often simultaneously. By December of 1974 she had also managed to raise the first litter of kittens in Shimaa.

Food Preparation and Consumption

The Matsigenka diet is ample and diverse. Their style of eating ranges from raw foods eaten on the spot to feasts involving days of preparation by many households. Although women are responsible for the greater part of food preparation and the distribution of food within the household, men are not averse to cooking and serving food.

Methods of Preparation--. Matsigenkas eat many foods raw, especially on collecting trips and while hand fishing. The great bulk of the diet, however, is made up of starchy staples that must be cooked. Every married woman and every grown woman with children has her own hearth. Hearths, especially when they are inside the house, are kept going almost constantly, although they may be banked when the woman plans to be away for most of the day. This means, of course, that a woman needs firewood. How much is needed, and how difficult it can be to supply, only hit home when we tried to cook our meals at our own hearth. Maintaining a supply of firewood is a constant chore, one that gets progressively more difficult the longer a household resides in one location.

Firewood. The Matsigenka hearth is just a place on the floor where the fire is built. It may be slightly hollowed out and ringed with stones, but this is not necessary. The fire itself (tsitsi) is in a star pattern, with logs pointed toward the fire in the center. The art of building and maintaining a good fire rests on extensive knowledge of the burning properties of different woods, and calls for constant attention. Maneuvering the burning ends of logs closer together intensifies the heat while pulling them apart reduces it; small branches are inserted to increase or decrease flame or smoke; adjustments keep the air flowing into the center and distribute weight so the pot does not fall over and spill.

The Matsigenka distinguish fires along two main dimensions: whether they burn slow or fast, and whether they burn with flame or smoke (Figure 6.6). For example, two nearometiki logs of about 20 cm in diameter can be pointed directly at each other and, when almost touching, will burn slowly (ireroni omorekatanaka) but with an intense pinkish-blue flame that can boil six liters of water in a large pot within five minutes. Pulled apart 10 cm, the burning surfaces will cool down to create a heated space suitable for popping corn. Pulled farther apart, they will cool but not immediately go out, so that later they can be pushed back together to create a hot fire again. These highly desirable logs are long-lasting (okusotanaketyo).

Since every wood is somewhat different, it takes a long apprenticeship to learn how to cook with the materials available at any given time. Children learn by being instructed continuously by their mothers when they are in the house. Rather than tend the fire herself, a mother will often order her child to make this or that adjustment, correcting the child until the fire is just right. Often, the available firewood is of inferior quality, and then a constant shuffling of wood in and out of the flame, fanning the fire, and knocking coals off the blackened wood is required before a meal is finished.

Traditionally, a household would draw firewood from unburned logs in its surrounding gardens.. Naturally, household members begin by bringing pieces of firewood of appropriate size from as close a distance as possible. Over time, the choice becomes whether to range farther from the house to drag back heavy wood, or to begin to cut up the larger trunks close to home. Since either alternative involves additional labor, the longer the residence in one place, the greater the cost of obtaining firewood. By 1972 firewood was periodically scarce near the school community. We begged, cajoled and bribed men to help us get firewood, but still fell short of our needs because they, too, were having difficulties.

An average household needs about 0.15 cubic meters of large logs each day, and another 0.05 cubic meters of small branches to do all its cooking. A shortage of wood in the middle of a forest may seem odd, but living trees are only potential firewood. Around the school community, people found driftwood after a storm to be their most convenient firewood supply. The downstream cluster had much less difficulty getting firewood. Their houses were situated either in the middle of new gardens or close by. Men would make a point, at the end of a day of garden work, of bringing home a log or two for firewood. If the garden is adjacent to his house, each effort may require twenty minutes or less, mainly to chop the logs, but if he must seek abroad for firewood, it can take an hour or more.

```
                              tsitsi
                         “fire, firewood”
                         /              \
                  tsitsi                    tsitsi
                  “fire”                    “firewood”
                 /      \                   /        \
morekatsirira      oenkani        omarapoani            otiomiapoani
   “flame”      “smoke”       “big stick (log)”   “small stick (kindling)”
        \       /                        \           /
      shintsi (“fast”)            otsonkanaka shintsi (“it finishes fast”)
“fast flame”  “fast smoke”     “fast-burning log”   “fast burning kindling”
          vs.                                 vs.
     iroroni (“slow”)          okusotanaketyo (“it lasts long!”)
“slow flame”  “slow smoke”     “long-lasting log”   “long-lasting kindling”
```

Figure 6.6. Categories of Fire and Firewood.

Food Processing. Large animals like tapirs and peccaries are butchered by men, but most other processing is done by women, who skin monkeys, pluck fowl, clean fish and caterpillars, and remove the husks, skins and seeds from fruits and vegetables. The most common method of cooking food is boiling or stewing in an aluminum pot. This is how most manioc and other tubers are cooked, after they have been peeled. Women also commonly boil fish or grubs, making a thin soup with tiny droplets of fat floating on the surface and pervaded by the flavor of the animal, especially prominent owing to the absence of seasonings. Women also occasionally boil a pepper pot of red peppers along with wild and cultivated vegetables, or make a sticky soup by boiling plantains together with some fish.

A second common method of food preparation is roasting directly in the coals. By finding a relatively cool spot among the coals and turning the food frequently, most foods can be roasted as an alternative to boiling, and the flavor developed by the two methods is quite different. As a consequence ash is regularly consumed along with the food and may be a significant source of minerals and trace elements in the diet (Ohno and Erich 1990; cf. Mertz 1981). For some foods, such as larvae and fish, an alternative is to wrap them in banana leaves or corn husks and place them in the coals, so that they steam in their own juices. Prior to the 1970s, before aluminum pots became generally available, roasting must have been a more common method of food preparation than it is today.

Fish and game in any quantity are smoked on a babracot as a means of preservation. The firewood is separated so that the logs smolder without flame, and the meat is left over the smoking hearth day and night until it is consumed. Family members are careful not to snack on these tempting delicacies between meals. Meat will keep this way for perhaps five days, becoming dry and tough but with a terrific flavor.

The preparation of manioc beer occupies a significant amount of women's time. They begin by placing ears of maize in a stream for a few days until the kernals begin to sprout. They then mash the kernals by rocking the edge of a large flat stone on a wooden pestle. Frequently, cooked sweet potato is added to the mashed maize. The sugar in these two foods helps get the fermentation started, or, as Eva said about sprouting maize, opochati ashi shitea, "it sweetens it for beer." Matsigenka brewers do not usually chew and spit manioc into the pot to add saliva enzymes for fermentation, but they are familiar with the technique and Orna has seen them use it when maize is unavailable.

The fermentation thus begun, they then boil and mash quantities of manioc. A woman usually has a large canoe-shaped trough in the house where she puts the mash and adds water. She then strains the coarse mash through a strainer woven from palm leaves, setting the fibrous residue aside. Children will sometimes suck on the residue without swallowing it, but its main value will be as a breeding place for the edible larvae, kao. The strained liquid, the consistency of buttermilk, is then covered with banana leaves and left to ferment. Initially fresh and sweet tasting, the fermenting liquid becomes progressively more sour (kacho) as its alcohol content rises; it also becomes lightly carbonated. I would guess that a medium-strong manioc beer, fermented about two days, has an alcohol content in the 4-6% range. The labor cost of brewing beer, not counting the harvest of manioc, is about 15 minutes per liter (O. Johnson 1978:60).

Eating--. Children spend about 15% of their daylight hours eating, but by the time they become adults this number falls below 10%. Snacking can take place at any time: Children left alone pop and eat popcorn or warm manioc left from breakfast; on rainy days the whole family will work near the fire and snack on ears of roasted corn or caterpillars; late at night someone may heat up food left over from dinner; and, of course, foragers help themselves to portions of whatever they find in the field. A few women who spent most of their time at home had become rather plump from snacking, something that never happened to men and was unusual in women.

The whole family commonly eats a meal together at around seven in the morning, and again in mid or late afternoon. These meals consist most often of manioc and, when available, meat, fish or grubs in small quantities. When some kind of animal food is not available to garnish the manioc, the Matsigenka consider the meal boring and will apologize to a guest. Baksh (1984: 67) found that, when there is no meat, the Matsigenka at Camana eat less manioc and increase their consumption of beer. Typically, an abundant food like manioc will be eaten at will, but special foods like meat or grubs are centrally distributed to ensure that everyone gets an equal portion. The degree of care given to equal distribution of a special food may be seen in the following observation of a meal in the downstream hamlet.

> Fieldnote [5-10-73] - At 6:05 Rosa has boiled up the remaining smoked fish into a thin soup, and everyone shows up to eat. Felipe and Mariano start out with their own plate of fish and a plate of yuca; Eva, Virima, Rosa, Micaela, Felipe's daughter and youngest two sons are all sharing from the pot the fish was cooked in and a plate of yuca. At 6:08 Karoroshi and Jorge arrive, joining in the meal with Felipe and Mariano. The soup plate started with Felipe, then Mariano, then around to Jorge and Karoroshi, each slurping in turn at the liquid until it is almost gone. Felipe makes the first move, taking a piece out and giving it to Eva, who shares it out. Then he takes a piece for himself,

> followed by Mariano and Jorge. Karoroshi then takes up the plate, takes a few more slurps, then a piece of fish. Mariano slurps up the last drops of liquid, and Felipe guards a small piece of fish for Amalia [his second wife]. The whole affair, at least the men's part in it, showed systematic, almost rhythmic, sequence which seemed to insure that all parties would get an approximately equal share, with Felipe and Mariano getting a courtesy start which gave them only a small real advantage. The whole fish episode took place rapidly with little yuca eaten until it was past.

Once the meal is over, there is some shifting of seating mats so that, just as in group fishing, sex segregation only lasts during the communal phase of the activity, then evaporates as individual families reassert themselves. After the meal, guests may stay on into the evening, chatting and telling stories.

After a period of adjustment that lasted a month or two, I came to enjoy Matsigenka food. With salt scarce I had to allow my palate time to become sensitive to the natural flavors of the food. Several varieties of maize were so sweet that the cob itself was sweet and people chewed it to a pulp before discarding it. Manioc, when prepared well, is a fine staple food. A single portion of meat for a meal would be no larger than I was used to eating in one mouthful, but I learned to break off tiny pieces to eat with each bite of manioc. Once accustomed to the lack of spices, I discovered that the natural flavor of the fish or meat would amply complement the tuber.

Perhaps owing to the scarcity of meat in the diet, the Matsigenka consider tapir, peccary, and monkey to be strong meats that must be eaten carefully. The red meats are taboo to pregnant women and young children, to people who are sick and therefore vulnerable, and to some who say, “I don’t know how to eat that.” But hunters who encounter game they personally cannot eat nonetheless try to bag it, because someone in their social circle will know how to eat it. For this reason, Matsigenka food taboos do not appear to reduce the degree to which most tabooed species are hunted (cf. Ross 1978).

Nutrition--. Dependent as they are on the bounty of nature, the Matsigenka enjoy a constantly varying supply of wild foods. Just when they seem about to run out of everything interesting, something new comes into season and is abundant for a few weeks. There is always plenty of food, and is unlikely under normal circumstances that the Matsigenka could go hungry. Only manioc beer, made by the women, seemed too scarce to please the men.

Furthermore, the complexity of the diet--high diversity, a tendency to eat even tough, dry, bony and crunchy parts, and the regular addition of dirt and ash--made it highly unlikely that any specific nutritional deficiencies could occur. They also ingest other substances like the ash and bark added to coca leaves (Goodspeed 1961: 116) and the soft inner pulp of the chorina palm (Euterpe ensiformis):

> Fieldnote [date] - I tried some and found it pleasant and satisfying, although I cannot say just why, for it was not sweet, had little flavor, and felt sort of dry in the mouth. Still, Felipe, Mariano, Rosa, and Jorge all sucked on some, so its attraction is attested.

In Shimaa, it is rude and intrusive to watch people eat, let alone weigh what they are eating. Baksh (1984: 380) reports a similar inability to get data on household food consumption in Camaná. Living with a family, however, gave him the opportunity to measure his own consumption of Matsigenka foods prepared in his household. His data illustrate the great diversity of the Matsigenka diet and the proportional contributions of wild and domesticated foods (1984: 380-93). The main scarcity he found was in dietary fats, accounting for only about 7% of total calories, a rate of consumption considered marginal by nutritionists. The general pattern described by Baksh--garden foods provide over 80% of the diet by weight, fish outweigh game by roughly 20:1, and domesticated animals account for only 1% of the diet--is similar to Shimaa; but the substantial importance of bananas and plantains in Camaná as compared to maize in Shimaa makes a straightforward adoption of Baksh's figures inappropriate.

Table 6.21, however, provides indirect evidence for the nutritional adequacy of Matsigenka diets by describing the nutritional value of foods produced by the three main strategies--foraging, fishing, and farming--each of which may be thought of as producing a "basket" of foods supplying the listed nutrients. Multiplying the values in Table 6.21 by the kilos of food produced by an average household in a year gives an estimate of the amounts of key nutrients produced that can be compared with an estimate of amounts needed for nutritional health (Table 6.22). Column (7) of Table 6.22 shows that the Matsigenka produce an abundance of every nutrient listed, generally about three times the recommended allowance.

Since they do not consume all of this food, we cannot assume automatically that they meet minimum nutritional requirements, but two lines of evidence support of the probability that they do so. First, the foods they most often waste (in abandoning gardens) are the starchy staples, especially manioc and cocoyam, with the least nutritional value beyond calories; nothing prevents them from eating selectively to meet all their nutritional requirements. Second, there is very little evidence of any obvious malnutrition among the people in our sample (see "<u>Health and Well-Being of the Household</u>" below).

FOOD PRODUCTION STRATEGY
(Units/kg. of typical "basket")

Nutrient	Foraging	Fishing	Farming
Calories (Kcal)	0.88	1.01	1.33
Protein (g)	55	179	15
Calcium (mg)	590	200	360
Phosphorous (mg)	730	1800	490
Iron (mg)	15	7	13
Vitamin A (r.e.)	1050	0	190
Thiamin (mg)	0.9	0.3	0.7
Riboflavin (mg)	0.8	0.8	0.4
Niacin (mg)	15	30	6
Vitamin C (mg)	350	0	210

Table 6.21. Nutritional Value of Kg of Food Produced by Foraging, Fishing, and Farming. (Source: Johnson and Behrens 1982: 178)

NUTRIENTS PRODUCED/RECOMMENDED

(1) Nutrient	(2) Foraging (194 kg/yr)	(3) Fishing (298 kg/yr)	(4) Farming (9800 kg/yr)	(5) Total (10,292 kg/yr)	(6) Recommended	(7) (5)÷(6)[1] (%)
Cal. (Kcal)	171	301	13,034	13,506	4,541	297%
Prot. (g)	10,670	55,342	147,000	213,012	66,978	318
Calc. (mg)	114,460	59,600	3,528,000	3,702,060	2,044,000	181
Phos. (mg)	141,620	536,400	4,802,000	5,480,020	2,044,000	268
Iron (mg)	2,910	2,086	127,400	132,396	37,230	356
Vit. A (r.e.)	203,700	0	1,862,000	2,065,700	1,700,900	121
Thia. (mg)	175	89	6,860	7,124	2,190	325
Ribo (mg)	155	238	3,920	4,313	2,592	166
Niac. (mg)	2,910	8,940	58,800	70,650	28,762	246
Vit. C (mg)	67,900	0	2,058,000	2,125,900	124,100	1713

Table 6.22. Comparison of Nutrients Produced and Nutritional Requirements, Av. Household/Year. (Source: Johnson and Behrens 1982: 178). [1]Amount produced as % of recommended allowance.

Manufacture

Barely participating in the market economy, the Matsigenka of Shimaa in 1972-1973 made nearly all of the material items they used in their daily lives, the notable exceptions being knives of various sizes and aluminum pots. They are skilled at making what they need, and attend to aesthetics in the sense that form, balance, and finish are objects of pride and critical comment. Yet the skill involved is not beyond an ordinary person's capacity with practice and some guidance. A complementary distribution of skills among men and women ensures that a married couple can be virtually self-sufficient as a unit, capable of long-term isolation without lacking essential technology. Here I describe and estimate the labor costs of the important material items, trying in the process to give a rough idea of how are made.

Possessions--. Matsigenkas keep careful track of their possessions (Table 6.23). Those they do not manufacture themselves they receive as gifts from friends and relatives. In addition to the items in Table 6.23, there were items that a few people in Shimaa owned that did not appear in our surveys. These included the assistant schoolteacher's broken shotgun, a portable record player acquired by Maestro during our first year of research, notebooks, textbooks, pencils, and paper belonging to some of the schoolchildren, Peruvian currency, slingshots, and flutes. There are undoubtedly also ritual paraphernalia like the sorcerer's stone (serepitontsi) that people would not have admitted to owning.

People tend to acquire locally manufactured items either by making them themselves or receiving them as gifts from husband or wife. Other kin and good friends also give manufactures as gifts. Nonlocal items, especially cooking pots and steel tools, were considered essential, but had become comparatively inexpensive in the school communities, thanks to more frequent contact with the outside and a strong ethic of fair trade fostered by SIL volunteers. Orna and I were always asked to bring back such items at every opportunity: when I left Shimaa in the winter of 1974, people requested that on my return the following summer I bring a water-boiling pot (tetera), comb (kishirintsi), scissors (teshiria), oil (igeka), chickens (ataava), and shorts (banyador).

Almost Every Man	Almost Every Woman
cushma	cushma
shorts*	shorts*
needles*/thread	aluminum pots*
achiote face paint	achiote face paint
machete*	kitchen knife*
fishhooks*/line*	baby sling
bow and arrows	shoulder ornaments
digging stick	cane boxes
	gourd bowls
Most Men	**Most Women**
net carrying bag	spinning/weaving set-up
cloth carrying bag	plates*
kitchen knife*	spoons*
shirt*	needles*/thread
coca	
flashlight*	
panpipes	
Some Men	**Some Women**
axe*	women's fishnet
pants*	net carrying bag
woven wrist bands	woven wrist bands
climbing rope	grinding board and stone
mirror*	dress*
broad knife*	
scissors*	
traps	
oar	
soap*	
drum	
matches*	
gourd bowl	
Few Men	**Few Women**
men's fishnet	mirror*
beads	sewing machine* (1)
feather headband	shoes/sandals*
balsa raft	beer trough
shoes*	
pocket knife*	

*Items the Matsigenka do not themselves manufacture.

Table 6.23. What Matsigenkas Own.

Materials--. One of the ways in which Matsigenkas classify objects in their environment is according to use. The broadest categories of use are ogagani "edible," ovetsikantaganirira "raw materials," and tera onkametite "useless." The most important raw materials are woods, canes and fibers. Apart from hides (drumheads) and teeth and bones (necklaces), animal parts are rarely used in manufacture.

Palms. As a group, palms are the most widely useful of all raw materials. There is no cover term for "palm," although the name of one, kamona (Iriartea exhorriza), is sometimes used to refer to several similar palms that provide hardwood and have edible palm hearts. Rather, each one is known specifically and in detail, and many dimensions of contrast--short/tall, spines/no spines, edible seeds/inedible seeds, etc.--could be constructed, none of which would be more relevant to the Matsigenka than any others.

Matsigenka	Scientific	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	
chorina	Euterpe ensiformis, E. precatoria	✓	✓	✓				✓		✓	✓		✓		
kamona	Iriartea exorrhiza	✓	✓	✓	✓	✓	✓	✓				✓	✓		
kapashi	Hyospathe tessmannii			✓				✓					✓		
kompiro	Phytelephas microcarpa			✓						✓			✓	✓	
kontiri	Iriartea sp.		✓		✓	✓		✓					✓		
kuri	Bactris ciliata, B. gasipaes						✓	✓			✓	✓	✓	✓	
manataro	Bactris chaetochlamys						✓						✓		
sega	Jessenia bataua			✓					✓	✓			✓	✓	tiroti
	Oenocarpus multicaulis	✓						✓			✓				
tsigaro	Scheelea cephalotes			✓					✓					✓	

Table 6.24. Palms Used In Manufacture.

[1]1. house post 2. house beam 3. roofing 4. wall slats
5. flooring 6. bow 7. arrowhead 8. mats
9. basket/sieve 10. spindle 11. batten 12. edible heart
13. edible fruit/seed [For identifications, see MacBride 1960; Henderson 1995; also Ferreyra {mention in acknowledgements}]

Use of the most common palms is summarized in Table 6.21. Trunks serve as house posts and beams; leaves provide roofing and strips for plaiting; hardwoods are used for bows, arrowheads, and spindles; and palm hearts, fruits and seeds make a significant contribution to the diet. Although several palms, especially kamona, serve many purposes, there is generally a prefered palm for any given use: kapashi leaves are by far the best for roofing, kuri makes the best bows and arrowheads, sega the best seating mats. Since these trees are rarely planted in gardens (cf. Balée 1988) and are usually found scattered widely in the forest, shortages arise early in the vicinity of a new settlement.

Wood. Apart from palms, a small number of hardwood species supply most of the household needs for wood. The main needs are for posts and beams for house construction, planks for doors, mortars and oars, and trunks for beer troughs and canoes. The most common trees to supply these needs are irivatiki (main house post), kamuia (Rubinacae; post, beam), keta (Juglans neotropica, walnut; door, mortar), potsotiniro (oar, door, spoon, beer trough), samviki (post, beam, canoe), and santematiki (door, canoe, oar). Caña brava (Gynerium sagittatum, uva grass), a large, sturdy cane that grows wild in stands along the river, is a main source of poles for walls, rafters, and temporary shelters; its cousin, arrow reed (Gynerium saccharoides) is a slender cane sometimes cultivated in gardens as shafts for arrows (cf. Rutter 1990: 103).

Fibers. The most important fiber is a cultigen, tivana (Bromelia sp) that is processed into twine for nets and traps. A number of wild fibers are extracted from bark and used in bowstrings (tamarotsa, Cecropia sp.) and lashings (shivitsa; pashirokitsa, Trema micanthra; paroto, balsa, Ochroma lagopus). Since the only nails the Matsigenka use are palmwood spikes used to build balsa rafts, lashing is the main method by which manufactures are held together. Much of the maintenance work to be done on older houses is reparing worn lashings.

Men's Products--. In all areas of activity there is a sharp differentiation between what women and men do. These differences are cognized in the sense that questions like tatoita ovetsikakero tsinani "What do women make?" elicit specific activities with high reliability. In the man's domain are bow and arrow, twine, housebuilding, and all wooden implements.

Bow and Arrow. A hunter should have at least two bows on hand, a smaller one for hunting birds and small game, and a larger one for large mammals. Because he will hunt with a variety of arrows, and arrows are frequently lost, he will also try to keep at least twenty arrows ready for hunting at any moment. In addition, he may keep partially completed bows or arrow parts around the house, to be completed on a rainy day or when needed before a big hunt.

The Matsigenka bow is of medium size, made from kuri (Figure 6.7a). This wood is much too hard to drive a nail into and rarely splinters. Unless a man has a kuri palm growing in his garden, as some men do, he must locate a tree in the forest, where they are few and widely scattered. Palm trees like kuri are composed of a very thin outer bark, then a layer of hard wood, followed by a soft center that makes up most of its diameter; the useful wood is thus more like thick tubing than a solid wood trunk. For bow wood he seeks a mature tree of perhaps 25 cm diameter, from which, using an axe or machete, he can extract a plank 3 cm thick, 4 cm wide, and 150 cm long. He may take a few such planks from the felled kuri tree, as

6.7a. Bow

arrowhead   foreshaft   shaft
feather
6.7b. Arrow

==================

point   teeth   foreshaft
6.7c. Kurikii, “palm shaft,” irashi osheto

point   barbs   foreshaft
shaft
6.7d. Tsegontorints, “barbed, irashi kanari

inside
view of
inside   point   sharpened
edges
view of
point   bamboo point   thread binding   palmwood foreshaft
6.7e. Kapiro, “bamboo,” irashi shintori

point   bulb   foreshaft
6.7f. Tyonkarintsi, “bulbed,” irashi tsimeri

==================

Figure 6.7. Bow and Arrow

well as some smaller pieces for arrowheads, but unless other men are sharing the resource with him, most of the wood--enough to make dozens of bows--will be left behind to rot.

[Figure 6.7 about here]

Using a machete, he roughly shapes the bow, then uses a knife as a scraper to give the bow its final shape: broader at the handgrip in the middle (2.5 - 4.0 cm), narrowing to the nocks at the ends (1.0 - 1.3 cm). When unstrung, the bow is perfectly straight and of a uniform thickness (0.5 - 0.65 cm) along its length (115 - 135 cm). The maker does not take any measurements, but stops frequently to hold the bow out and turn it this way and that, checking for symmetry, proper thickness and taper. The fine work of scraping and shaving the bow takes about three times longer than the rough shaping. The resulting bow is polished and well-proportioned, capable of sustaining a pull of about 25 - 30 kg. It does not lose its spring with time and can last up to five years without breaking.

The bowstring is a twine (<u>tamarotsa</u>) made from the bark of the <u>tamaro</u> tree, which is also used to make the cords men wrap their ankles with in tree climbing and for some snares. This tree is common and the bark easy to remove: an incision near the base of the tree allows a man to pull the bark, causing it to tear in a straight strip upwards until it detaches from the tree perhaps 25 meters above ground. After the bark strip dries for two days, it is possible to pull the coarse strands of fiber from the woody bark (there is a knack to doing this efficiently, requiring the proper twist as the two are pulled apart). The fibers are then separated, straightened and entwined into a three ply cord (in a manner similar to <u>tivana</u> twine, to be described in greater detail below). The resulting twine is sturdy and capable of lasting for two years with regular use. The completed bowstring is 2-4 mm in diameter and 20-30 cm longer than the bow. The excess cord will be wrapped around the arrows to make a tight packet while walking, and will be wrapped around the upper limb of the bow during hunting. There is enough fiber in one 25 meter strip of bark to make four bowstrings.

A Matsigenka hunter needs four main kinds of arrows. All his arrows use the arrow cane chakopi (Gynerium saccharoides) for the shaft (Figure 6.7b), that grows wild along streams in the vicinity of Shimaa and may be transplanted to a garden. A man selects cane that are straight, about 1 cm in diameter, and over 110 - 120 cm long, cutting them easily with a machete. He brings them home, hardens them over the fire and then allows them to dry in the sun for three days.

Usually, a man secures feathers to the butt end (otiokike = anus) of the shaft. Arrows intended for small game at short range may be left featherless, but feathers are considered essential for accuracy beyond 10 m because they cause the arrow to rotate and fly true. Whether or not he will attach feathers, a man prepares the butt end of the shaft by melting wax or pitch (tsineri) on it and on 20 cm of cotton thread, then rotating the shaft so that the thread winds tightly along the last centimeter of the butt end. If he will attach feathers, he takes a wing feather--preferably black--from one of a number of game birds and splits it in half lengthwise along the quill. Shaving the feather 1 cm at each end leaves bare quill that can be bound with thread to the shaft, again using wax or pitch to seal the thread. The midsection of the feather is not bound to the shaft, so that it tends to bulge slightly. Looking down the shaft from the butt end, the feather will be seen to spiral to the right at about a 30° angle. Attaching the feather's companion half to the opposite side of the butt completes that end of arrow manufacture. Despite Pope's (1974) proclamation that "practically all arrows have three feathers," and " the only good arrows that have two feathers are on weather vanes," if Matsigenka arrows have any feathers at all, they have only two.

The substance used to seal the thread bindings may be wax obtained from bee hives, or pitch (called by the same name, tsineri) from the "leche caspi" tree. Pitch is obtained by cutting the bark and allowing the sticky yellow sap to fill a small bowl. After simmering in a pot for about four hours, the liquid is allowed to cool until it can be formed into a ball, which hardens as it cools still further. Like beeswax, it can be melted with flame to drip onto the threaded shaft, and it is so much like beeswax that the Matsigenka believe bees get the wax for their honeycombs from the tsineri tree.

What distinguishes one Matsigenka arrow from another is its arrowhead, which may be made either of palmwood or bamboo. Of the two basic palmwood arrows, the "palm shaft" (kurikii), also called "spider moneky's" (irashi osheto), is 50 cm long, sharpened to a point, broadening to one cm in the middle, then tapering to a narrow foreshaft. It is serrated along its mid-section to increase the tissue damage and bleeding as the monkey tries to remove the arrow (Figure 6.8c). The foreshaft is heated and rubbed with wax, jammed tightly into the foreward end of the shaft, and wrapped with waxed thread. The "barbed arrow" (tsegontorintsi), also known as "guan's" (irashi kanari), is intended primarily for fowl (Figure 6.8d). Much smaller than spider monkey's arrow, it has four barbs inserted into the shaft along with the foreshaft. These are to broaden the area of damage done by the arrow, to increase the probability that some vital part of the bird will be hit.

The bamboo-tipped arrow (kapiro), also known as "peccary's" (irashi shintori), is lanceolate, sharp-edged and broad, designed to do as much internal damage and cause as much bleeding as possible (Figure 6.7e). Baksh (1984: 316) reports that men believe bamboo to be naturally poisonous, and will use taste and smell to select the most venemous bamboo stalks from which to make their arrows. A piece of bamboo 2 cm wide and 10 - 15 cm long is shaved to a point and given sharp edges along its length. It is split edgewise at the butt end to admit a palmwood foreshaft, and then bound to the foreshaft by careful waxing and wrapping with thread for 5 cm. The other end of the foreshaft is bound to the arrow cane in the same manner as palmwood arrowheads are.

A less common type of arrow is tyongarintsi, made from one of several hardwoods with a point expanding to a bulb followed by a foreshaft (Figure 6.8f). Out of twenty arrows, only one or two will be of this type, which is intended for smaller birds (irashi tsimeri, "sparrow's"). The purpose of the bulb is to stun the bird or break its wing so the hunter can collect it quickly after hitting it. Other uncommon arrows include a long, thin palmwood point for shooting fish (irashi shima, "boquichico's"), and a detachable harpoon point (katsarori) made of kuri and attached to the foreshaft by twine, also used in fishing.

Every man has some knowledge of how to make bows and arrows, but often his knowledge is incomplete. One of the less-respected men did not know how to make spider monkey's arrows and had none in his possession; two others did not know how to make the bulbed bird arrow (tyongarintsi) and obtained theirs from relatives. One man knew how to make all four major arrows but not how to make bows--his was a gift from a close friend.

The men found it easy to distinguish their arrows from those of other men, although most of them found it difficult to tell me how¸ saying simply, "He makes his arrows and I make mine." Style differences that stand out for these experts include the length of the shaft, the style of serration, the color and manner of the thread binding, and whether feathers are split in half or used whole. Men also used the size and strength of bows as markers of different craftsmen. The Matsigenka of Shimaa hunt so rarely in groups that there is seldom any need to keep track of arrows to determine who killed an animal, and ownership of a bagged animal belongs to whoever shot it.

Time and energy measurements show that a man can make a bow and 10 arrows in about one eight-hour workday, expending energy at a moderate rate of just under 200 calories per hour (Table 6.25). Pope (1974), who studied a large number of native American bows and arrows, was not impressed with the quality of these weapons in general, nor would he have been with the Matsigenka's. In addition to using two feathers rather than the recommended three, their failure to bind the feathers securely along their whole length means a less efficient rotation during flight and a greater tendency to wobble. He also found the bow he tested "heavy, slow and jarring." He attributed this to crudeness of design and the deadening effect created by wrapping excess bowstring. This, he says, "speaks of a lack of intelligence on the part of the maker" (1974: 21).

This ethnocentric allusion to "intelligence" aside, my observation of Matsigenka bow hunters does not undermine Pope's technical assessment. Their arrows tended to wobble noticeably in flight, and to miss their targets the vast majority of attempts. On the other hand, the men are good stalkers who can get surprisingly close to game before taking a shot, often within 10 m by imitating calls and using forest cover as camoflauge. Ever hopeful, men take their bows and arrows with them on all forest journeys, except in rare cases when a designated resource, such as palmleaf roofing, has already been located and must now be laboriously harvested and brought home. In 1972-1973, bow hunters in Shimaa succeeded in bagging virtually every kind of game, including fowl, monkeys, peccaries, tapir, deer, and the one puma.

Activity	**Energy Rate** (kcal/min)	**Time** (min)	**Energy Expended** (kcal)
Bow			
1. Walk 1.6 km (forest)	7.2	29.3	210
2. Fell kuri palm	7.5	10.0	75
3. Section felled tree	5.0	10.0	50
4. Split plank from section	5.3	9.5	50
5. Return walk (downhill)	4.5	25.5	115
6. Rough shaping (machete)	2.7	30.0	81
7. Fine shaping (knife)	2.9	90.0	261
Subtotal		204.3	842
Bowstring (4 bowstrings)			
1. Walk 1.1 km (forest)	7.2	21.4	154
2. Strip 25 m bark	2.8	16.5	46
3. Return walk (downhill)	4.5	17.7	80
4. Separate fibers	2.6	100.0	260
5. Entwine fibers	2.6	162.0	421
Subtotal		317.6	961
(Subtotal ÷ 4 [1 bowstring]		79.4	240)
Arrow (10 spider monkey arrows)			
1. Walk to cane patch	6.8	7.1	48
2. Cut cane (machete)	3.1	7.4	23
3. Carry cane back home	3.7	7.6	28
4. Rough shaping arrowheads	2.5	29.8	74
5. Fine shaping arrowheads	1.5	54.5	82
6. Mounting arrowheads	1.2	21.8	26
7. Feathering shafts	1.6	41.7	67
Subtotal		169.9	348
(Subtotal ÷ 10 [1 arrow]		17.0	35)
Total: Bow and 10 Arrows		453.6	1430

Table 6.25. Cost of Manufacture of Bow and Arrow. (Source: Montgomery and Johnson 1973: 6).

Twine and Netting. Men have much need for twine. Tivana (Bromelia sp.), the source of twine commonly used in making fishing nets and net carrying bags, is a cultigen whose long thin leaves, similar in appearance to those of the pineapple plant, contain fibers that run vertically from tip to base. It is usually harvested in quantity when a man makes up his mind to make a bag or net, but one or two leaves can serve to make a short piece of twine when needed in a hurry. The leaf is succulent and breaks with a snap near the base. With the acquired knack one can pull the fibers from the leaf cleanly in one sweeping motion, leaving the moist green pulp aside and draping the white fibers in the sun to dry.

After leaving them to dry for two days in strong sun, the man sits down and separates the fibers. They are fine and tend to be tangled somewhat, but they are very strong and do not break as he separates them into thin strands (each composed of many extremely fine fibers) 70 - 90 cm long. He takes two strands and entwines them by rubbing them between palm and inner thigh with a downward motion, or between his two palms. He does this very carefully, repeating several times so that the twine is tightly wound and of an even thickness of about 1 mm. The whole process of producing a meter of single strand twine (1-ply)--including harvesting, stripping, cleaning, drying, and twining--takes about 25 minutes.

To make the final <u>tivana</u> twine, he takes two lengths of single-stranded twine and twists them together using the same palm-palm or palm-thigh motion. This goes much faster, requiring about three minutes to produce a meter of 2-ply twine ready for use in manufacture. By selecting two strands of different length, a man ensures that one will run out before the other. When this happens, he frays the ends of the shorter piece and the new piece and feathers them together as he twines them with the longer piece. Repeating this step each time one

6.8a. Making a net

starting thread

Row 1

Row 2

Row 3

Row 4

etc.

6.8b. Making a knot

1. bring twine unker knotting stick: mesh in

2. bring loop of twine through previous row:

3. start knot:

4. pull knot tight

<u>Figure 6.8. Making netting from twine</u>.

strand runs out, he is able to produce a continuous twine, thin, flexible and strong, that he winds into a ball very much like string or yarn.

[Figure 6.8 about here]

The basic principle of netting is to start with a row of meshes tied by knots to a loop of twine. An additional row of meshes is then knotted onto the first row, and so on (Figure 6.8). A man adds rows of meshes until his net is of the desired length and width. Men are careful in this work, frequently pausing to view the emerging pattern and even undoing some work in order to get the shape and proportions right. When Omenko started his net bag (<u>tseoki</u>), he used a small rod (.05 cm in diameter) as a guage to set a uniform mesh size for the bottom. When he wanted a more open mesh for the sides of the bag, he used a larger rod (1 cm diameter). By wrapping the twine around the rod and making the knot, each mesh came out the same size, lending a remarkable consistency to the final product (Figure 6.8b).

When he gets to the last row, he weaves the mesh into a tightly woven border 6 mm wide. Being linked by knots prevents the loops from slipping or separating too far. Although knotting adds a laborious step to the process, the resulting net will hold even small objects without allowing them to slip through. Yet the net bags have a surprising capacity, for they can stretch to hold a volume double the size they appear when empty. And, being netting, they can be crushed into a small size and easily carried out of the way until needed.

We may now estimate the labor cost (in time) of making a net bag (<u>tseoki</u>).

One <u>tseoki</u> requires 90 m <u>tivana</u>. At 1 m per leaf, this means 90 leaves must be harvested, at an average cost (including transport) of 17.0 min/leaf, or 1530 min for 90. These must then be stripped (1.3 min/leaf) and cleaned (0.9 min/leaf) for 198 min for 90. Making 1 m of <u>tivana</u> requires 3.0 min/m to twist the 1-ply strand, costing 270 min for 90, and then twined together with another strand (2-ply) at 2.9 min/m, or 261 min for 90. It costs 0.2 min per knot to make a tseoki with 4,116 knots in it, or 823 min. Adding all these costs up, one tseoki costs 3082 min, or 51 hours (at an average rate of 3.3 kcal/min, this adds up to a little over 10,000 kcal in energy expenditure).

Since a net bag opened up into a flat rectangle is about 1/4 m^2, a square meter of netting of the same mesh size, about what is needed to make a woman's fishnet, would take 200 hours to make. A man's fishnet is at least twice as large in area as a woman's net, but has a much wider mesh (less knotting and less twine required per square meter) and perhaps costs 100 hours to make.

Housing. That they abandon their settlements for a new location every few years does not lead the Matsigenka to build flimsy houses. On the contrary, they expend much energy building houses that are sturdy, secure, and dry. Like many aspects of Matsigenka technology, they must be lived with to be appreciated (cf. Barriales 1977: 24). Matsigenka architecture is undoubtedly an ancient art, and appears almost identical to that of related groups, such as the Piro (Matteson 1954: 41-42).

To build such a house, a man begins with four corner posts (otinkamipoa, "master post") cut from the trunks of dense hardwoods (esp. irivatiki), about 25 cm in diameter and 290 cm long. He sets these in holes 75 cm deep and compacts earth solidly around them so that they cannot be budged, using a stone attached to twine as a plumb bob to assure that the posts are precisely vertical. He carves notches in the top of each post to cradle the main beams (okonovoaro, 10 cm diameter and 6 m long) that become the two long sides of the rectanglar base on which the roof will ultimately rest (Figure 6.9a).

[Figure 6.9 about here]

He then lays three cross beams (ovevirimenkoaro, 6 cm diameter and 5 m long) unlashed across the main beams. At right angles to these, parallel to but outside the main

6.9a. Basic House Frame

cross-beams

main beams

eaves poles

corner posts

6.9b. Basic Frame with Rounded Ends - Top View

eaves pole
main beam

corner
curved eaves pole **posts** **end**
wall posts

cross beams

Figure 6.9. House Construction - Pankotsi

6.9c. House Ready for Palm Leaf Roofing - Side View

Figure 6.9. House Construction, cont'd.

beams, are two small eaves poles (onampinapoa, 4 cm diameter and 10 m long). The eaves poles and cross beams, lashed together, form a rigid frame resting on the main beams. Lashed to the eaves poles and rising at a slope to the ridge pole (ovankiaropoa) are the rafters (ovankevoatarira) that will support the palm-leaf roofing.

Occasionally a man will stop with this basic pattern and settle for a rectangular house, but he usually adds elliptical ends. To do so, he places three end posts on a curve at each end of the house. He then extends the eaves poles in a circuit around both ends of the house by lashing to the end posts palmwood strips that are thin enough to bend, but still sturdy enough (3 cm thick x 7 cm wide) to bear the weight of rafters; only wood of the kontiri palm is suitable. Viewed from inside the house, this makes a roughly elliptical horizontal pole that runs completely around the house about two meters above the ground, to which the lower ends of the rafters are lashed (Figure 16.9b).

The rafters, which are made from caña brava or from any of a number of saplings, are lashed at their upper ends to the ridge pole, about 4.5 m above the ground. The ridge pole is held in place by four struts (ovarigiiro) , one at each end connecting it to the two farthest end posts, and two in the middle connecting it to the two outer cross poles. The rafters are further stabilized by a palmwood brace that runs around the inside of the roof at the middle of the rafters, 3-3.5 m above the ground. When the rafters have been lashed in place, the whole roof becomes a tightly integrated frame, a solid mass pressing into the notches in the corner posts, with no possibility of being blown away, or fractionally moved, even in a heavy thunderstorm (Figure 16.9c).

The next step is to attach the roofing materials. These are made from the fronds of a number of palm trees. By bending the leaflets on one side of the midrib of a frond over to the other side, a man creates a criss-cross pattern of leaflets with few openings where rain can get through. He lashes the rib horizontally across the bottoms of the rafters with the leaflets pointing downward, then lashes another rib alongside it, continuing around the eaves until he comes back to his starting point. Then he starts a new row 7-8 cm higher on the rafters, so that the fronds in the new row substantially overlap those in the previous row. He repeats this process a third time, then begins to lash the fronds vertically to the rafters, layering one over another as he goes around and around the house, rising closer to the ridge pole after each circuit. To gain access to the higher elevations, he makes a ladder by cutting footholds in a log, or builds a platform inside the house.

The prefered roofing leaves by far are kapashi, although leaves of the chorina, kompiro, and sega are acceptable substitutes. Whereas these latter are believed to last four or five years, everyone agrees that kapashi will last ten years without disintegrating. Their appeal is not the ten-year lifespan but the everyday quality of the roof: fewer leaks, less storm damage, and fewer repairs during their period of habitation. Sega leaves are preferred for topping off the roof, plaited in twos to make a single mat to be draped lengthwise over the ridge pole and lashed to it. Sometimes a second ridge pole is lashed on top of them, or flat rocks placed on top, to prevent their being blown away in a gale. After a year or two it will be necessary to replace these crowning leaves.

The Matsigenka build their walls (tantarintsi) most commonly of palmwood staves (kamona or kontiri), or caña brava poles. The wall runs from the floor up in under the eaves, about 1.2 m. The slats or poles are aligned vertically as close as possible together to keep fowl in and predators out. They are lashed to palmwood rails that run parallel to the ground a few centimeters above the bottom and below the top of the slats. A doorway opening, framed in hardwood, is left in the middle of one of the long straight walls. A hardwood plank on hinges made from strips of hide or bark serves as a door (sotsimoro), although many do with just reed mats.

Although most houses have a dirt floor, they usually have a raised sleeping area (menkotsi), made of palmwood laid over a framework of poles. The palmwood flooring is obtained by felling a palm, usually kamona, and softening the wood with a large number of vertical slashes with an axe or broadknife. When flexible enough, a man can open the trunk, remove the soft insides, then flatten the trunk out into a plank perhaps .7 m wide and 6.5 m long. Laid across a frame, this makes a flexible, slightly bouncy floor or bed. A similar construction, but up in the cross beams, serves to create a platform where a shaman does his chanting.

Except for rafts, the Matsigenka do not use nails or dowels, but lash everything together. Balsa (paroto) is the most common source of lashing fiber along with tamarotsa and shivitsa. There are stands of balsa and shivitsa in known locations, and a visitor to them can see many trees with old and new scars where trees have been partially stripped. The bark is very flexible and extremely tough. Even thin strips cannot be broken or torn apart, although they are easy to cut. It is similar to coarse sisal twine in its ease and range of use.

Under conditions like those in Shimaa in 1972 it takes 430 hours of labor to build a typical house 10 m long and 5 m wide, with rounded ends and fully walled. Since 300 hours, roughly two thirds of the total cost, is needed for the roofing alone (installing rafters and palm leaves), young men with small families reduce roof area by building only the rectangular core of the structure. The labor of preparing and building walls is another tenth of the total, and a few men have never gotten around to walling their houses.

It takes nearly three months of full-time labor to build a typical house. Other family members help fold the leaflets of palm fronds or tie wall slats, but most of the labor falls to a man alone or to two kinsmen who help each other build their houses together. Since men must garden and forage also in order to feed their families, completing a house usually takes longer than three months. Mariano began his house on September 9 and had the rafters ready for roofing by September 18. But he was still roofing in November and only finished up his wall in mid-December, nearly three-and-a-half months after starting. Despite help from his brother and other family members, it was during this period that Mariano fell behind on weeding (see above). This was the house his son Apa set on fire two years later (Chapter 3).

A roof requires 3500 leaves. At 12 leaves/tree, therefore, roofing one house involves felling 300 palm trees (Baksh (1984: 294). A man can carry at most 40 leaves at one time, and making some ninety round trips up steep mountain trails and then down again laden with an awkward, bulky burden of roofing leaves is the greatest drudgery. The Matsigenka believe that leaf-cutter ants are transporting sections of leaf for the roofs of their own underground dwellings, and an endless line of ants tottering under leaf-segments several times larger than themselves is an apt cultural image for a Matsigenka transporting roofing leaves. Double the time of each round trip from two hours to four as trees become scarce and we can understand how men would begin to think of substituting inferior roofing leaves, as they were beginning to do in Shimaa by 1973. Even so, most men in Shimaa during 1972-73 were still making the scores of four-hour round trips required to obtain the best (kapashi) leaves for their roofs.

Even assuming an average round-trip of only two hours to obtain materials, transport accounted for half of the total cost of building a house in Shimaa. Doubling the round-trip to four hours increased the cost of building a house from 430 hours to over 600 hours, transport accounting for 80% of the total cost. By comparison, a new house in Camaná in 1980 cost 935 hours. Although a number of factors were involved in the higher cost, including a communal approach that utilized men's labor less efficiently and a somewhat larger house, the main difference was that each trip for roofing leaves cost more than twice as much time in Camaná as in Shimaa (Baksh 1984: 298). Camaná's population is twice that of Shimaa, and the labor cost of building a house there is twice that of Shimaa, evidence that where roofing materials are concerned a process of intensification has taken place (Johnson and Earle 2000: xxx), where either labor costs increase or quality of materials declines. This was evident in Shimaa by 1973, when Karoroshi, who was unhappy with his house for inferior timbers and a leaky roof, said "I would build a new [house], but it is too far to go for materials."

The Matsigenka build simpler shelters when away from home. If caught in a rainstorm while hunting, a man cuts a few palm fronds and sticks them in the ground next to a tree, to make a temporary lean-to. When his family moves to the river during the low-water season, he requires about two hours to build a more durable shelter (savorovanko), an A-frame of caña brava poles over which he layers caña brava leaves battened down with braces. More than a lean-to, this is a tent-like hut large enough for a family, although when everyone is asleep there is no free floor space. Being the low-water season, a storm-proof house is not needed and the temporary residence at the river has the feel of camping, when wild foods are plentiful and everyone tolerates with a sense of adventure the missing comforts of home.

Other Men's Products. Men do all the work with wood in Shimaa. At beer feasts, men often pass the time carving wood, especially to make drums and drumsticks. They make drums (tampora) from a hardwood cylinder cut from a tree trunk, hollowing it out with knives and machetes, passing the drum from hand to hand as the feast progresses. They fashion drumsticks from kuri, the palmwood used for bows and arrowheads.

> Fieldnote [beer feast] 12-9-72 - ...the men were working on a drum for Oscar. The drum went from hand to hand, each working 15 minutes to a half hour before passing it on. Moderate amounts of manioc beer went around, and spirits were relaxed and happy. An incident with my knife was instructive. Antonio needed a knife to make a hole in the leather drumhead (made from the howler monkey I shot and gave to Aretoro), and mine was most readily available. When I saw what he wanted to do, I was about to recommend he try the leather punch (one feature of this Swiss Army knife, including 2 cutting blades, screwdriver, bottle opener, can opener, scissors, a steel file, saw, toothpick and tweezers, and a corkscrew), but before I could say anything he had taken the main knife blade, the one I use most, and, placing a piece of wood beneath the place on the leather where he wanted a hole, deftly cut one the correct size and shape. I was still absorbing this event, and thinking how they sharpen blades on stone, don't have bottles, cans or corks to open, when Maestro and Antonio started admiring the knife with all its attachments. Maestro was so taken with it he asked me to sell it to him ("the price doesn't matter, I want a knife like this to have until the day I die"). I agreed, and then he told me a story about the Swiss missionary who promised to sell him such a knife years ago, then sold it to someone else--Maestro was giving me a morality lesson, so that the same thing wouldn't happen again!
>
> The general steps in drum construction are: select and dry the skins (they can be howler monkey, spider monkey, or even peccary), hollow out a tube of wood to the desired shape and size

> (say, 25 cm in diameter and 40 cm long), prepare two hoops (one smaller than the other) for each end, place one leather piece over one rim of the drum and press the smaller hoop down over it to fasten the skin to the rim. Then, pull the leather up around the outside of the smaller hoop and fit the larger hoop over the smaller hoop, with the leather pressed between the two hoops. Now the excess leather of the drumhead is pointing upward, away from the other end of the drum. Do the same to the other end of the drum. Then, punch holes along the outside edge of each drumhead, and tie the two pieces directly together with side cords. Tightening the cords pulls the outer edges of the drumheads toward each other, covering the outer hoops at each end. The resonance of the drumheads can be tuned by tightening or loosening the side cords. A couple of pieces of thread and some tiny perforated seeds tied across the bottom drumhead serve as snares. [I edited this paragraph to give a bit clearer description of how the drumheads are installed.]
>
> ...The drum (for a right-handed person) is hung by its strap over the left shoulder, with the left arm resting along its top and the left hand hanging loosely over the front drumhead (distinguished from the back by having no snare). The <u>kuri</u> drumstick, which is tapered from a blunt end about 2 cm diameter to a pointed end, is held lightly between thumb and first finger of the left hand, the blunt end touching the drumhead during drumming. The right hand holds the drumstick between thumb and first and second finger tips, and drums perpendicular to the left drumstick. Carlos, who is left-handed, drums in mirror-image to this. When they drum they drum very fast--I can only keep up with the beat by drumming as fast as I can, which takes a lot of concentration.

Also at beer feasts, or on rainy days, men will occasionally fashion toys. Favorites are birds made of corn husks (<u>shinkimashi</u>) and hit with the hand badminton-style back and forth over a cross beam, and spinning tops with a hole in one side that hum as they spin (<u>oshonkanaka opoimatanake</u>; “it-spins it-hums”). I also once saw children playing soccer with a ball of homemade rubber (<u>konori</u>).

Men make rafts (shintipoa) from balsa logs to use in crossing the river or moving heavy items downstream. You can make a balsa raft on the spur of the moment by cutting down a balsa tree, stripping its bark, cutting it into four or five logs 2-3 m long, using a rock to drive palmwood spikes through adjacent logs, and lashing the logs together side by side using their own bark. The whole job can be done in an hour. Such a raft, made of green balsa, will be slow and heavy and ride low in the water, but it will float well enough to get you across the river. If your need is not pressing, the logs will dry out well enough in two or three days to make a light, high-floating raft.

Outside some homes an odd-looking sugarcane press is found: looking something like a beaked hitching-post, it is a hardwood pole with a horizontal hole drilled through it above the beak. A wooden bar is inserted in the hole, along with cane which is crushed by the bar used as a lever. The juice runs down the carved wooden beak, dripping off its tip into a container. The juice is boiled down into a sticky candy that is much beloved.

A few men have made dugout canoes (pitotsi), but because they are hard to make and hard to use in swift, rocky mountain streams, most use rafts. The work in making a canoe is similar to that in making a trough (vatea) for manioc beer, which is shaped like a canoe. A heavy hardwood log must be roughly shaped where the tree was felled, then maneuvered closer to home where final shaping takes place. An axe or machete can be used; an adze is prefered, but there were none in Shimaa in 1973.

Men's Skills. Overall, men's manufacturing time is dominated by four areas: tivana twine and netting (34%), wood products (e.g. drums, spindles, beer troughs, and balsa rafts; 25%), houses (19%), and bows and arrows (10%). So clear is the division of labor by sex that men spend 88% of their manufacturing time on these tasks whereas women spend 1%.

Not all men are equally skilled, however. Nearly every man can make a bow and the basic arrows for birds, monkeys, and peccaries, as well as house, twine, balsa raft, oar, traps, cane boxes and net bags (made from twine). Most men also know how to make comb, women's fishnet (also from twine), and arrows for fish and small birds. But only the most skilled men know how to make slingshots, unusual arrow-types, and men's fishnet. Canoes are rarely used at this altitude and the one man who did know the skill emphasized that he only knows how to make a small one. The men I interviewd in the lower-altitude communities of Camisea and Camana all knew how to make canoes.

Several men in the time allocation sample were highly skilled. Out of 23 skills men may have, Javier had 22, Oscar, Aretoro, and Aradino had 21, and Omenko had 19. Javier, Aradino and Aretoro lived apart from hamlet groups, as for much of the time did Oscar and Omenko. Other men, mainly those associated with the downstream hamlet, had far fewer skills: Felipe had 15, Eduardo and Julio had 13, and Karoroshi, Mariano, Roberto, and Evaristo each had 11 skills, half the number Javier knew. Roberto and Mariano, for example, did not know how to make bows and received theirs from Julio. Perhaps loners tend to master more skills than men accustomed to living in hamlets (Johnson 1998). Some of the difference in skills may also represent local or subcultural variation, like bolo-style slingshots and uncommon arrow types.

Women's Products--. The division of labor by gender is as extreme on the women's side. Unlike men's work, however, women's manufacturing is dominated by a single activity, the making of cloth. The Matsigenka grow their own cotton, an activity in which both men and women participate. Once the cotton has been harvested, a woman first prepares it for spinning by placing it on a mat on the ground and beating it with thin sticks to soften it and help remove the seeds. She cards and fluffs it somewhat and begins spinning it into thread, using a palmwood spindle (made by men) set in a clay base (made by women). With the right hand she flips the spindle with her fingers, spinning it on its base in a gourd bowl, its unmistakable clack and clatter issuing from Matsigenka houses at any hour from early morning until long after sunset.

The knack at this stage is to catch the fluff of cotton on the top end of the thin spindle, its rotation twisting the strands of cotton into a single thread. Periodically, when the length of cotton between the spindle in her right hand and the fluffed cotton in her left is spun, she allows the thread to wind down onto the spindle and pulls out a new fluff of cotton for spinning. As thread accumulates, she rolls it into a ball. When she has two softball sized balls of thread, she will take both and spin them into a two-ply thread to be used for weaving. Spinning cotton is the predominant task associated with cloth, accounting for 51% of cloth-making time.

Weaving is a skill for which women are greatly admired. The technique is the backstrap loom (Rowe 1977). The warp is laid out by winding a continuous ball of thread in a figure-eight pattern around a number of stakes set in the ground (Baksh 1984: 305). It is then attached to loom bars at each end, the far one being tied to a house beam, the near one attached to a strap around the weaver's waist. Using a batten made of polished palmwood, she beats the weft into place across the warp. Stripes and small checkerboard designs are set when the loom is set up. The quality of the finished cloth depends upon many things, including how evenly the thread has been spun, the care with which the loom is set up, and the evenness with which tension is maintained by the weaver's leaning backward or forward while weaving.

A woman acquires the skill through years of collaboration with an older woman, usually her mother. It is not uncommon to see a grown woman with children of her own turn to her mother for advice in setting up the loom or determining the design for the weave. She will be judged by the fineness of her thread, the tightness of her weave, and the absence of errors in her design. Some young women who do not know how to weave are regarded as lazy and less desirable as wives. Other girls already know the rudiments of spinning by age 8 and produce a coarse cotton string that will be used for some purpose or other in the household.

Women in Shimaa on average spend over an hour and a half per day making cloth, both spinning and weaving. Most of it is for cushmas, but other needs, such as cotton bags, baby slings, and wristbands must also be met. Spinning serves to occupy a woman in times that might otherwise be considered leisure, much like knitting does for women elsewhere. Weaving is more demanding work. Sometimes, two women will set up their looms facing one another in the same house, so they will have companionship during the long hours of repetitive labor. Orna Johnson (1978: 188) estimates 10 weeks of spinning and 3 weeks of weaving to make a cushma, about 90 days. Since women in Shimaa do cloth work about 1.7 hours per day, they spend about 150 hours on cloth in 90 days. 80% of that time is for cushmas, so we may estimate the cost of a cushma at about 120 hours, including both spinning thread and weaving cloth. If anything, this underestimates the cost (Baksh 1984: 301). Even so, by this estimate a cushma costs at least one-fourth the cost of a new house. No wonder when western clothing becomes available, Matsigenkas eagerly seek to obtain it.

The cotton gown or cushma (manchakintsi) is the main goal of cloth making. Everyone in the family requires at least one, and the desirable state is to have three: an everyday cushma that is neither torn, frayed nor worn through; an old, ragged one used for heavy or dirty work, and a brand new one only to be worn on special occasions, like beer feasts. In a large family, a woman must make cloth manufacture a major commitment. She will always be spinning, always weaving, and each family member will know where he or she stands in the line waiting to receive the next cushma. Although children's cushmas are easier to make because they require less cloth than an adult's, if a woman has a large family with older children in it, younger children may have to go naked or wear mended hand-me-downs because their overburdened mother cannot get out from under the backlog of demand from the older members of her family.

Baby slings (tsagomburontsi) take up another 10% of a woman's cloth-making time. The remaining 10% is evenly distributed among cloth bags (tsagi), straps for net bags (tseokitsa), and wrist bands (maretsa). Like cushmas, these smaller items are always decorated with simple linear patterns, using thread dyed brown and black to contrast with the white background of the cloth. This requires considerable skill, and women will peer closely at the designs in other women's cushmas, curious about the details.

Cloth manufacture altogether occupies 75% of a woman's manufacturing time. The remaining 25% is split between plaiting (9%), beadwork (6%), and other activities like mending, making gourd bowls, and face paint. Plaiting refers to items woven from palm leaves and cane strips, including sitting mats (shitatsi), sieves (tsiveta), and baskets (morinto, tsimenkorita). Each family member has his own sitting mat and there should be a few extra for guests. The easiest way to make one is to cut a sega palm frond, bend the leaflets from one side over to the other side, and plait the two sets of leaflets, tying off the ends to form a rectangle with the rib of the frond making up the edge of one of the long sides. Larger mats (shitatsi) require strips about 150 cm long and 1-2 cm wide cut from caña brava, laid parallel and tied with cotton thread. Women also plait sieves for straining the fibers out of manioc beer, and baskets with lids for storing spinning materials and few other possessions. Sitting mats wear out after a few months, but are easy to make, and the other items may last for years, so their manufacture is an occasional, not a regular, activity.

The division of labor by gender is summarized in Table 6.26. In those tasks associated with women, they spend 124 minutes per day compared to 3 for men, whereas in those associated with men, they spend 118 minutes per day compared to 7 for women. These numbers emphasize how much a marriage is a joining of two incomplete partners to create a fully-skilled partnership.

Task	Adult Men	Adult Women
Cotton Cloth	1.5	103
Plaiting	0	13
Beads	1.5	8
Twine/Netting	31	2
Wooden Artifacts	31	3
House Construction	47	1
Bow and Arrow	9	1
Other	6	7
TOTAL	127 min/day	138 min/day

Table 6.26. The Division of Labor by Sex: Manufacture (min/day).

Input-Output: A Quantitative Model of Household Self-Sufficiency

In this section I compile the evidence showing that an average Matsigenka household--essentially a monogamous nuclear family living together under one roof--can supply its own needs from its own efforts. Recognizing this self-sufficiency is fundamental to appreciating both how and why the Matsigenka live at the family level of sociocultural integration. The key evidence is in tables, which I have grouped together at appropriate points so as not to interrupt too much the argument I am making.

Figure 6.10 [5.3] describes the flow of energy expended by members of an average downstream household in the course of their daily living. The numbers are calculated by multiplying the minutes they spend in different activities each day by the amount of energy they spend per minute in those activities. In my model of the household economy, I treat these expenditures of energy (work) as inputs.

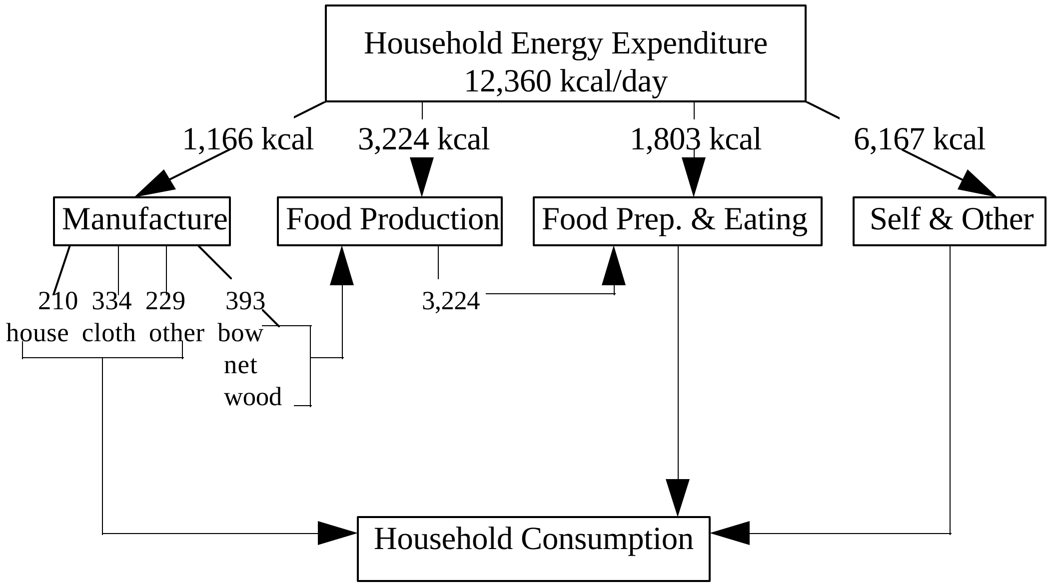

Figure 5.3. Household Input-Output: Overview

This requires a different perspective than that usually taken in input-output analyses. In economic theory the central focus is usually on firms. Firms take inputs like capital, labor, and materials, and process them into outputs, products to be sold for a profit. The household participates by supplying the labor input and by purchasing a portion of the output (Leontief 1966), but in practice input-output analyses by economists usually drop the household sector from quantitative models (e.g., Carter 1974). We cannot do this in analysing the Matsigenka economy, where the household not only plays the role of worker and consumer, but is also the firm that does the producing--the separation of household and firm that dominates the modern economy is nowhere to be found.

My argument is that it is possible to give a nearly complete description of the Matsigenka economy entirely in terms of the household. Because several households in the upstream [school] cluster (5, 6, 7, 8, and 9) were strongly influenced by their dependence upon the income of the schoolteacher, I have used the households in the downstream hamlet (households 10-14)--largely insulated from his income and still living in a manner closer to the recent past before the coming of the school--as models for my average household. Patterns of activity in the downstream hamlet differ somewhat from that of the whole Shimaa community, and so the following data may differ in details from time allocation patterns described earlier.

In this model, the household is a center into which inputs like food and clothing flow to enable and sustain the activity (time and energy), or output, which results in a series of products. These products are as diverse as material goods like tools, weapons, and food, and less tangible outputs like child care and recreation. Products are then either directly returned to the household as input, in the form of nutrients or hygiene, for example, or used in further activity to produce more output, as when a batten is used in weaving. All output activity leads directly or indirectly to the creation of inputs for the maintenance and enhancement of the well-being of the household. In this sense, the Matsigenka economy is a cycle of household activity whose output is the transformation of resources into inputs that serve to fill the needs of the members of the household. The key question to which I try to supply as precise an anwer as possible is, "To what degree is the Matsigenka household capable of providing for its own needs from the labor of its own members?"

Household Output--. The output of an average household can be modeled in terms of energy expended, linking it to the physical concept of work. To calculate the work of a household it this sense, it is necessary to estimate the minutes per day individuals spend in different activities. These are provided in Tables 6.27 and 6.28, broken down for males and females in four age categories: Adults aged 14 or older, youths 6-13, toddlers 2-5 and infants 0-1. years old. The next step is to multiply those estimates by the amounts of energy each type of person expends in each activity to get an estimate of the amounts of energy expended each day by types of individuals in daily activities (Tables 6.29 and 6.30); these figures had to be revised from the originals to reflect differences in body weight between the entire Shimaa sample and our current sample from the downstream cluster. These estimates must then be multiplied by the number of each type of individual actually found in an average downstream household (Table 6.31) to reach the final estimate of household outputs (Tables 6.32 and 6.33), from which Figure 6.12 was constructed. The question then becomes, are these allocations of energy to different activities sufficient to produce the inputs required to maintain the health and well-being of a Matsigenka household?

DOWNSTREAM MALES (AV. MIN/DAY)

Activity	**Adult**	**Youth**	**Toddler**	**Infant**
Eating	55	77	113	100
Agriculture	199	132	3	0
Foraging	130	55	3	0
Manufacture	139	88	0	0
Food Preparation	20	66	0	0
Hygiene	12	11	7	0
Child Care	6	22	0	0
Social	55	110	47	27
Idle	145	209	604	653
Other	21	11	3	0
DAYTIME TOTAL	782	781	780	780
Night	660	660	660	660
24-HOUR TOTAL	1442*	1441*	1440	1440

Table 6.27. Time Allocation in the Downstream Hamlet: Average Male by Type (min/day). [*Totals differ from 1440 due to rounding.]

FEMALE TIME ALLOCATION: DOWNSTREAM AVERAGE (MIN\DAY)

Activity	**Adult**	**Youth**	**Toddler**	**Infant**
Eating	70	109	98	100
Agriculture	52	13	0	0
Foraging	41	13	0	0
Manufacture	102	12	0	0
Food Preparation	185	84	0	0
Hygiene	24	19	0	0
Child Care	73	32	0	0
Social	48	43	48	282
Idle	169	445	634	398
Other	15	9	0	0
DAYTIME TOTAL	779	779	780	780
Night	660	660	660	660
24-HOUR TOTAL	1439*	1439*	1440	1440

Table 6.28. Time Allocation in the Downstream Hamlet: Average Female by Type (min/day). [*Totals differ from 1440 due to rounding.]

RATES OF ENERGY EXPENDITURE: DOWNSTREAM MALES (KCAL/MIN)

Activity	**Adult**	**Youth**	**Toddler**	**Infant**
(Av. Weight, kg)	(51.0)	(31.6)	(9.6)	(8.1)
Eating	1.8	1.6	0.7	0.6
Agriculture	4.8	4.1	1.7	0
Foraging	5.1	4.3	1.8	0
Manufacture	3.6	3.0	0	0
Food Preparation	1.8	1.6	0	0
Hygiene	2.3	2.0	0.8	0
Child Care	2.1	1.8	0	0
Social	1.3	1.1	0.4	0.4
Idle	1.3	1.1	0.4	0.4
Other	3.1	2.6	0.3	0.3
Night	1.0	0.8	0.3	0.3

Table 6.29. Male Energy Expenditure Rates, Downstream Hamlet (kcal/min).
(Source: Montgomery and Johnson 1977; Montgomery 1978)

RATES OF ENERGY EXPENDITURE: DOWNSTREAM FEMALES (KCAL/MIN)

Activity	**Adult**	**Youth**	**Toddler**	**Infant**
(Av. Weight, kg)	(40.5)	(19.9)	(15.3)	(6.0)
Eating	1.3	1.1	0.8	0.5
Agriculture	2.6	2.2	0	0
Foraging	4.3	3.7	0	0
Manufacture	1.7	1.4	0	0
Food Preparation	1.9	1.6	0	0
Hygiene	2.4	2.1	0	0
Child Care	1.4	1.2	0	0
Social	1.0	0.8	0.6	0.4
Idle	1.0	0.8	0.6	0.4
Other	1.8	1.5	0	0
Night	0.8	0.6	0.5	0.3

Table 6.30. Female Energy Expenditure Rates, Downstream Hamlet (kcal/min).
(Source: Montgomery and Johnson 1977; Montgomery 1978)

Type	Males #/hse	Males Av. Wt.	Males Av. Age	Females #/hse	Females Av. Wt.	Females Av. Age
Adult	1.2	51.0	29.2	2.2	40.5	29.7
Youth	0.6	31.6	12.7	1.6	19.9	9.0
Toddler	0.8	9.6	2.2	0.2	15.3	4.5
Infant	0.4	8.1	0.5	0.4	6.0	0.4
TOTAL	3.0			4.4		

Table 6.31. Composition of Average Downstream Household.

MALE ENERGY OUTPUT (KCAL/DAY)

Activity	Adult	Youth	Toddler	Infant	TOTAL
(Av. #/Hse)	(1.2)	(0.6)	(0.8)	(0.4)	(3.0)
Eating	119	74	64	24	280
Agriculture	1,146	325	4	0	1 ,475
Foraging	796	142	4	0	942
Manufacture	600	158	0	0	758
Food Preparation	43	64	0	0	107
Hygiene	34	13	5	0	52
Child care	16	24	0	0	40
Social	86	73	15	4	178
Idle	226	138	194	104	662
Other	78	17	2	0	97
Night	792	317	158	79	1,346
TOTAL	3,936	1,345	445	211	5,937

Table 6.32. Daily Energy Expenditure of Males, by Type: Average Downstream Household.

FEMALE ENERGY OUTPUT (KCAL/DAY)

Activity	Adult	Youth	Toddler	Infant	TOTAL
(Av. #/Hse)	(2.2)	(1.6)	(0.2)	(0.4)	(4.4)
Eating	200	192	16	20	428
Agriculture	297	46	0	0	343
Foraging	387	77	0	0	464
Manufacture	381	27	0	0	408
Food Preparation	774	214	0	0	988
Hygiene	128	64	0	0	192
Child Care	224	61	0	0	285
Social	106	54	6	45	211
Idle	372	570	76	64	1,082
Other	59	22	0	0	81
Night	1,162	634	66	79	1,941
TOTAL	4,090	1,961	164	208	6,423

Figure 6.33. Energy Expenditure of Females, by Type: Average Downstream Household.

Household Output as Products--. We can describe some of the products of work/activity quantitatively--the products of agriculture, foraging, and manufacture, for example. Other "products," like hygiene or chatting, are less tangible and difficult or impossible to quantify. In those cases, the best that can be done is to describe their contribution to the well-being of the household.

Manufacture. The flow of processes in the household economy is circular, or continuous, and we could enter at any point. Manufacture is as good a place as any to start, since so many of the other processes depend on it, and few products of manufacture are ends in themselves. As we have seen, the vast majority of manufacturing activities are divided into male and female tasks, each with its distinctive mix of products.

The men and older boys in an average downstream household spend 220 minutes (758 kcal) per day in manufacture. More than a quarter of this time (61 minutes) is devoted to house construction in all its facets, including sleeping platforms and temporary huts while foraging. This adds up to about 370 hours per year. Since a new house costs about 430 hours, the average downstream household spent enough time during the research year 1972-73 to build a nearly complete house, more than expected if people move every four years. But in fall 1972 three of the five households of the downstream cluster--whose houses were destroyed by a flood in 1971--built new houses, followed by another new house in early 1973.

The men of a downstream household spent about 42 minutes a day, or 256 hours per year, making twine and the artifacts made from it, such as net bags and fishing nets. Since a net bag costs about 50 hours to make, this is enough labor to produce about five net bags per year, or about 1.25 square meters of net of similar texture (size of holes), more than enough for a fishing net. Since net bags and fishing nets last a few years, this is an adequate investment of time to meet the needs of the household.

Men spend about 11 minutes a day (66 hours per year) making bows and arrows. From Table 6.25 we can estimate that 66 hours would be enough time to make perhaps two bows and 200 arrows. Yet, unless they are lost or broken in some unorthodox way, such as digging for roots, bows last for several years and a man needs only two or three on hand. Similarly, men do not make more than 100 hunting trips in a year, and by their own estimate they lose or break 1-2 arrows per trip. The time they devote to bow and arrow making is ample to meet household needs.

Men devote another hour a day to manufacture of a wide range of other wood products, including balsa rafts, beer troughs, spindles, boxes, combs, spoons, and tops. 370 hours a year is adequate to meet the needs of the household for these items, although beer troughs can be very time consuming. The remaining 45 minutes of men's manufacturing time each day is scattered among such varying tasks as making necklaces, gourd cups, or achiote face paint.

The women and older girls of a downstream household spend a combined output of 244 minutes (408 kcal) manufacturing each day. 200 minutes each day are spent making cloth, amounting to over 1,200 hours each year of which about 960 hours are devoted to making cushmas. At about 100 hours per cushma, this is enough time for the women of the average household to produce 10 cushmas per year. With an average household of 7.4 members, 10 cushmas per year is enough to provide one and a half cushmas to each household member each year. This is probably just barely enough to maintain the desired mix of old and new cushmas. As the everyday cushma begins to tear and fray after many months of continuous use, the new one will be brought into more regular use, and it would be desirable if its replacement were already on the loom by then.

Over 240 hours per year of clothmaking time remain after cushma-making has been subtracted. This time is invested in the smaller products: cloth bags, slings for holding babies, and wristbands. Nearly all older children and adults own at least one cloth bag, and all mothers need slings for their infants, but these items require a fraction of the weaving and thread a cushma takes, and the time alloted by the average downstream household is sufficient.

Only about seven minutes a day, or 40 hours a year, are devoted to bead work and animal-tooth necklaces, but this is adequate because necklaces last for years once completed. Even less time, less than five minutes a day (26 hours/year) is devoted to plaiting mats, baskets and sieves. Although for consistency I will use this figure in the input-output analysis, in fact this does not seem enough to me. On average the entire sample of Shimaa households spent over 150 hours per household on such tasks each year, and this seems closer to the mark, considering that mats and strainers get heavy use and must be replaced frequently. Like the men, the remaining minutes of women's manufacturing time each day (32) are scattered among diverse tasks like gourd bowls and face paint.

Of manufactured items, the two that most directly become input are clothing and housing, both of which serve primarily for warmth and protection. Most other manufactures--bows and arrows, net carrying bags, plaited sieves, balsa rafts--do not fill basic needs directly, but are used especially to obtain and prepare food.

Food Production . An average household expends five hours (1,406 kcal) per day foraging. Only adult men hunt, but all adults and youths join in fishing and in foraging wild plants and insects in the forest. Forest activities outnumber fishing by a ratio of 3:2 (59% to 41%), even though fishing is more productive than forest foraging (0.4 kg/hour vs. 0.2 kg/hour). Foraging and fishing produce "food baskets" that are difficult to compare: Whereas fishing yields small to medium fish and a smattering of other river creatures, forest foraging yields a large array of different foodstuffs, including game meat, insects, palmhearts, and fruits. All foraged foods are greatly appreciated. The forest also provides nonfood products like animal skins (drumheads), teeth (necklaces), vegetable dyes, and the hallucinogen ayahuasca.

The other major category of food production is Gardening. Here, the strategy differs from Wild Food in that, whereas all wild foods are carefully marshalled and consumed without waste, gardens are made larger than needed and much of their produce will eventually be abandoned "to peccary." The members of the average downstream household invest seven and a half hours (1,818 kcal/day) in agriculture, 70% of it provided by men and boys. In contrast to wild foods, this time is most productive, returning nearly 20 calories of food energy for every calorie of labor invested in gardening (annual garden yield of 13,063,100 calories ÷ 663,570 kcal/hse/year labor cost). In addition to food energy, gardens produce some goods that go to other productive activities, including barbasco roots (poison fishing), tivana fiber (twine), and achiote (face paint).

Food Preparation. The members of an average household invest 10 1/2 hours (1,095 kcal) per day in food preparation, 85% of it from women and girls (541 min/day) Men and boys provide much of the firewood to meet the required 0.2 cubic meters each day. This amounts to 73 cubic meters per year which, supplying an average of 3 million kcal or energy per cubic meter (Malloch and Baltzer 1935; FAO 1983), would mean that a Matsigenka household would consume about 220 million kcal energy from fuelwood each year, primarily for food preparation and secondarily for heat and evening light. This and slash-and-burn fires are the only sources of energy, beyond their own labor (and the sun, of course), employed in their economy, where no draft animals or fossil fuels are consumed (we occasionally supplied small amounts of kerosene to downstream households for wick lamps).

Eating. Now we can turn to the output Eating, whose product is nutrition. A household expends 708 kcal/day eating, with children eating about 100 minutes each day, a figure that drops to closer to 60 minutes for adults. The amount of food produced by a household each year and how its nutritional content compares with an estimate of the dietary needs of the household were presented in (Table 6.22). The estimates of dietary needs are based on recommendations that have been deliberately inflated by the National Academy of Sciences (NAS 1974) to safely cover nutrient needs in marginal populations, and my estimates of dietary intake are based on production figures, not consumption, so Table 6.22 must be interpreted with caution. Nonetheless, the evidence is clear that the Matsigenka have ample nutritious food. Overall, their height-for-weight ratios are good (Table 6.23). In 1972-1973 there were only two unambiguous cases of malnutrition, one a six-month-old boy with symptoms of protein deficiency (moon-face, faded dry hair), the other a 13-year-old boy with a marked pigeon chest, indicative of vitamin D deficiency. The younger boy was healthy when checked several months later, and a possible cause for the vitamin D deficiency was never discovered.

Wieseke's (1965) study of health in Camisea confirmed a picture of overall nutritional health:

> The physical examinations confirmed that they generally eat enough carbohydrates and proteins: few were extremedly thin, none were edematous and the ones with anemia usually had a specific illness or a social reason for a poor diet (e.g., orphans). Three had extremely severe peridontal disease and many had poor teeth and gums. (Wieseke 1965: 24)

Few social or religious taboos inhibit the Matsigenka diet (Johnson and Baksh 1989). The most powerful is the taboo against snake meat, which no one ever eats. This means a small but probably not trivial loss of fat and protein throughout the year, since snakes are killed often, only to be buried or cast into the swiftest river current. Most other food taboos concern red meat and tend to be sporadically observed except by pregnant women. Apart from the loss of snake, therefore, and a small reduction in the amount of meat in the diets of pregnant women--which may have the effect of keeping birth weights low (Speth 1990)--magico-religious beliefs have a minimal effect on overall patterns of food consumption.

WEIGHT FOR HEIGHT, TIME ALLOCATION SAMPLE

	Male				**Female**			
Age	Av.Ht.	Av.Wt.	Std.Wt.	%Std.	Av.Ht.	Av.Wt.	Std.Wt.	%Std.
Adult	157.4	53.3	58.9	90%	143.2	45.2	43.2	105%
Youth	119.6	25.0	22.7	110%	108.5	18.5	18.2	102%
Toddler	79.1	11.2	10.8	104%	85.0	12.1	12.0	101%
Infant	70.	6.7	8.7	77%	64.2	6.8	7.0	97%

Table 6.34. Observed Weights Compared to Standard Weight-for-Height, Per Jelliffe (1966: 224-240).

Other Activities. The remaining activities people engage in are such that their "products" are difficult to quantify. Although it would be consistent with the model to refer to them as outputs with specific products, it does not really seem useful to refer, say, to "rest" as an output whose product is "recuperation" or some such thing. I will briefly discuss each of these activities and indicate their--often obvious--value for the members of the household.

Hygiene consumes 244 kcal of household members' energy per day, and refers to housekeeping and personal care such as bathing and self-grooming. Matsigenka women do most of the housecleaning, keeping the floor swept clear of debris and keeping the yard free of weeds. All household members bathe at least once a day, and occasionally decorate themselves with achiote or comb their hair.

Child care consumes 325 kcal/day, but this figure is not very informative because women care for children while engaged in many other tasks. When a woman is not actively feeding, calming, or cleaning her small child, she is still watching over it or giving it commands. As we saw, young children are in their mother's presence about 75% of the daylight hours (and virtually all night), and in a sense their mothers are providing "care" throughout.

The category "social" consumes 389 kcal/day. The category includes chatting and visiting without a more purposeful activity (that is, two women chatting while spinning cotton would be coded as spinning cotton), giving or receiving care from another (as in being groomed, or treated for an illness), and group activities like beer feasts and reuniones organized by Maestro. Whether in the apparently desultory conversation of family members sitting idly slapping pium flies, or in the larger scale of a beer feast, topics frequently concern the events of the day or current gossip such as thefts or a successful hunt. Social activity is often a time of valued information processing and exchange.

Idleness takes up a large amount of time, but comparatively little energy (1744 kcal/day). The Matsigenka spend quite a bit of time sitting still, doing nothing apparent. They are comfortable with extended silences and can often be seen staring ahead of them. Conversations resumed after such silences indicate that often the silence was occupied with thinking over the topic that was being discussed before the silence. Young children are usually idle, doing nothing; uncommonly, they are engaged in play with other children, or are idle due to illness. As they get older their idle time declines as they begin to socialize more and to take on economic responsibilities.

The "other" category involves just 1% of the household energy. It is a residual category for cases where our subjects were away from the community or for whom we had no information on that day when the time allocation observation was done.

Night activity consumes the most energy of any activity (3,287 kcal/day). This is because, even though the rate of energy expenditure is the lowest of any category, it encompasses 11 hours per day. Time allocation studies are generally limited to daylight hours, and ours was no exception. From living in Matsigenka households for periods of time, we developed a sense of how time is spent from 7:00 p.m. until 6:00 a.m. In the evening until 8:30 or 9:00 there may be some quiet activity, such as telling stories or re-tracing the events of the day. Light manufactures like cotton thread or combs may keep a few hands busy while the discussion goes on. But people tend to go to sleep early, and by 9:00 the house is generally quiet. People sleep all night with minor interruptions, and begin stirring around 5:00 or 5:30, when someone builds up the fire. But most household members will rest until about 6:00, when they begin their day's activities.

Taken together, the full array of activities of the Matsigenka household amount to a total output of 12,360 kcal per day, or 4,511,400 kcal per year. With this output they generate enough inputs to keep the household well-fed, -clothed, and -housed (by Matsigenka standards). They spend quite a bit of time doing nothing (that is, neither producing nor consuming). The greater part of their daily lives is devoted to meeting basic needs for food, clothing, shelter, and reproduction of the household. Although not a hurried or stressful way of life, it is one quite fully occupied with work whose value is directly clear to everyone.

Health

Although they are well nourished and comfortably sheltered, the Matsigenka of Shimaa face many challenges to maintaining overall good health. This is not for lack of trying. They have standards of cleanliness to which they adhere, and they respond to injury and illness with all the tools at their command. But their technology for dealing with health threats, and particularly with infectious diseases, is of limited effectiveness.

Hygiene--. The Matsigenka work at keeping themselves, their homes, and their clothing clean. Naturally, sitting on dirt floors, working in forest or garden, and preparing unprocessed foods people get dirty, their houses and patios littered with refuse. But the Matsigenka would usually sit on the ground without a mat beneath them, and they bathe daily, wash their cushmas frequently, and wash their hands in clear water before preparing food. They do not go around encrusted in dirt or smelling bad.

They are also careful with waste, confining garbage (kaara) to designated areas away from the homestead, which they regularly sweep and weed. At night, "you urinate outside on the patio" pintsintakite sotsi, pampatuiku; in daytime, beyond. You should also spit away from the house (piavaatake parikoti). The Matsigenka of Shimaa are disgusted by feces (itiga), not only of other people but of any animal. The feces of toddlers, not yet toilet trained, are quickly collected into a leaf and disposed of. Paths will be moved if members of any household begin to defecate regularly near one. A man, who might urinate in his garden while working, would leave the garden to defecate (pishitakake inkenishiku choeni inchatoku "you defecate in the forest next to a tree"). In Camaná, chickens that were known to feed in community outhouses would not be eaten but sold downriver to non-Matsigenkas instead. The evil odor of feces is believed to invade the body and cause illness (Shepard 1999: 160).

The main reason a new house is ideally located along a mountain stream is to assure a water supply uncontaminated by human wastes. This is achieved as long as no other families live upstream. Sometimes, when this is not possible, a family will find a tiny stream or spring at some distance from the house, and carry in all their drinking and cooking water from that clean source. One household had built a bamboo flume to bring water from a small stream 30 meters to the edge of the house clearing. Such mountain streams, however, dry up in low water season, when people turn to the river. The river drains a watershed with a population of many hundreds, however, and thus offers an annual opportunity for parasite re-infection.

As is typical of the humid tropics, everyone carries some parasite burden. The one I felt most strongly was amebiasis, which would sneak up on me in the form of vague fatigue and listlessness, then render me virtually immobile. At that point I would recognize it for what it was and begin medication and start to be active again within three or four days. In contrast, it seemed that the Matsigenka lived with ameba without being much affected by it. Occasionally someone would complain of the symptoms of anemia, weakness, tinnitus, dizziness and sleeplessness that I associated with amebiasis, but not often. Perhaps they come to biological terms with amebas early in life or die in the attempt.

Wieseke (1965: 35) found parasitoses to be nearly universal in Camisea (only 8 out of 167 stool samples had no parasites; Table 6.24).

parasite	% of stool specimens
ameba (E. histolytica)	32
whipworm (Trichuris t.)	53
Strongloides s.	15
hookworm (Necator am.)	57
Ascaris	62

Table 6.36. Pasasites in stool samples, Camisea 1964. (Wieseke 1965: 23)

The three major parasites found in Wieseke's study were roundworms (Ascaris) infecting 62% of the people, hookworm (57%) and whipworm (53%). Hookworm was also implicated in a substantial rate of anemia found in the study. To these parasites we may add lice, which were the subject of frequent grooming between the people of Shimaa, who would stir the lice up by slapping the head of the groomee and then pick the lice out and eat them or set them aside.

But efforts at hygiene are in a sense a losing battle in Shimaa. In addition to parasites, infections pass freely between members of a household or hamlet because of the continual affectionate touching and sharing between them:

> Fieldnote 10-25-72 - The eye infections hit both at the outside of the eye and on the eyeball itself. Our creams relieve the outside infection rapidly, but we have very little eye drops medicine, and so cannot directly treat the eye itself. Instead, we end up applying day after day the same treatment of eye ointment and sulfa pills, which is not expensive but takes up a lot of medicine by volume.

People carry the infection on their manchakintsis [cushmas] and their hands, touching one another, blowing their noses on their clothes, etc. The infection persists and spreads to others in their families, so that we end up treating nearly everyone.

Illness and Injury--. First greetings after a period of absence usually include statements or questions about health, as when Evaristo greeted me, pokakevi novisarite tera nomantsigatake "You have arrived, Nephew. I am not sick". The question, tera pimantsigate "Not you-are-sick?," can elicit a lengthy description of complaints to which courteous listeners respond with je'ee "Yes" and ario "Is that so?".

The most debilitating infections are colds, conjunctivitis, and parasites. Colds and conjunctivitis hit the community in waves. As indicated in my fieldnote excerpt, they quickly spread to everyone. Aware of contagion if not of its causes, people routinely fled the community when word of infection reached them, not to return until the infection had left the community. The reaction is most powerful in the case of influenza, merentsi, also known as kamagantsi (lit. "death-thing," or "that which kills"). Wieseke (1965: 12) reports, "Just before their migration [to Camisea], those from the Manu had seen many of their people, especially the older ones, wiped out by white man's influenza." Even during the early contact phase, infectious diseases were difficult to manage:

The month foillowing the clinic which has just been described, a measles epidemic struck Camisea and Shivankoreni. Almost without exception, persons who had not given a past history of having had the measles fell ill with the disease. Four fled in fear but two returned when they too contracted it. Fifteen died with complications of encephalitis and pneumonia in spite of efforts by the linguists to treat with penicillin all cases which seemed to warrant it. So many were so ill at the

> same time that it was difficult for the well ones to find time to obtain food for the sick and to bury the dead (Wieseke 1965: 39).

Wieseke's (1965) detailed health survey of Camisea is probably applicable in general terms to Shimaa in 1972. She found that the most common acute complaints were cough, cold, and stomach ache, and that the most common chronic complaints were diarrhea and stomache ache. Low grade skin infections were common (32 individuals, out of total 168), "which probably could have been avoided by simple cleanliness" (p. 32). Twelve displayed evidence of old or acute pinta, 32 had respiratory infections, and 36 had more than 1/4 of their teeth missing ("Teeth were generally found to be in poor condition" p. 32). Sixty-three people had mild heart murmurs, but only seven had hypertension (systolic pressure over 140); 23 had palpable livers, probably reflecting frequent amebiasis (and perhaps malaria).

In Shimaa, other infections occured sporadically, including earache, toothache, and skin sores. More common were snake bites and accidents, including cuts or wounds sustained during work. One of the snake bites required our intervention with anti-venin injection, but the other two were likened to the bites of the large black ant, maiini: painful, but not dangerous. As people actively engaging a wilderness, the Matsigenka frequently suffer injuries: "If grouped together, accidental and deliberate violent deaths form the single greatest cause of death in those who die before the age of 16" (Wieseke 1965: 35).

Most health complaints came to our attention because the medicines we had with us were believed to be more effective Matsigenka remedies. Our house became a center where people would stop to tell us their symptoms and ask for treatment. They were pragmatic about accepting this help, seeing illness and injury as more or less naturally occuring. That is, witchcraft was not seen as a predominant cause of the illnesses we treated in Shimaa. Some of the illnesses were seen as spiritual in origin, however, and we will return to this crucial topic in Chapter 7.

During 1972-1973 in Shimaa, no infants died, but this was probably our good fortune. We did medicate many children, and sewed up the cut scalp of a victim of an infanticide attempt. But Baksh was equally attentive during his research in Camana, yet six children died. At least four children also died in Shimaa during our absences from the field between 1973 and 1975: one was sat on by accident while sleeping in a pile of rags, one was stillborn, and two who were doing fine suddenly died.

Wieseke's data from Camisea do not seem out of line for Shimaa:

> There were a total of 197 pregnancies among the 40 women, 11 of these ending in abortion. Of the 186 children born, 87 died later or were stillborns. It was impossible to distinguish stillborns from those who died from birth injuries by history alone.
>
> | | |
> |---|---|
> | diarrhea ` | 20 |
> | infanticide/homicide | 18 |
> | not ascertainable | 9 |
> | drowning | 8 |
> | grippe | 7 |
> | stillborn/birth injury | 6 |
> | chest | 5 |
> | malaria | 5 |
> | (Other) | 9 |
> | TOTAL | 87 |
>
> Some explanation is required concerning the causes of death. "Chest" and "grippe" were kept separate instead of being grouped together as respiratory illness because of histories of chest

> pains (even though the child was too young to express this) without respiratory disease. However, "chest" does include at least one distinct case of pneumonia and it is likely that those dying of "grippe" had a complicating pneumonia. The two children of the 6-15 years group included under "infanticide/homicide" were shot because they were ill; the adult was murdered. Illegitimacy, illness, too many girls in a row and inability to care for the child were reasons given for killing the smaller children and the infants of this same category. Two of these were allegedly accidental: one was stepped on by a brother at two weeks of age and another was dropped by a sleepy mother at five months. Burying and drowning were common methods of killing infants. A neonate who "wouldn't nurse" may have died of tetanus but is listed under "malnutrition." (Wieseke 1965: 25-6)

That two older children were shot because of illness is a startling allegation that would be virtually inconceivable in Shimaa in 1972-1973, but a serious epidemic could frighten people into killing or driving off the sick (even children) if seen pragmatically as a way of saving everyone else.

Remedies--. When people are really ill, they lie quietly on their mat while the rest of the household goes on as usual, ignoring the sick person. Since the Matsigenka see any serious illness as life-threatening, members of the family are worried about the sick person, but they do not shower attention on him (Chapter 4). This distancing also reflects ambivalence arising from fear that the sick person is also dangerous:

> Contact with a dead person or his spirit (invisible) is fatal. For this reason, they are likely to remove a seriously ill patient from the house to lessen the likelihood of such a contact. They have been seen by the linguists to set a seriously ill boy afloat on a raft on the river. (Wieseke 1965: 13)

That the sick loved one may have brought spiritual danger into the household arouses a self-preserving avoidance, strengthening the idea that illness is primarily the sufferer's own business.

The Matsigenka have a host of herbal remedies for illnesses of all kinds: teas, poultices, aromatic vapors, rendered concentrates. But, where spiritual danger is present, their most common practice is to bathe the endangered person with very hot water and cut their hair as short as possible. Snakebite and pneumonia, both of which are seen as resulting from being shot with spirit arrows, are treated this way, but a wide range of body aches and pains are suitable for baths and haircuts. Shepard (1999) has thoroughly described and analysed Matsigenka herbal medicine. Table 6.25 lists some of those used in Shimaa.

ana (Span., "huito"), wild plant, juice rubbed on skin infections

igentiri, wild plant, small amount in very hot water stops bleeding wound

kamana, tree, sap shrinks swelling of snakebite

kempanaro, iguana (Iguana iguana), ash from burned skin for snakebite

kivuriri, small white butterfly, will suck out swelling

maiinipini, wild plant, leaves reduce pain of bite of maiini ant (Grandiponera sp.)

oroenkirishi, wild plant, small quantity of leaf on eyelids for headache

puonkashiri, wild plant, leaves rubbed on 6-month-old baby to stimulate walking

seri, tobacco (Nicotiana tabacum), leaves rubbed on skin to relieve itching; smoked in curing ritual

shintsi iroshi, wild plant, leaves for bath so babies will walk faster

shintsi oshivokanake, wild plant, leaves for bath so babies will grow quickly

tanko (nettle), wild plant, for body pain

teretsipini, wild plant, soaked in lukewarm water as bath for skin infections

Table 6.36. Some Matsigenka Remedies. See also Ivenkiki, Table 6.11.

The most common herbal remedies are the many varieties of ivenkiki (Table 6.11), each specific to a different ailment like stomachache, sore throat, or headache. But many other plants provide remedies as well. Some of these no doubt have pharmacological effects appropriate to the illness, like the vitamin C in peppers (Capsicum sp.), lemons (Citrus limon) and hibiscus (Hibiscus sp.), all of which are used for colds. The powerful drug potogo (Ficus sp., Span. "ojé;" cf. Matteson 1954: 61) is an effective abortificant, blamed for Serafina's death (Chapter 4) and reported to have had near-fatal effects elsewhere (Dorotea Pereira 1970). Even such practical remedies as these, however, may have potent spiritual qualities, and others, like datura and tobacco, are profoundly spiritual. I will reserve full discussion of the spiritual side of healing, including taboos, until Chapter 7.

Overall, the Matsigenka of Shimaa present a mixed health picture. They have an ample diet and are energetic and supple, capable of great feats of athleticism and endurance. They are attractive, maintain personal standards of cleanliness, and attend to their health needs with an array of remedies. On the other hand, they live with parasite loads that weaken them and probably contribute to many infant deaths, they are subject to viral and bacterial infections that periodically sweep their hamlets and incapacitate them (putting food production at risk), and their daily lives expose them to risk of serious injury (e.g., falling debris, capsizing canoes, snakebite). Despite the beauty of nature surrounding them and their freedom to set their own work agenda, theirs is a hard life, and nowhere is this more evident than in the virtual absence of elderly people (Fig. 5.1).