## CHAPTER ELEVEN

# Dam the Water: The Ecology and Political Economy of Irrigation in the Ayacucho Valley, Peru

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Nature determines how much water is available to an area, but humans decide whether or how it will be used. They make these decisions in an ecological, economic, and political context that selects for certain behaviors over others. People build and expand irrigation systems when it pays them to do so. Aridity is only one factor considered. Even under conditions of demographic growth, agriculturalists may decide against expanding an irrigation system–even though that may seem the "sensible" thing to do–if ecological conditions make the costs too high or if economic forces favor nonfarm work.

The Ayacucho Valley illustrates some of the forces militating against the expansion of farming and irrigation in rural Peru. Because this valley is lower and farther to the west (see Winterhalder *intra*) than many other inter-Andean valleys, such as Cuzco, it is drier and much poorer in agricultural resources (Díaz 1969: 23-82).[1] Ayacuchanos moderate this aridity by means of village and interhamlet irrigation systems, using them to cultivate maize and provide drinking water. These systems irrigate only a small portion of the potentially arable area, however, and large portions of the valley remain undercultivated.

Since at least 1966, when I first traveled to Ayacucho, the people of the district of Quinua (located 34 kilometers by road to the northeast of the city of Ayacucho) have spoken of enlarging their irrigation systems in order to increase agricultural production. Similar aspirations are common throughout the Andes (Dobyns 1964:31-33). Even in highland Ecuador, a region much moister than the Ayacucho Valley, many farmers report that water scarcity is their chief source of stress (Stadel 1989:44-45, 1991).

Thus far, however, Quinuenos and most highland peasants have been unsuccessful in most of their attempts to expand their water supply, in spite of the need for increased food production to provide for growing numbers. Quinuenos have been able to wrest control of water from semifeudal *haciendas* (which had monopolized much of the water until the mid-1960s), but they have been unable to mobilize labor to build bigger and more efficient irrigation systems. This inability to expand irrigation is largely a result of ecological and economic costs. The aridity of the areas to be irrigated, and the consequent labor costs of irrigation, are high. At the same time, demographic and national economic conditions have favored out-migration and nonfarm work.

Since the 1940s the population of Quinua has grown at an ever increasing rate, while the value of peasant farm production has declined in national markets in comparison to the price of manufactured goods. Traditional income, from cyclical labor migration to coastal cotton plantations, that was used to supplement farming also disappeared in the 1960s. To cope with these stresses, Quinuenos have entered nonfarm occupations (craft manufacture, petty trade, highway repair, et cetera), and farming has become increasingly supplemental to total household income.

Nonfarm work and migration, in turn, have created serious labor shortages, forcing Quinuenos to carefully allocate their energies. After comparing the relative value and costs of different productive strategies, they have opted to construct schools–the infrastructure for their new commercial roles–rather than irrigation–the infrastructure of farming.

## THE NATURAL ENVIRONMENT AND THE DISTRIBUTION OF WATER

Two natural factors determine the availability of water in Quinua: seasons and altitude. I have discussed the ecology and climate of Quinua in detail elsewhere (Mitchell 1976a, 1976b, 1991a, and n.d.). Suffice it here to say that the Ayacucho Valley experiences three seasons based on precipitation (Rivera 1967, 1971:37-45; see Table 11.1). September through November (sometimes called "spring") is characterized by light rain that gradually increases in intensity. The rainy season proper usually begins in December, tapers off in March, and ends in April. In a normal year it rains torrentially for an hour or so most days at its peak in January and February. The rainy period is also the warmest season, because temperatures do not drop as rapidly at night, but it often seems colder because of the clouds and high humidity (Winterhalder and Thomas 1978:23-24). The dry season lasts from May to August. At its height in July and August there may be no precipitation; the

## TABLE 11.1 VARIABILITY OF RAINFALL, CITY OF AYACUCHO 1961-1970

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | YEARLY TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Rainfall Amount (mm)** | | | | | | | | | | | | | |
| Mean | 113.8 | 107.1 | 104.2 | 33.4 | 15.4 | 4.5 | 6.3 | 7.0 | 26.9 | 40.6 | 49.2 | 82.4 | **592.4** |
| Minimum | 43.7 | 55.2 | 54.5 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 5.6 | 12.8 | 3.5 | 29.0 | **458.5** |
| Maximum | 287.5 | 241.9 | 194.3 | 58.9 | 41.2 | 24.6 | 21.8 | 21.8 | 55.0 | 109.0 | 131.7 | 141.4 | **917.8** |
| **Days With Rain** | | | | | | | | | | | | | |
| Mean | 21 | 20 | 20 | 10 | 4 | 2 | 4 | 6 | 10 | 13 | 12 | 19 | **147** |
| Minimum | 11 | 12 | 11 | 4 | 0 | 0 | 0 | 3 | 5 | 6 | 6 | 14 | **117** |
| Maximum | 31 | 28 | 29 | 15 | 9 | 3 | 10 | 12 | 15 | 21 | 16 | 23 | **174** |

Source: Rivera (1971:41-43). Data on days with rain include the years 1963-1970 and April through December of 1962. In Rivera's table providing the data on days with rain, I counted a dash as meaning "insufficient data" (January-March, 1962, July-September, 1969, and June 1970). Only those years marked with a "0" were counted as 0. The "yearly total" of days with rain is based only on the years 1963-1969.

terrain is exceedingly dry, and the soil is as hard as stone. This period of time is also characterized by lower, even freezing, temperatures at night.

These generalizations about climate do not preclude substantial differences from year to year. The amount of annual and monthly precipitation varies considerably, and droughts appear "without predictable regularity" (Winterhalder and Thomas 1978: 13; see Winterhalder *intra*). Between 1961 and 1970, it rained an average of 147 days in the city of Ayacucho, producing an annual mean of 592.4 millimeters of rain (Table 11.1).[2] Variability from year to year, however, was substantial. In 1963, 174 days of rain produced 917.8 millimeters, but in 1968, the 117 days of rain provided only 568.4 millimeters, about half as much. I do not have the figures on the harvest, but I am sure that 1969 was a poor year for farming.[3]

Even when total annual precipitation is high, monthly variation may adversely affect agriculture. Precipitation from September through December is crucial to the germination of the main crop (*hatun tarpuy*), but monthly differences from year to year are substantial. In the city of Ayacucho from 1961 to 1979, for example, an average 40.6 millimeters of rain fell in the month of October, but the deviation from this mean was high. In 1966, 109 millimeters of rain fell in October, but only 12.8 millimeters fell in 1961. Insufficient rain during germination harms the crop, a phenomenon that endangered the 1988-89 and 1989-90 harvests in Quinua (Mitchell n.d.a).[4]

Altitude also influences the distribution of water (Table 11.2; Winterhalder and Thomas 1978:9). The lands of Quinua extend from about 2500 meters above sea level to more than 4,100 meters, and the higher altitudes are colder, cloudier, and moister than those lower down (Arnold 1975; Holdridge 1947; Rivera 1971:29; Tosi 1960; Tosi and Voertman 1964). High elevations are moist largely because of abundant rain; annual precipitation is nearly double that found at low elevations (500-1000 compared to 250-500 millimeters per year). The low rate of evapotranspiration also increases moisture at high altitudes, although these evapotranspiration potentials are not as low as those proposed by Tosi (Frére et al. 1975:133; Knapp 1988:28-29 and personal communication September 14, 1989).

As in the rest of the tropics, Quinua has a diurnal temperature climate (Troll 1968) in which changes from day to night are greater than seasonal variation and the day's heat escapes quickly at night. Elevation also affects temperature; high altitudes are colder than low ones. Low altitudes are also sunnier, as clouds are fewer and usually dissipate earlier in the day than in high altitudes. Temperatures decrease 0.5 degree centigrade for every 100 meters of elevation in the Ayacucho region (Rivera 1967, 1971:36; Winterhalder and Thomas 1978:20).[5] The valley bottom, however, sometimes experiences nocturnal temperature inversion, since cold air is denser and sinks to the valley at night.

These ecological constraints restrict the zones suitable for agriculture. Most of the community is either too high and cold or too low and dry for intensive farming. In 1972, 57.6 percent of Quinua was natural pasture and 23.7 percent woods and mountains, whereas only 12.2 percent of the total land was permanent farmland (Mitchell 1991a:43, n.d.).[6] The situation on the western side of the Ayacucho Valley is even worse. Similar to Winterhalder's western escarpment (Winterhalder *intra*),

## TABLE 11.2 QUINUA'S ECOLOGICAL ZONES: CLIMATOLOGICAL AND PRODUCTIVE CHARACTERISTICS

| Zone | Altitude (Meters) | Annual Rainfall (mm) | Mean Annual Temp. (°C) | Productive Regime |
|---|---|---|---|---|
| Rain Tundra/ Wet Paramo | 4100+ | 500-1000 | 0-6 | Herding |
| Prairie | 4000-4100 | 500-1000 | 6-12 | Herding/farming |
| Moist Forest | 3400-4000 | 500-1000 | 6-12 | Herding/farming |
| Savannah | 2850-3400 | 500-1000 | 12-24 | Irrigated farming |
| Thorn Steppe | 2500-2850 | 250-500 | 12-24 | Unirrigated farming |
| Valley Bottom | 2500 | 250-500 | 12-24 | Irrigated farming |

Source: Meteorological data are from Arnold (1975) and Tosi (1960)

it is in a rain shadow and significantly less productive than the eastern valley (Díaz 1969:61-74; Rivera 1971:39).

## IRRIGATION FARMING AND PRODUCTIVE CAPACITY

The abundant moisture at high elevations in Quinua favors agriculture, but the cold temperatures and increased frost risk at these altitudes limit the kind of crops that can be grown. As cold temperatures retard plant growth, crops mature more slowly and farmers can grow only fast-maturing and/or frost-resistant ones. In the savannah (2,850-3,400 meters above sea level), the thorn steppe (2,500-2,850 meters), and the valley bottom (about 2,500 meters), temperature favors agriculture, but aridity seriously limits production.[7] Maize and many other crops require irrigation in these zones, but irrigation water is limited, except in the valley bottom.

Savannah farmers obtain irrigation water from small streams, lakes, and springs in the moist, high altitude grasslands above the village (see Mitchell 1976a and n.d. for a complete description of the irrigation system in Quinua). These sources also provide drinking water for people and animals. The volume of water available for agriculture is small, but that water is nonetheless crucial to farming (Mitchell 1976a; Murra 1960).

In the upper savannah (3,050-3,400 meters above sea level) the rainy period is too short for the cultivation of maize, so that irrigation is used to extend the growing time of the rainy-season crop (*hatun tarpuy*) and thereby the altitude of maize cultivation. Farmers only soak their fields once, but this water is generally sufficient to plow, plant, and germinate the seedlings (Mitchell 1976a). The sporadic

rain at this time of year (see the months of September through December in Table 11.1) normally keeps the seedlings moist without further irrigation, although in years of low rainfall, this is not the case and crops fare poorly for lack of water. Irrigation is also sometimes used to grow an early crop (the *michka*), planted in August in the dry season, but little water is available to plant this water-demanding and labor-intensive crop cycle, and few people do so. Irrigation, however, is used for households and kitchen gardens throughout the dry season.

In the lower savannah (2,850-3,050 meters), the growth cycle of crops and the duration of the rainy season generally coincide. Irrigation is used here to supplement rainfall during lulls in the rainy season, but there is not enough water to do so on a sustained basis in any area of the savannah. Since little irrigation water is left by the time it reaches the lower savannah, the dry-season cycle is rarely planted here, although farmers do maintain households and kitchen gardens with the water.

The thorn steppe lies just below the savannah. It is a dry woodland with cactus, and in most areas there is not enough water for even drinking purposes. Farmers who cultivate here must bring drinking water to their fields in pots in the dry season and dig cisterns to collect rain water in the rainy season. Quinuenos rely entirely on unirrigated farming in the thorn steppe, not a very successful enterprise. Maize, for example, does not produce here in most years because of aridity. Potatoes do not grow here at all. Instead of these two crops (the most important in Quinua), farmers plant this zone with wheat (the third most important crop) and chick peas. This farming, however, is nonintensive, and farmers must often let their land lie fallow for long periods to store water for a later sowing.

The valley bottom is similar environmentally to the thorn steppe. It is too dry for most unirrigated farming, but water is available from the Rio Pongora, the Rio Chacco, and the Rio Occopa (Díaz 1969:39-52, 79; Rivera 1971:21-23). This abundant irrigation water supplements rainfall during the rainy season and permits a second crop during the dry season. As in the savannah, irrigation also supplies households, kitchen gardens, and drinking water for people and animals (Mitchell 1976a).

These ecological realities constrain production and thereby help organize the distribution of Quinua's population along the mountain slope. The two irrigated maize zones are the most densely populated areas (Table 11.3). In 1961 the savannah contained 83.8 percent of the inhabitants. They lived in 55 settlements with an average density of 81 people per settlement. The irrigated valley bottom had the next highest density with an average of 52 people in each of the six settlements. Since the valley is narrow (Rivera 1971:18), however, the total population is small, and in 1961 the valley bottom accommodated only 5.9 percent of the district's population.

The unirrigated thorn steppe and the high altitude zones are the least densely populated. In 1961, the thorn steppe, larger in area than the savannah, housed only 5.9 percent of the inhabitants living in 8 settlements with an average density of 40 people each. The density was even lower in the cold prairie and moist forest. Only 0.5 percent of the population lived in a single settlement in the prairie (density of 26 people), while only 2.1 percent of the population lived in three settlements in the

**TABLE 11.3 PERCENTAGE OF DWELLINGS, SETTLEMENTS, INHABITANTS AND MEAN SETTLEMENT SIZE BY ECOLOGICAL ZONE DISTRICT OF QUINUA - 1961**

| | Prairie | Moist Forest | Savannah | Thorn Steppe | Valley Bottom | Location Unknown | TOTAL NUMBER |
|---|---|---|---|---|---|---|---|
| Dwellings | 0.4% | 1.9% | 85.0% | 6.1% | 4.7% | 1.8% | 1,370 |
| Inhabitants | 0.5% | 2.1% | 83.8% | 5.9% | 5.9% | 1.8% | 5,348 |
| Settlements | 1.3% | 3.8% | 69.6% | 10.1% | 7.6% | 7.6% | 79 |
| Mean Settlement Size (No. of People) | 26 | 37 | 81 | 40 | 52 | 16 | 68 |

Note: The mean settlement size is the number of inhabitants divided by the number of settlements.

Source: Peru 1966:345-347 and informant interviews.

moist forest (average settlement size was 37 people).[8]

These patterns of population and land use are characteristic of those found throughout the semiarid eastern Ayacucho Valley. The thorn steppe is one of the largest zones found in the eastern valley, but because of limited water, it is only sparsely cultivated and inhabited.[9] More irrigation water here would result in a significant increase in agricultural production that would help sustain the continuously increasing population of the valley.

In sum, irrigation is necessary for the intensive cultivation of maize and most other crops in the savannah, thorn steppe, and valley bottom, but in the savannah such water is scarce, and in the thorn steppe it is absent. In the savannah irrigation provisions households, livestock, and kitchen gardens. In farming, the limited water is used primarily at the beginning of the main planting (*hatun tarpuy*) to extend the growing season. There is not enough water to irrigate during prolonged droughts or for most people to plant a dry-season crop (*michka*). To do so, Quinuenos would have to enlarge their water sources and improve the canals to prevent filtration.[10]

The unirrigated thorn steppe, which lies just below the savannah, is too dry to be farmed intensively. Quinuenos would have to extend their irrigation system into this zone to grow maize and most other crops here. The labor and material costs of this irrigation, however, would be higher than those needed to irrigate the savannah. The aridity of this zone increases the need for water and thereby the number of irrigation turns, while the sources of water are farther away, requiring a greater investment in canals.

The valley bottom is the only area with adequate water for both households and farming. This water is near at hand, so that, although the irrigation turns are many, the canals are short and the energy investment less than that in the thorn steppe.

Quinuenos often speak of increasing their water supply and improving their canals to stabilize agriculture in the savannah, to increase the dry-season planting and double cropping in the savannah, and to bring irrigation water to fields in the thorn steppe. They fantasize about the crops they could grow and the population they could sustain if they did so. The archeological site of Huari lies in the thorn steppe, and people sometimes point to the ancient stone-lined canals that once fed the large population of that city but that are no longer used. Every now and then officials of the community have attempted to organize to tap into high altitude lakes to increase their water supply and thereby realize their dreams, but so far they have been unsuccessful in most of these efforts. They have been unsuccessful, not because the people of Quinua are unwilling to work in a sustained fashion (as some officials maintain), but because the people have decided that the energy costs of that irrigation are too high and the return on the resulting production too low. That low return is a consequence of government policy that has undermined the value of peasant production in comparison with the return on nonfarm wage work.

## THE SOCIAL ALLOCATION OF WATER

Until 1973, when Quinua was reorganized by the agrarian reform of President Velasco, the community consisted of both independent peasants and semifeudal *haciendas*. The independent community was located in the upper and lower savannah around the central town and received water from the Hanan Sayoc-Lurin Sayoc irrigation network. *Haciendas* were found in parts of the lower savannah and in most of the thorn steppe and valley bottom.

Quinua never appears to have contained as many *haciendas* as did other areas of Ayacucho. Even in 1876, the first period for which we have data, only 15.5 percent of the population was classified as living on a *hacienda* (Table 11.4). By 1961, only 3.7 percent of the population was doing so. At the time of the Agrarian Reform in 1973, there were eight large *haciendas* and six small ones in Quinua. Most of their owners lived in the central town of Quinua or Ayacucho. In 1973 the Agrarian Reform created cooperatives out of all but two of those *haciendas* that still remained.[11] Over time, the number of cooperatives was reduced as the former peons divided the lands into private parcels. In 1981 two cooperatives remained, with a total of 177 inhabitants (Peru 1983).

In spite of their small numbers, *haciendas* dominated Quinua production through control of land and–most especially–water. Until 1966 not only was irrigation water scarce in Quinua, but *haciendas* had preferential rights to the water, which they used to obtain a peasant work force. In the Hanan Sayoc irrigation network, one *hacienda* took the entire flow every Saturday. In Lurin Sayoc, *haciendas* controlled the water on Mondays and Tuesdays, while in the Susu network they had the water every day but Sunday. In the valley bottom, water is

**TABLE 11.4 NUMBER AND POPULATION OF HACIENDAS DISTRICT OF QUINUA**

| | 1876 | 1940 | 1961 | 1972 |
|---|---|---|---|---|
| Number of Haciendas | 9 | 16 | 11 | 14 |
| Number of Families | ND | 78 | 51 | ND |
| Resident Population | 539 | 330 | 199 | ND |
| **HACIENDA RESIDENTS AS PERCENTAGE OF DISTRICT POPULATION** | **15.5** | **5.8** | **3.7** | **ND** |

Note: ND = No data

Source: Peru 1878, 1948, 1966, 1983 and informant data for 1972.

abundant and therefore open to all, but *haciendas* controlled most of the land as they did in the thorn steppe.

Although independent peasants owned most of the land in the savannah, *haciendas* nonetheless captured their labor through this monopoly control of water. The independent peasants of this densely populated area had to purchase the water they needed for farms and households with work. The amount of water given depended on the type of chore and amount of energy required. A man might have to plow an *hacienda* field for an entire day (supplying his labor, plow, oxen, and animal food) in return for one day's water. *Haciendas* especially needed peasant workers during the plowing and crop cultivation. If the *hacendado* (the owner) discovered someone taking water without paying for it, he would seize some valuable item (a tool, a piece of clothing, an animal, et cetera), known as a *prenda,* that he held until the person worked for him (see also Skar 1982: 289). In the thorn steppe and valley bottom, *haciendas* used control of land to get laborers, giving peasants cultivation or grazing rights in return. (See Díaz 1969 for brief descriptions of such arrangements throughout the department of Ayacucho.)

On days not monopolized by *haciendas*, water in the savannah was supposed to be allocated among peasants equally, but since the amount of water was insufficient, it was (and still is) rationed (Mitchell 1976a). In spite of the egalitarian ethos surrounding water and other resources ("we are all equal," "we are all poor"), however, the resulting distribution of water was (and is) far from equal (Mitchell 1991b).[12] Because water is distributed to plots of land, not people, the rich (who own more land) get more water than the poor. Since work on the irrigation corvée is assigned to households (rather than apportioned according to land ownership), however, the poor must contribute more work for every unit of water.

Aside from Sundays, which are always reserved for the first-come, first-served distribution of household water throughout the year, Quinuenos use two systems of distribution depending on the crop cycle. During the sowing of the rainy-season crops (September-December), demand is high and the irrigation schedule tight. Peasants respond to the tight schedule by implementing the patacha, a formal system of irrigation turns administered by water officials. In this procedure, the officials assign water first to the higher fields and descend field by field until the onset of the full rains, usually in December, when everyone is able to plant. Apportioning water in this manner is an adaptation to the ecological realities of high altitude farming: the higher the altitude the longer the maturation period and the earlier crops need to be planted (Mitchell 1976a).

During the rest of the year, peasants distribute water in the savannah on a first-come, first-served basis. At this time, water is needed for household use, livestock, kitchen gardens, the dry-season planting (the *michka*), and double cropping. It is also sometimes used to irrigate rainy-season crops during drought. However, there is rarely enough water for more than household use, livestock, and kitchen gardens. Only a few people, mostly powerful farmers who cash crop potatoes and who are able to mobilize sufficient moral and physical force to obtain water, are able to plant the dry-season crop. Little water is available to irrigate fields during droughts.

Quinuenos often fought (and still fight) over water during the first-come, first-served distribution system, sometimes coming to blows. During conflicts, they consider a person's communal service in assigning moral rights to the water. Previously, people who sponsored religious fiestas had preferential rights, that even allowed them to take water out of turn during the *patacha*. Since the decline of the fiesta system, Quinuenos legitimize water rights primarily through work on irrigation corvées and other communal obligations.

But moral rights do not necessarily give a person water. Powerful townspeople and peasants often lay claims to a myriad of vague communal service, obtaining water ahead of others even when they have not participated in the irrigation corvées. In some cases, people may decide that so-and-so has the right to water, but a competitor may mobilize more force and the farmer not receive it. In the patacha, however, the intervention of political authorities and the clear altitude rule of distribution alleviate much of this strife.

## AUGMENTING THE WATER SUPPLY: ATTACKING *HACIENDA* PREFERENCES

In the 1960s Quinuenos began to increase the water available to them by attacking the preference given to *haciendas*, using existing legal prohibitions on the private ownership of water to do so (see also Guillet *intra*). They initiated legal action to form irrigation boards (*juntas de regantes*) to administer the water in the savannah systems (see Bolin *intra*) and to introduce the altitude distribution system (the *patacha*) administered by an irrigation judge (*juez de agua*). *Hacienda* owners came to be treated like everyone else and lost any rights to special days.

Instead, field altitude determined water allocation during times of great demand. During the rest of the year the first-come, first-served system continued, but *haciendas* now had to compete with everybody else.

The Susu network switched to an irrigation board in July 1966. Before the change, five *haciendas* had received water six days of the week. The change to the standard peasant system was initiated by the mayor of Quinua. He was well connected to Popular Action (*Acción Popular*), the political party of President Belaunde. Belaunde, an elected president, had campaigned in Ayacucho and had received the support of the mayor and the people of Susu. The mayor used his connections to the party and to a distant relative in the national senate to petition the Ministry of Agriculture in Cuzco, which granted Susu the right to elect an irrigation board.

The affected *hacendados* countered with legal proceedings in Cuzco against the action, but they lost in this and in all subsequent litigation. A peasant invasion of their lands also forced them to temper their actions in town. Undertaken in retaliation for *hacienda* legal maneuvers against the irrigation board, the invasion increased *hacendado* fears that they might lose their properties in some agrarian reform. By 1973, when the Agrarian Reform formally arrived in Quinua, peasants in Susu were still distributing water by means of the irrigation board and irrigation judge.

## AUGMENTING THE WATER SUPPLY: THE DAM AT YANAQUCHA

At the same time that Quinuenos were moving against the control of water by the *haciendas*, the same mayor initiated a project to expand the irrigation system of Hanan Sayoc. He and other authorities petitioned the government to construct a new dam at Lake Yanaqucha Chica to increase the water in the system and to build new canals lined with cement to limit filtration. Quinua was already using this lake for water, and no other community had claims to it or the surrounding watershed.[13] Quinuenos wanted to increase the capacity of the lake to stabilize the water supply for the hydroelectric plant and potable water system that had been built earlier in 1966 for the central town. They also hoped to increase the amount of double cropping in the savannah and to expand the irrigation system into the thorn steppe to permit more intensive cultivation of that large zone. The government provided $10,000 US (250,000 *soles*) for the venture, and the community began work on it in 1967.

Although a new dam was eventually constructed, budgetary constraints limited its size. It held only 90,000 cubic meters of water (compared to an expected 280,000 cubic meters), too little to significantly increase irrigation capacity. The supply was sufficient to ensure a steady source of tap water and hydroelectric power but not to expand the amount of farmland under irrigation or to increase double cropping. This project had been funded by Popular Cooperation (*Cooperación Popular*), a political arm of President Belaunde. Possibly because of its political mission, Popular Cooperation spent its limited budget on funding as many "showy" initiatives as possible, spreading its largesse among several communities rather than seriously

increasing the productive potential of a single one or even a few. In Quinua's case, electricity and tap water were emphasized over farming.

According to its mandate, Popular Cooperation was to provide the materials and engineering expertise for the dam, while the people of Quinua were supposed to provide the labor to build it. That mandate was more easily stated than realized, however. The limited utility of the dam created a major furor about the labor to be provided, and the resulting dispute ultimately led to a general decline in the community's acceptance of corvée labor.

At first, every family in the central district (defined by the Hanan Sayoc-Lurin Sayoc irrigation networks) was assigned to work two days on dam construction, to be followed by a second round after all families had completed a turn. The dam, however, was designed only to provide water for the central town and the barrio of Hanan Sayoc. The people from Lurin Sayoc barrio, which has a separate irrigation system, were to derive no direct benefit from the dam.[14] They were adamantly opposed to the work, for it violated the peasant sense of justice that people work on only those parts of the irrigation system that they use. The authorities responded to their complaints by arguing that everyone should unite to construct the Hanan Sayoc dam, after which they would cooperate to get money to build a new dam for Lurin Sayoc.

This argument proved ineffective, and many peasants demanded to be paid for their labor. Peasants were also upset at the fines set for missing the work. To secure enough workers, the municipality had set a very high fine of $1.00 U.S. (25 *soles*) for a missed day or a total of $2.00 U.S. (50 *soles*) for the two days. Replacement peons were charging $0.80 U.S. (20 *soles*) per day. At the various meetings to discuss the project, women without husbands complained loudly that they were unable to pay such high fines and fees. They also protested the decision to exclude children under 15 as workers, even though families often sent their children for such corvée labor.

Peasants refused to show up at the construction site. The authorities of the central town split on the issue of forcing them to work. The population of Quinua often divides into two loose political factions that fight over control of community resources and, consequently, money and jobs (see also Gelles *intra*).[15] In the case of the Yanaqucha dam undertaking, the factions coalesced around national party affiliations. The mayor of the town,[16] a *populista,* that is, a member of Belaunde's political party, had been appointed guard of the construction site, earning a fabulous $2.40 U.S. (60 *soles*) a day. His job was the only compensated position on the project other than those filled by outside experts.

The governor (the town official in charge of police and public order), a member of the *Aprista* party and opposite town faction, declined to help the *populista* mayor. He was embittered by the earlier reforms in which he had lost preferential rights to water. He and others of his group were also angered at being cut out of any paid work on the dam. Consequently, he fomented the opposition to the dam and used his post as governor to stymie the construction. He would neither fine nor jail those who refused to work on the corvée (as he was supposed to do), and he sometimes refused to call public assemblies to discuss the problems on the project (as he was also supposed to do).

Frustrated by the lack of cooperation and inability to get workers, the German engineer in charge threatened to cancel the undertaking. After several months of debate, the mayor and town council bent to popular will and the engineer's threat. Henceforth only the people using the Hanan Sayoc irrigation system were required to work on it. The people of Hanan Sayoc did so reluctantly. It was widely believed that only the residents of the central town would truly benefit from the dam. To create an incentive for the work, therefore, the engineer and the mayor began to distribute "Food for Peace" parcels[17] to the workers–even though this payment was contrary to the ideology of Popular Cooperation, which held that work on public projects was to be donated freely, that such constructions were "made by the people" ("*el pueblo lo hizo*").

## CHANGES IN CORVÉE LABOR

Not only did this dam fail to bring water to the thorn steppe but it marked a serious shift in the acceptance and allocation of corvée labor. Local authorities had previously organized annual corvées to repair the general infrastructure: irrigation canals, reservoirs, roads, bridges, public buildings, schools, the plaza, chapels, the church, and the cemetery. In addition to these annual tasks, they periodically employed the corvée for new construction: schools, the hydroelectric plant, the communal hall, and the dam at Yanaqucha (Mitchell 1991b).

Corvée labor is the tax obligation of the conjugal family, and each family has to supply a male worker or pay a fine. The family might send a member of the conjugal unit to the work, often a younger son, or hire a day laborer (peon) as a replacement (Mitchell 1991b). Townspeople rarely work on the corvée: they send peons in their stead, pay fines, or donate alcohol and coca leaves to the peasant workers.

Although peasants still work on the corvée, they do so less frequently. In 1966 families contributed seven to nine days of free labor each year just to maintain the infrastructure. In 1988, however, they were contributing only four to six days, as they no longer repaired roads and bridges.[18] After their experience with the dam, moreover, Quinuenos have come to reject most claims for work on new projects. If they do work on such ventures, they generally want to be paid. Schools are an important exception.

## SCHOOLS: THE INFRASTRUCTURE OF COMMERCE

Quinuenos still use the corvée to construct new schools, and their efforts to extend irrigation appear truly halfhearted when compared to their efforts to expand education (Table 11.5). In the 1930s, few Quinuenos went to school (Mitchell 1991a:119-123). There were only four schools in the entire district, and none taught beyond the second grade. In the 1940s, school attendance began to accelerate. In 1953, to meet this increased demand for instruction, Quinuenos built a central school (*nucleo escolar*) containing all primary grades. Since then they have

**TABLE 11.5 NUMBERS OF STUDENTS AND TEACHERS DISTRICT OF QUINUA–1986**

| | Nursery School | Primary School | High School | Technical School | Ceramic School | Other | TOTAL |
|---|---|---|---|---|---|---|---|
| Central Town | | | | | | | |
| Students | 57 | 623 | 192 | 39 | 22 | 31 | **964** |
| Teachers | 2 | 17 | 11 | 6 | 2 | 2 | **40** |
| Hamlets | | | | | | | |
| Students | 63 | 925 | 0 | 0 | 0 | 219 | **1,207** |
| Teachers | 2 | 28 | 0 | 0 | 0 | 7 | **37** |
| District Total | | | | | | | |
| Students | 120 | 1,548 | 192 | 39 | 22 | 250 | **2,171** |
| Teachers | 4 | 45 | 11 | 6 | 2 | 9 | **77** |

Note: The ceramic school is run by the Ministry of Industry and Tourism, rather than by the Ministry of Education.

Source: Peru, Ministerio de Educación. 1986. Resumen Estadístico de Supervivencia, al junio de 1986. Ministerio de Educación, Oficina de Presupuesto y Planificacción Educativa, Dirección de Estadística.

constructed fifteen more schools with corvée labor: nine primary schools in the hamlets and a secondary school, three nursery schools, and two artisan schools in the central town. In 1986 the 77 teachers employed by these 16 schools were educating 2,171 students.

The government has contributed the materials for school construction, but the people of Quinua have provided free labor for both construction and maintenance. This corvée work on the schools is popular and sustained. The people themselves have urged the construction of the schools, and most households have willingly (more or less) donated one to two days of free work each year toward maintenance. Even when peasants have built schools that few of their children would use (as in the construction of a nursery school in the central town in 1973), they have tackled the tasks without the fierce opposition to the work found in the construction of the Yanaqucha dam.[19] Quinuenos do this work and encourage their children to go to school, even though education is costly. Not only do parents lose the help of their children on the farm and in the household but they must buy them clothing and school supplies (Mitchell 1991a:119-123).

While Quinuenos have willingly worked on school construction, they have also frequently attacked teachers for poor performance and drinking on the job. This conflict further supports my argument: Quinuenos are often unhappy because they

believe the teachers are not adequately instructing Quinua children.

In contrast to their struggle for education, the efforts of Quinuenos in expanding irrigation appear irresolute. They would like to have more water, but not at the expense of diverting significant energy from schools and other more important paid work.

The failure of the dam to expand agriculture, of course, lies not only with the political decision of Popular Cooperation to underfund the original proposal but also with the truly limited funds available for such projects in Ayacucho (McClintock 1984, 1988). The lack of funds, however, does not explain why Quinuenos had first pushed for electricity and potable water over irrigation in 1966 or why they failed to unite against the decision of Popular Cooperation to build a smaller dam. Nor does it explain why they refused to cooperate in providing the labor on this undertaking or why they have been unable to agitate collectively for funds to improve irrigation since then. In 1987, for example, a number of persons (mostly townspeople) met in an attempt to launch the construction of a new and even larger dam at Yanaqucha. After an initial flurry of activity spurred by the efforts of one migrant who often dreamt of public projects to improve his pueblo and who frequently cash-cropped potatoes on his Quinua fields, interest subsided and the scheme was abandoned.

## POPULATION PRESSURE AND THE POLITICAL ECONOMY OF PRODUCTION

The changes in the corvée and the inability of Quinuenos to expand irrigation stem from the combined pressures of population growth and adverse rural-urban terms of trade. These pressures have undermined agricultural production (and its irrigated infrastructure) and have encouraged peasants to enter nonfarm work. These same pressures, however, had also undermined the *hacienda* system, facilitating the peasant victory in wresting the water from them.

It is a serious error to think of peasants as self-sufficient (Mitchell 1987). They rarely have enough land to provision themselves, and they are tied into the larger economy in very complex ways. Quinua households generally cultivate only between one-quarter to one-half hectare of land, an amount insufficient to support most of them. Single adults need about one-eighth hectare of irrigated land during good agricultural years just to provide food, which leaves them no income to provide for fiestas, coca leaves, clothing, medicines, and supplies (Mitchell 1991a:81-86). In poor years, they need even more land. Since the size of the household averaged 4.4 persons in 1981, many households were unable to grow enough food for their members. Like rural people elsewhere in Peru (Collins 1988; Figueroa 1984), Quinua farmers must use a variety of strategies to buy additional food. Some grow early potatoes as a cash crop (the *michka,* see Zimmerer *intra*), a lucrative but risky and energy-demanding activity. Others produce crafts for sale. Still others work on the highway or in some other occupation. Many have migrated to obtain work.

Until the 1940s nonfarm work and labor migration were generally temporary.

**TABLE 11.6 RATIO OF BIRTHS TO DEATHS DISTRICT OF QUINUA–1955 TO 1985**

| | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 |
|---|---|---|---|---|---|---|---|
| Births | 145 | 163 | 218 | 231 | 227 | 249 | 260 |
| Deaths | 83 | 97 | 70 | 125 | 80 | 86 | 78 |
| **RATIO BIRTHS/DEATHS** | **1.75** | **1.68** | **3.11** | **1.85** | **2.84** | **2.90** | **3.33** |

Source: Municipal Records, District of Quinua

Peasants worked on craft production or travelled to the coast to work on the cotton harvest after their own crops had been planted. They used their earnings to buy seed and food, to obtain money for ceremonial expenses, and to purchase additional land in Quinua. In the 1940s several processes began to undermine this rough equilibrium.

The first and perhaps most important catalyst was the rapid growth in population resulting from reduced infant mortality (Mitchell 1991a:29-33). The birth rate jumped from 12.6 births per 1,000 in 1940 to 42.0 per 1,000 in 1981. If we consider a death the opening of a "social space" and a birth as a claim on that "space," the ratio of births to deaths clearly illustrates the pressures of population growth. In 1955 there were 1.75 births for every death, a figure that more than doubled to 3.33 in 1985 (Table 11.6). In 1981 the 2.8 percent annual growth rate would cause the population to double in only 25 years.

This rapid increase in population has created profound pressures on production. There is not enough arable land to feed all the people. The increased numbers have also exacerbated the water problem. Since the irrigation system provides both agricultural and drinking water, the near doubling of inhabitants of the central town between 1961 and 1986 (Table 11.7) has seriously diminished the water available for farming. The rainy-season sowing consequently had to be delayed by two weeks in Hanan Sayoc in 1987. This increased consumption of drinking water may also have made the thorn steppe less amenable to cultivation in recent years.

The stresses of population growth have been exacerbated by national economic pressures on farm prices. Since the 1950s Peruvian farm products have declined in value vis-à-vis manufactured ones because of the measures taken by successive governments to subsidize the food consumption of the export sector and urban masses (Appleby 1982; Collins 1988:20-21; de Janvry 1981; Franklin et al 1985; Long and Roberts 1984:60-63; Thorp and Bertram 1978; see Meillassoux 1981 for a description of similar processes elsewhere in the world). Food prices are often controlled directly. Foreign exchange rates are also manipulated to favor cheap food

## TABLE 11.7 POPULATION GROWTH OF QUINUA 1876-1986

| | 1876 | 1940 | 1961 | 1972 | 1981 | 1986 | Percent Increase 1961-1986 |
|---|---|---|---|---|---|---|---|
| Town | 200 | 824 | 394 | 465 | 745 | 778 | 97.5 |
| Hamlets | 3278 | 4825 | 4954 | 5057 | 5184 | 5361 | 7.6 |
| **TOTAL** | **3478** | **5649** | **5348** | **5522** | **5929** | **6139** | **14.8** |

Note: I discount the 1940 figures because they are too high, even after one takes into account the fact that the census combined the data for the hamlets of Lurin Sayoc and Hanan Sayoc with those for the central town. Informants report a consistent increase in the size of the central town, not a decline.

Source: Peru 1878, 1948, 1966, 1974, 1983. The 1986 figures are from the listado de establecimientos de salud, Ministerio de Salud.

imports. At the same time, major agricultural exporters such as the United States have subsidized Peruvian and other Third World purchases of their grains (Caballero 1981:182-183; Contreras 1984; de Janvry 1981:148-149; Hall 1985; Lazo and Morgan 1985; Sanchez 1984:9; Valderrama and Moscardi 1977), further undermining peasant prices and therefore production. Ayacucho had been a major producer of wheat since the colonial period (Urrutia 1985: 112), but that production declined significantly after the United States began subsidizing Peruvian purchases of United States wheat in 1954 through the cheap credit provided by PL 480 (the so-called Food for Peace law).[20]

Low urban food prices translate to reduced farm income. Using 1961 as a baseline, the value of the principal sierra products (maize, potatoes, barley, wheat, beef, mutton, and milk) dropped 15.2 percent in 1972 compared with the price of the principal goods consumed (rice, cooking oil, fats, noodles, sugar, beer, cane alcohol, soda, textiles, school supplies, detergents, soaps, candles, kerosene, plastics, and salt) (Alvarez 1979, as cited in Caballero 1981:212). In consequence, peasants today need more sacks of potatoes to buy kerosene (and even coca leaves) than they did in 1950.[21]

Farmers in Ayacucho are also relatively isolated from Lima, the nation's largest market. Other areas of Peru (such as the Mantaro Valley) have lower transport costs for their produce, increasing the relative economic pressures on Ayacucho farmers. (See Zimmerer *intra,* for another example of the importance of transportation costs in cash cropping.)

In the 1960s, moreover, traditional sources of income from cyclical migration to

**TABLE 11.8 PERCENTAGE OF UNOCCUPIED HOMES DISTRICT OF QUINUA 1961-1981**

| | 1961 | 1972 | 1981 |
|---|---|---|---|
| Town Center | 5.4 | 2.7 | 23.0 |
| Hamlets | 0.3 | 7.2 | 16.4 |
| **District Total** | | | |
| Percent | 0.9 | 6.8 | 17.2 |
| N (Unoccupied Homes) | 12.0 | 116.0 | 279.0 |

Source: Peru 1966, 1974, 1983

the coastal cotton plantations also disappeared, the result of reduced cotton demand on world markets and disruptions in production caused by a poorly executed agrarian reform (Mitchell 1991a:98-101, 1993). Quinuenos and other peasants had used this migratory income to supplement their own farm production, buying food, seeds, and other goods with their earnings.

These combined economic pressures have made farming in Ayacucho increasingly marginal. Even the experimental agricultural station of the University of Huamanga did not show a profit in the early 1960s, in spite of its favorable ecological location in the valley bottom and its access to the technological innovations and resources of the university (Díaz 1969:48-50).

Quinuenos have experienced these demographic and economic pressures in personal terms. They wonder how they are to feed themselves and their children. Most have rejected the idea of putting more energy into farming because of its poor returns compared to other occupations. Many have left the community. Only 34.6 percent of the people born in one hamlet had left to live elsewhere in 1967, but 55.4 percent of them had done so in another hamlet in 1987 (Mitchell n.d.).[22]

Migrants maintain myriad relationships with Quinua. Many male migrants, especially highway workers and those living in Ayacucho, have wives and children in Quinua to whom they return frequently. Still other migrants have taken their entire families with them to the coast, leaving their homes unoccupied but retaining their lands, which they actively cultivate by using sharecroppers or hired hands. Data on home occupancy (Table 11.8) show that the number of unoccupied houses increased considerably between 1961 and 1981. Some migrants, however, have abandoned their homes and fields entirely. In 1972, 16.3 percent of irrigated lands had lain fallow for more than one year (Mitchell 1991a:72, Table 17). Since farmers cultivate their irrigated fields whenever they can, some of these fallow lands had

**TABLE 11.9 MALE EMPLOYMENT–DISTRICT OF QUINUA PERCENTAGE OF FARM AND NONFARM WORKERS 1955-1985**

| | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| Farm Work | 83.6% | 85.0% | 87.5% | 80.5% | 81.8% | 69.9% | 63.5% | **77.7%** |
| Nonfarm Work | 16.4% | 15.0% | 12.5% | 19.5% | 18.2% | 30.1% | 36.5% | **22.3%** |
| N= | 146 | 160 | 216 | 231 | 203 | 249 | 260 | **1465** |

Source: Data on the occupation of fathers, Municipal birth records, District of Quinua.

probably been abandoned by their owners.

Instead of migrating, some Quinua farmers have responded to the squeeze on their income by entering the nonfarm economy to a greater and greater extent (Mitchell 1991a:103-106). They have become artisans, truckers, and petty entrepreneurs of all sorts. In 1966 fewer than 50 households produced the famous Ayacucho churches and other ceramics for sale. Today more than 500 do so, using the income to purchase food, manufactured goods, and other items. Data from birth records demonstrate that the percentage of fathers considered nonfarm workers leapt from 16.4 percent in 1955 to 36.5 percent in 1985 (Table 11.9).[23] Farming has become increasingly an ancillary occupation that subsidizes the low wages and profits of the nonfarm sector (de Janvry 1981; Meillassoux 1981).

Some Quinuenos, however, have responded to these demographic and economic pressures by more intensive cash cropping. Many have substituted cash crops for those they had previously bartered. A few devote all their fields to the commercial production of early potatoes, buying their own potatoes and other food in local markets (in Quinua and surrounding villages) at a cheaper price after the main harvest is in. Only a smattering, however, have sufficient capital, water, and labor to be cash-crop specialists.

Increased cash cropping raises the question of why peasants have failed to expand irrigation to stabilized potato production (low rainfall is a major risk of early potato production) and to permit more intensive cultivation of the thorn steppe. Anecdotal evidence suggests that those most involved in commercial agriculture favored the work on the dam and other attempts to expand irrigation. But these farmers are few in number. The majority of Quinuenos have decided against agricultural expansion. People earn more money with less risk producing ceramics for market than they do cash cropping potatoes.

## LABOR SCARCITY AND PEASANT PRODUCTION

Labor scarcity also severely constrains Quinua agriculture. Most farmers are unable to field enough hands to cash crop, to expand irrigated farming, or even to cultivate the farms they already have. It is ironic that Quinua suffers from labor scarcity at the same time its population is growing. Nonetheless, Quinua's population structure is characterized by few adult men and high dependency ratios.

Men migrate (both seasonally and permanently) more often than do women, creating persistent male labor shortages (see also Brush 1977:32-39, 57; Caballero 1981:125; Collins 1988; Degregori 1986:45, 119; Díaz 1969:62, 65). In 1981, Quinua's population of working adults (ages 20 to 39) had 41 percent more women than men (Mitchell n.d.). A similar ratio of women to men is found throughout the department of Ayacucho (Díaz 1969; Rivera 1971:87-88).[24] Those men who remain, moreover, are often too busy with nonfarm occupations to work as much as they once did in agriculture. Women, therefore, are obliged to take on additional farmwork, adding to an already heavy labor schedule (Mitchell 1991b:197-200).

High birth and migration rates have also created high dependency ratios. In 1981, 47 percent of the population was under fourteen years of age, a significant burden on those adults who remain. These children, moreover, generally attend school today, and are therefore unavailable to care for livestock and help in the home and fields as they once did.

Census data demonstrate that many households are without an effective work force. Many Quinuenos live alone or with an unrelated companion (see also Brush 1977:32-39, 57). In 1972, 15.7 percent of the households in the district (total N = 1,382) were single-person households, and in 1981, 19.3 percent of the households (total N = 1,347) contained 1.5 people. The majority of people who live by themselves are women. Since the sexual division of labor is considered essential to the effective functioning of the household, women live alone primarily because of adverse life circumstances: they are widows, their husbands and children have migrated, or they and their children were abandoned by migrating men.[25]

The inadequate size of the adult male work force is further demonstrated by a census of 25 households in the savannah in 1987. In this rural hamlet, 12 percent of the households consisted of single persons, another 12 percent were grandparent-grandchild households, and 8 percent were two generation mother-daughter households. Although the average size of the households was 4.4 persons, 44 percent of them consisted of two people or less. Since the productive unit is usually the household, most households are too small for much of the agricultural work.

Labor stress has been intensified by the Shining Path guerrilla war that began in 1980 (Mitchell 1991a:10-13). Young men are those most likely to be killed by the military and paramilitary, but young women are also assaulted, raped, and killed. Parents worry, moreover, that Shining Path partisans might murder or injure their children, or that their children might join the revolutionaries or be compromised by them in some way. Many young adults, therefore, have been sent by their parents

to live with kin in the city of Ayacucho or in Lima, further depriving the community of workers.

It is this labor scarcity, together with the poor rural-urban terms of trade, that explains why Quinuenos have been unable to organize effectively to expand irrigation. Farming and irrigation require work. Irrigated cultivation not only takes an initial large investment of energy to build the system but also requires heavy labor throughout the year (about 38 additional person days a year per hectare) (Mitchell 1991a:76, 207-209, 216-219).[26]

Quinuenos are forced to allocate scarce labor. They must evaluate the advantage of farm work in comparison to the value of alternative occupations, and many have opted for nonfarm work. They are therefore willing to put time and effort into building the infrastructure for commerce (education) but not into expanding that for farming (irrigation).

Similar processes are common elsewhere in the world. In Yemen, for example, labor scarcity has encouraged peasants to put less effort into the maintenance of agricultural terraces and sometimes to abandon them completely (Vogel 1988). In Ecuador, peasants identify labor scarcity as an important source of stress (Stadel 1989:47, 1991).

## THE DECLINE OF THE *HACIENDAS*

Quinuenos were successful in organizing against the *haciendas* in the 1960s because the *hacienda* system had already been weakened by the same economic forces affecting the peasantry and because peasants were also acting to free their labor.

The decline of Quinua's *haciendas* was part of a national trend that began in the 1930s and accelerated in the 1950s and 1960s (Caballero 1981:83, 239-240, 313-332; Maltby 1980; van den Berghe 1980). *Haciendas* are systems of labor recruitment in which land and water are exchanged for work. As population grew, *haciendas* replaced these semifeudal mechanisms of labor recruitment with cash labor (de Janvry 1981:82; Skar 1982:256-261). Peasants also began to demand cash remuneration for their work at the same time that *haciendas* were replacing human energy with fossil fuel energy. Low commodity prices affected *haciendas* and peasants alike, decreasing the value of *hacienda* production along with peasant production.

The everpresent risk of peasant invasion and of agrarian reform that dominated Peruvian life during the 1960s (Skar 1982:53) further increased the anxieties of ownership, prompting *hacendados* to sell or abandon their property. Wealthy Quinuenos were very nervous during this period. In 1964, for example, a rumor that guerrillas were marching on Quinua caused many of the rich to hide their possessions and flee the town temporarily.

The children of *hacendados,* often reluctant to become tied to the land, preferred to migrate to department capitals and Lima. Some *haciendas* sold marginal lands to tenants to capitalize their better parcels with the proceeds. Others sold out

altogether, abandoning agriculture for the better returns of nonfarm work. When the University of Huamanga offered to buy a high-altitude *hacienda* in 1964, they received more than 20 offers (Díaz 1969:67)! Some *haciendas*–even those with irrigated lands–were simply abandoned after tenants agitated for a more just system (Díaz 1969:77).

As a result of these processes, since 1876 Quinua *haciendas* have declined in number as has the size of their resident population (Table 11.4). Some *hacendados* divided and sold their property, often to peasants who had earned the capital by migrating to work on coastal cotton plantations. In at least one case in Quinua in the early 1960s, the heirs to a *hacienda* had abandoned the area of the estate occupied by tenants and sold only the portion that the *hacienda* had cultivated directly. They were rightfully concerned that the peasants would have rebelled if they had tried to sell the lands occupied by the former peons (see also Díaz 1969:43-44).

Informants report that Quinua peasants had always resented the labor service on *haciendas* and (not unexpectedly) took whatever opportunity they could to minimize that service. (See Mitchell 1991a:179-184 for a life history of attempts by peasants to escape *hacienda* service.) By the mid-1960s, the underlying economic forces allowed them to act on this resentment to free their own labor.

## CONCLUSIONS

Land, labor, and water are inextricably linked in Quinua's agricultural production and carrying capacity. Intensive farming in the Ayacucho Valley requires irrigation. Farming produces calories, but that production itself takes work. Irrigated agriculture requires more energy than rainfall farming, not only for the construction of the infrastructure but for its maintenance and for the actual cultivation of fields. Irrigation in the thorn steppe would require even more effort than that in the savannah. Quinuenos cannot expend labor thy do not have. They make decisions about that labor depending on its relative value.

Quinuenos have decided to devote more and more resources to nonfarm production. A trucker is able to buy food in the market for his children. Once farmers consume all their harvest, they would starve if they depended only on farm earnings. A ceramicist can buy seeds, supplemental food, school supplies, a radio, or a phonograph with his earnings, but a farmer cannot. Others have been unsuccessful in the commercial economy, an economy that has nonetheless become vital to their survival. Men or women who simply sell their labor are only able to eke out a living, but they rely on that work to survive nonetheless.[27]

Quinuenos would like to extend the irrigation system into the thorn steppe, but they are unwilling to divert energy from more productive enterprises to irrigate this ecologically difficult zone. They are willing to build and maintain schools, however, because they consider education the key to participation in the commercial economy. Irrigation–despite its importance to farming–now takes a secondary place to nonfarm activities.

Similar forces have discouraged heavy investment in irrigation throughout the Ayacucho Valley (see also Díaz 1969:29). The aridity of Ayacucho makes the expansion of irrigation more difficult than it would be in moister areas of the Andes. The city of Ayacucho itself has had a shortage of drinking water since at least the early 1970s. This aridity increases the costs of irrigation, but the problem is not always one of water. Rather, as in Quinua, many areas have water available; people only need to construct the dams and canals to get it to their fields.

Ayacuchanos have developed new irrigation systems and in 1968 fifty such projects had been planned or were in construction throughout the whole department[28] (Rivera 1971:153-171). These activities, however, only touch the surface of what could be done to extend agriculture if peasants found value in doing so. Instead, Ayacuchanos have put considerable energy into education. In 1961, only 28.8 percent of the total population and 47.3 percent of children aged 15 to 19 were able to read (Degregori 1986:133). By 1981, only twenty-years later, these figures had changed. In that year, 55.0 percent of the total population and 82.8 percent of children 15 to 19 years of age were literate (Degregori 1986:139).

Responding to the same ecological and economic constraints as exist in Quinua, the people of Ayacucho generally have been preparing themselves and their children for migration and commerce, de-emphasizing farm work and irrigation to do so.

## NOTES

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1. Ayacucho is also a very narrow valley (Rivera 1971:30-31), further limiting its agricultural potential.

2. Data on days of rain only cover April-December 1963 and the years 1964-1970. See explanatory note in Table 11.1.

3. Rainfall data are from the city of Ayacucho. The city is located on the valley floor and consequently much more arid than most of Quinua. The meteorological experiences of the two areas, however, are similar, and Rivera (1971:39-45) classifies them together on the basis of rainfall in his "Andean Type" (*"tipo andino"*).

4. Very little rain fell in November and December 1989. I have no data on what has taken place since December of that year. Excessive rain from September through December is an additional risk to the harvest, for it damages maize seedlings, Quinua's most important crop.

5. Elsewhere in the Andes a drop of 0.8 degrees centigrade has also been recorded (Winterhalder and Thomas 1978:20).

6. The remaining 6.6 percent was devoted to other uses.

7. My terminology for the ecological zones of Quinua is based on Arnold's (1975) analysis of Tosi's (1960) classification for Peru. The English terms for the zones are derived from Holdridge (1947), a source for Tosi's terms. The terms are artificial ones (Gregory Knapp, personal communication, 1990), and my classification is etic rather than emic. The people of Quinua distinguish terminologically only between the high altitudes called *sallqa* or *urqu* (the moist forest and above) and the low altitudes called *quechua* (the savannah and lower zones), a classification that corresponds to Pulgar Vidal's (n.d.). See Mitchell (1976b, 1991a:39-46) and Mitchell (n.d.) for other discussions of Quinua's

ecological zones.

8. The rain tundra/wet paramo areas have always been (at least in recent times) uninhabited. Since the Shining Path revolutionary movement began in 1980, many people have abandoned all the high altitude zones, fleeing for safety to the savannah and the central town or leaving the community entirely.

9. See Rivera (1971) and MacNeish (n.d.) for a description of the ecology of the Ayacucho Valley. The members of the Ayacucho Archeological-Botanical project organized by MacNeish use a different terminology to describe the ecological zones of the valley, but their "thorn scrub" is roughly equivalent to my "thorn steppe." Table 5 in Mitchell (n.d.) depicts the differences in terminologies.

10. Considerable water is lost from the canals through seepage and evaporation. Evaporation is difficult for Quinuenos to solve, but cement canals would limit seepage.

11. Two *haciendas* around the archeological site of Huari had not been turned into cooperatives, at least as late as 1980, but were considered part of the national patrimony.

12. It is unwise to accept informant accounts of equality in water distribution at face value as some scholars have done (cf. Lees 1973, but see my critique of this position in Mitchell 1977). When water is tied to land and land is owned unequally, water is *ipso facto* distributed unequally. Both the rich and poor (if they pass the dress code) are equally free to enter banks in the United States, but they are restricted in what they withdraw. Quinuenos are similarly free to go to the water distribution, but the rich and powerful withdraw the most water. See Mitchell (1991b) for an extended discussion of inequality in Quinua in spite of the egalitarian ethos.

13. At least no other community was exercising any claims to the lake or watershed.

14. Hanan Sayoc and Lurin Sayoc irrigation systems are connected, and some water is shared between the systems but only in a minor way (Mitchell 1976a; n.d.).

15. These factions are led by townspeople but include rural peasants. They are informal alliances that often use kin and *compadrazgo* (fictive kin) ties (Mitchell 1972, 1979).

16. The mayor subsequent to the one who had initiated the project.

17. This food caused considerable confusion. The labels were mostly in English and without any instructions on how to use such unknown foods as powdered eggs. Some Quinuenos suspected the food was poisoned or contained chemicals to sterilize the users.

18. With the advent of heavy truck traffic and bus service since the late 1960s, Quinuenos are no longer using foot and animal paths extensively, allowing them to neglect their repair.

19. A proposal to build a high school (colegio) in Quinua in 1967 did engender enormous anger. The anger, however, was not at the school construction but at the deception on the part of the townsman who had obtained signatures on a petition from illiterate peasants without telling them they were asking to be taxed to pay for the school.

20. The United States subsidy lasted until 1973. These cheap prices for imported foods are probably an important factor in the dietary shift from potatoes and maize to imported wheat (in the form of bread and noodles) throughout the Andes (Crissman and Uquillas 1989: 10; see also Contreras 1984 and Hall 1985). The imported wheat was also better suited to milling than was Peruvian wheat, which created additional pressures for foreign rather than domestic purchases (Valderrama and Moscardi 1977).

21. Peasants have begun to organize against these unfavorable terms of trade. Indeed, peasant protest against low agricultural prices in Ayacucho was one of the factors that led to the arrest of the president of the Agrarian Federation of Ayacucho (*Federación Agraria de Ayacucho*) in 1989 on charges of "terrorism" (Amnesty International 1989: 27-28). I have no data on the price of coca leaves since the development of the cocaine trade in the 1980s, but I presume that the price of the leaves to the peasant also must have increased relative to other prices.

22. Unfortunately, I do not have comparable data from the same hamlet. The increased percentage of permanent migrants suggested by these data from different hamlets, however, is supported by informant reports of such increases.

23. The percentages of nonfarm workers are probably higher than indicated, as I counted the men labeled *obreros* in the birth records as farm laborers, even though many of them undoubtedly work in manual labor rather than in agriculture.

24. In the areas of the coast to which Quinuenos migrate in large numbers, there is a

corresponding increase of males over females: the rural areas surrounding the city of Lima had a ratio of 125 men to 100 women in 1961, a figure that declined to 111 to 100 in 1981 (Maletta et al. n.d.: I, 48, 60).

25. Women, of course, are independent actors who sometimes live alone out of choice or who do so because they have left abusive husbands. Nonetheless, most people try to live with somebody else not only for emotional and sexual companionship but to share the workload.

26. My data on the increased labor intensity of irrigated farming are at variance with data collected by Gregory Knapp in Ecuador, where irrigated farming is less labor demanding than rainfall farming (personal communication, 1990). The difference may rest on the inclusion of the time needed to get and guard water in my data. The actual time spent irrigating a field is small.

27. These economic disparities are not inevitable. Change, however, requires effective political action to provide resources for the peasant infrastructure and higher returns on peasant production. These steps require modifying the political and economic environment favoring the coast over the sierra. In addition, action must be taken to control population. In my research, I have found that Quinuenos are interested in limiting family size. A number of men and women have spoken to me of wanting smaller families, but they have neither the knowledge nor resources to effect their desires. Women, nonetheless, are already bearing fewer children than did their mothers (Mitchell 1991a:33).

28. The department is significantly larger in area than is the Ayacucho Valley.

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