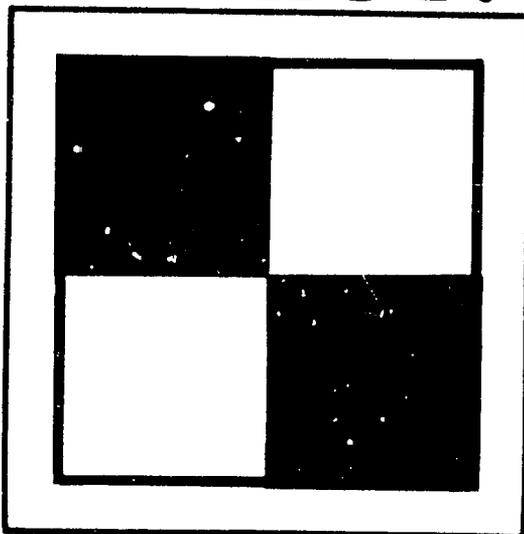


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AMARU IV



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APPROPRIATE TECHNOLOGY FOR THE BOLIVIAN
CAMPEÑO:
A BACKGROUND SOCIAL FEASIBILITY
STUDY

AID Contract No. 511-193 T

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PREFACE

This report presents research data relevant to the design of an appropriate technology project for Bolivia. Part II and Part III are community studies. The communities selected as examples of Bolivian campesino life were Yura, a traditional, Quechua-speaking community in Potosi, and Huaytu, the oldest of the national colonization communities in the Santa Cruz area. Yura shares many forms of social organization with altiplano traditional communities and shares a cultural ecology specific to the irrigated high valleys of the southern Bolivian departments where the AID mission is targeting many of its projects. The example of Huaytu yields a time depth of settler colonist experience: experiments, innovations and unique approaches have been tried by various Huaytu colonists; it is important to understand what techniques and adaptations have been adopted.

The two community sections are divided into sections: SOCIAL ORGANIZATION, current TECHNOLOGY AND PRODUCTION, and recommendations for APPROPRIATE TECHNOLOGY based on the expressed and observed needs in each community.

Part I of the report sketches some general recommendations for the proposed appropriate technology project.

Each solution of appropriate technology "is usually site-specific, taking into account local conditions" (DBS/AID/W May 1978: 5). Ideally, each proposed technology should be studied region for region. The research for this broad social feasibility study was performed before AT specialists had made their studies or recommendations in the areas of agriculture, off-farm production, sanitation and energy. Discussions between the AMARU consultant social anthropologist Brownrigg and the VITA team covered details important to specific technologies. We hope that as a background study this presentation will aid in determining social feasibility.

PART I RECOMMENDATIONS

Recommendation: The focus of the project should be on labor saving devices oriented to the consumer market.

Statements defining Appropriate or Intermediate Technology often assert that there is an abundance of labor in rural areas. In both community case studies there was a scarcity of labor available for the critical economic functions. In Huaytu, the only abundant labor was that available for hire among the seasonal migrant workers; the cost of this labor inhibited the production strategy of farmers. A recurring phrase was used for those who cultivated larger areas: "se hace trabajar con su capital" (they work the land with money). The capital component involved in market/ cash oriented rice and cattle operations was well understood.

Yura illustrates the effects of the Santa Cruz migrant labor "abundance" on one community of origin. The youth and men of Yura engage in migrant labor as the only important source of cash for the community. Their outmigration is reducing the viable labor force needed for the traditional intensive agricultural technology of the valleys which is based on irrigation. In the careers of Yura migrants, wage labor is seasonal at the beginning: timed for the period of low agricultural activity. However, increasingly, men leave for longer periods. During the annual "winter" of June, July and August, work traditionally shifts from agricultural crop production to the repair of canals, terraces, houses and roofs. With the labor force absent, the essential canals and terraces begin to fall into disrepair, threatening the entire closely inter-related system of irrigation.

In both areas the importance of agricultural labor contributed by adolescents and youths competes with the abstract ideal of education. Children needed to pasture animals or to weed fields are withdrawn from school; the migrant labor force includes youths ages 12-17.

In both areas the work of women in agriculture is critical. In the highland communities, women are becoming increasingly central to the basic production. In both areas, women have distinct spheres of special agricultural activity especially tending of small animals, fruit cultivation and food processing other than cooking.

Some rural areas of Bolivia export their most valuable commodity as the only marketable product. This export of labor augments their relative undercapitalization. In areas of Bolivia where the existing technology and the particular crops require seasonal peaks of hand labor concentration, only the more successfully cash oriented farmers can purchase this commodity.

The impression that campesinos are "underemployed" arises from their special distribution of work days. Campesinos' use of time is synchronized with the life cycle of the plants and animals on which they depend for a livelihood. The precise scheduling of the operations and technological interventions with these living species are cued or governed by minor fluctuations in weather. For example,

days may pass while a campesino waits for a break in the rain to weed or to fumigate. If the opportunity is missed, the crop is lost.

In view of this situation, the recommendation is made to focus on labor saving devices for critical agricultural operations. Other appropriate solutions to the inequities of labor distribution might include

- o cropping patterns which require a more consistent labor component over the annual agricultural cycle, such as tree crops
- o selective improvement of the caliber of produce and storage arrangements to enhance marketability
- o development of "off-farm" employment locally especially in the area of food processing.

A consumer orientation is also recommended. Items which are useful, priced within campesino means and made available through the normal market channels of the provisions and hardware commercial houses patronized by campesinos and in the open markets (canchas) of regional market towns will pass the acid test of "appropriateness:" the buying habits of the lean campesino pocketbook.

Farmers who have individualized their operations are vulnerable to changes in the cost of labor versus the sale price of their product. They cannot afford to further depend on borrowed, rented, leased or otherwise contracted work implements when those tools are in seasonal demand. The thrust of consumerism among campesinos is toward ownership of work tools. Small essential tools such as tacus, machetes or hoes are shared only among first degree primary relatives: a mother and daughter, sisters, brothers, a father and son. Access to less common tools such as fumigators is opened to renting friends only after the owner has completed his or her operational use of the tool—as often as not after the critical time for the operation has passed. More valuable tools, such as an oxen/plow rig in the traditional setting are available only to a small network of individuals charted by close interactions in other spheres of life. The limitations placed on the sharing of expensive resources is perhaps best illustrated by the etiquette of who sits in the cabin of trucks: no truck owner would relegate primary relatives or ritual kinsmen to the back of the truck to accommodate either a high status person or a passenger who offered a large sum of money.

The social feasibility of any innovation which requires acquisition by a group or the organization of a group to buy and use it as a common resource needs to be studied carefully. There are important trends of Bolivian socioeconomic organization which weigh against feasibility:

1) Although it remains true that some highland communities are organized to create, maintain and use common resources, the organization of a group, even a whole community, is activity and resource specific and cannot be easily or automatically transferred

to a new resource or activity. The rules, rights and obligations which surround the use of a common pasture area, for example, cannot be automatically extended to community woodlots. Pasture rights may be common during the six to twelve year fallow cycle, but the use of the same real estate during a year when pastures are rotated into high altitude production as temporales is governed by individual families' long term usufruct rights. A community woodlot would preempt everyone's use of a common pasture area during the fallow cycle, but only a few families' use of the same area as a temporary field. It would be this smaller group which would have to accept the alternative use. The whole community, however, would have to be involved in a decision to rest an entire zone for certain uses.

As a second example, those highland valleys which practice irrigation have developed elaborate forms of personal reinforcement (festive behavior; peer group prestige) and sanctions (monetary fines; withdrawal from work parties) to assure that the users of a canal system contribute the labor necessary to maintain them. This social organization is highly redundant. Life long careers of personal prestige and satisfaction, benefits of ritual reciprocity all reinforce the organization which incidentally maintains the canals. The means to social gratification and subsistence survival are intimately linked. Reorienting the system to some other means would necessarily have to have a similarly important end. Group survival, individual motivation and diverse elements of social life would be affected by changes.

2) For much of Bolivia, the corporate (=owning resources in common) and closed (=setting limits on rights to those resources) character of communities has been destroyed. Under the hacienda system, the closed group of tenants had rights to certain resources (pasture, firewood, water, etc.) as long as each individual in the group filled the terms of labor contracts. Agrarian reform privatized those resources. In colonization areas the model was carried still further: land was allocated in lotes to individual families to be sold at will.

Small groups of cooperating kin or neighbors exist in the "open communities," but this social organization promotes factionalism at the community level.

3) The dispersed settlement pattern throughout much of the Bolivian countryside must be taken into account in proposing any innovation which requires a group beneficiary. All too often it is some outside authority who determines the inclusivity of the group which will "benefit" in order to make demands for contributions of labor or financial support from an unrealistically large or dispersed number of campesinos. "Community labor contribution" becomes a predatory, projected official fantasy of the mink'a: members of the group act only under the threat of sanction and in bitter resentment. The community contribution is perceived as a modern mita labor tax.

Examples can be cited from both communities studied. In Huaytu, a minority among the commercially oriented farmers, truckowners and the two lumbering operations based there were enthusiastic supporters of road improvement. The majority of the Huaytu colonists

had adapted their marketing strategy to existing road conditions or were subsistence producers. The perception of the majority was that the major beneficiaries of road improvement would be outsiders: lumber operations which competed with the Huaytu groups for an increasingly scarce resource, Montero based transport companies, and commodity dealers. This perception was witnessed by the users of the road. A more equitable financing arrangement might have been to create a toll road, rather than impose a labor and cash assessment on the local population.

In Yura, the ayllu authorities ultimately responsible for mustering any community labor force were not signatories to a contract which committed community labor to build a school expansion. The authorities' dispersed clientele would have been ill-served by a centralized school.

4) Bolivian campesinos who have participated in groups, such as cooperatives, "burned" by corrupt leaders are "twice shy." The case of the Huaytu cooperative Hernan Busch (see Part III: Huaytu) is unfortunately representative.

This is not to say that groups with new, self-help purposes are not needed. Associational, community-based groups such as consumer and credit cooperatives, simple group buying clubs, savings and loan associations, cooperative or collaborative transportation arrangements and producers' unions would make an important difference. All over Bolivia in the more isolated communities, precious cash resources of campesinos are spent to pay the marked-up prices at small local stores. Campesinos' need for and problems in obtaining small loans has been treated in several studies.

Rather, the remarks recognize the problem of forming such groups: the intense promotional work required to foment new social technology. There is simply an easier way to introduce a certain class of appropriate technology:

- 1) Assure "visibility" through demonstration, access to models
- 2) Assure a supply through work with local artesans
- 3) Facilitate distribution and any educational promotion
- 4) Let the campesino consumer decide.

Recommendation: Grant funds should be used to arrange, and subsidize technology specific courses at convenient locations throughout Bolivia for the local level "promotores" of the broadest number of organizations.

We should recognize that the introductory demonstration and promotion of appropriate technologies may require the involvement of many institutions in Bolivia which do extension work among campesinos. Reliance on any single highly localized source of any new technology, either in terms of direct provision or expertise, threatens social feasibility.

In order to prevent the bottleneck of an "institutional monopoly," to promote networks across regions and to allow maximum diffusion of ideas among those promoters and community organizers who will in turn carry the innovation to campesinos, it is recommended that no lone agency involved in campesino interface extension work be funded through this program to distribute or to promote a technology at the local level. Rather, it is recommended that program funds be directed to educate the extensionists.

The recommended format would be a technology specific course for the inclusively invited field promoters of all institutions working among campesinos in a given area. Such courses might be focused around a particular representative of one such institution who would make a circuit of convenient centers in different departments to explain and to demonstrate a technology his or her group had developed. Funds could also be used to provide "scholarships" to subsidize attendance by promotores for one week courses and to distribute demonstrator models or prefabricated kits so that each group which attended would be in a position to begin demonstrating the technology.

This model suggests the desirable neutrality of the proposed counterpart: the Oficina de Ciencia y Tecnologia of the Ministerio de Planeamiento y Coordinación, through a further coordination with the MPC office of regional planning so that courses could be hosted at the individual DDC headquarters. This Ministry is not involved with campesino interface, though it is involved in both research and dissemination of research results. The general character of the courses would be informational: here's a solar cooker; this is what it can do; this is how you make one, now you try it!

Invitations to attend such courses should be as holistic as possible to avoid the pitfalls of political, institutional, budgetary and religious rivalries among groups work in direct interface with Bolivian campesinos. The field of appropriate technology is in a risky position of social feasibility if a certain otherwise neutral item is available only from or diffused by one group. Possession or use of the innovation implies association or affiliation with that group. The item or innovation might be rejected simply because of its "symbolic" environment.

Groups doing local level extension work are struggling with various problems of acceptance. There is a magical allure surrounding foreigners and individuals perceived as personally rich and powerful or in salaried association with rich and powerful entities (=anyone who rides in a non-public vehicle or whose income source is not part of the local economic structure). What works for them is regarded as a function of their wealth and power, as such, inapplicable to poor people. Role halos of ideological or cultural differences impedes acceptance. Attitudes of promoters toward campesinos may be inappropriate.

The point is not to doom appropriate technology by betting grant funds on a single institution.

Recommendation: Some project funds should be set aside for research and development grants to institutions and to individuals.

Many Bolivians and institutions working in Bolivia are at work developing appropriate technology solutions to meet a variety of needs. Some of the project funds might be set aside to create grants for research and development. The group or individual working on an AT solution would make a formal research grant application for a funding level which would support the research of two persons at Bolivian salary levels for about six months. On the basis of the results of research under such a grant, the grant could be renewed.

Solar heating devices are an example of a type of appropriate technology which has a good long term prospect of social feasibility but which exists in a low level of development in Bolivia. Solar water heaters (califones solar de agua caliente) are currently being developed, manufactured and installed in Bolivia by one small company which has been in business just over a year.

Sol-Bol of Santa Cruz modified an Israeli patent design in terms of materials available in Bolivia. Production of the 150 liter, 2 solar collector plate model was subsidized by its novelty. Some 250 wealthy homebuilders paid \$b 14,000 per unit prices for its prestige value, not its practical energy characteristics. The infant industry was given a boost by an order from the Ministerio de Urbanismo y Vivienda to install 300 units in middle income housing projects. Sol Bol was able to modify the design to produce a model with an 80 liter tank heated by a single solar collector and reduce the unit price to \$b 7,500 retail. It is this type of gradual market expansion, design rationalization and cost reduction which will bring such a device to the price and size range suitable for Bolivian campesinos who can benefit from its energy use characteristics.

The World Bank is considering building 50 houses with a third generation Sol Bol design for solar water and interior heating at Ulla Ulla as a demonstration project. This project is important as a research experiment, integrating solar panels into an antiplano vernacular housing. However, such a demonstration amidst Aymara pastoralists cannot be expected to diffuse rapidly to those other 4,000 m altitude altiplano houses where the interior temperature is a mean 40°F. The estimated costs of material and labor for a demonstration dwelling of this type built in Los Altos of La Paz in October 1979 \$b 20,000. However, both the demonstration of such devices in more prestigious residences throughout Bolivia and the support of the developing industry through the inclusion of solar energy residential devices in public housing provide market and social mechanisms through which such devices may eventually reach the Bolivian campesino.

Solar heating devices are therefore an example of a type of appropriate technology with good long term feasibility which exist in a low level of development.

Certain technological innovations are within the economic reach of most Bolivian campesinos but are not widely available. For this class of innovations, project funds could be used to encourage artisanal manufacture on the assumption that once a supply is assured, the items will be disseminated through normal market channels to individual consumers.

Some worthy innovations are not yet adapted to the Bolivian commercial or physical environment. In selecting certain types of technology for research and development funding or technical assistance, the criteria should be raised that after such development, the innovations could eventually be available through normal market channels at prices geared to campesino consumption.

RECOMMENDATIONS OF SPECIFIC TYPES OF APPROPRIATE TECHNOLOGY TO BE PROMOTED UNDER GRANT FUNDS

Agriculture

Devices which make agricultural production more labor efficient, improvements in the quality of agricultural produce, and processing techniques hold the promise of increasing campesino incomes. In the APPROPRIATE TECHNOLOGY sections of the two community studies, several specific technologies are identified.

There are many proposals to meet these general ends, however; it is difficult to begin to comment on them. In the section on Huaytu, there is a longer discussion of some specific proposals, such as the use of animal traction and conversion of tropical forest areas to pasture use which have strong, negative social feasibility implications.

A projection of beneficiaries cannot be made at this point in project design; however, several areas of need for agricultural improvement were identified in the two communities which would have a wide potential number of beneficiaries among Bolivian campesinos.

For highland and altiplano communities, the need to restore upland vegetation forage quality appears critical. For the irrigated valleys of southern Bolivia, improvements in their orchards hold the greatest promise of increased cash income.

For lowland areas such as Santa Cruz, parts of Cochabamba and the Beni, rice is a leading cash crop of campesino producers. Improvements in rice production, processing and storage with appropriate technology solutions have been treated in detail in the Huaytu study. Introduction of any of the devices and improvements discussed would have a beneficiary population of a potential 200,000+ families.

Food Processing

Food processing except some preliminary drying is generally out of the hands of Bolivian campesinos and in the hands of market intermediaries in Bolivia. Problems of increasing the income base of rural communities, promoting off-farm income in rural areas and availability of produce at reasonable prices to urban consumers are interlinked. Promotion of appropriate technology solutions which will allow more food processing in farm communities would be a step to solve all these problems. In developing solutions, the work of women must be taken into account. In preparing food produced in a rural area for home storage and home consumption, women campesinos command many important technologies which could be applied to "industrialize" the processing of food goods. "Farm gate" prices are low; a more appropriate approach would be to create the means for a "community processed gate." Literally any processing of agricultural foodstuffs improves its price: chuño, the dehydrated potato, is more valuable than potatoes; dried, hulled rice is more valuable than arroz en chala; roasted peanuts cost more than raw peanuts in the shell; cheese is more popular than milk, etc.

Energy

The most critical need for energy is for fuel in the highlands. In the highest altitudes, the fuel supply depends upon taquia: the dried dung of the cameloids. In other highland areas, the few trees, bushes and the woody parts of cacti are used for fuel. Solutions based on solar energy and electricity have the best long term potential to meet this need, but there are no immediate solutions available, given the criteria of local production and low cost.

Demand for electricity for illumination is high, given the cost and capricious availability of the traditional sources: candles, kerosene, gasoline and battery powered devices. Demand for "productive" uses of electricity (i.e. to power wood working tools, to mill) lags because of the newness and the unpredictable supply in areas already electrified. Larger operations such as sugar mills in the Santa Cruz area are able to invest in auxiliary generators as an insurance against temporary interruptions in service; small scale operations can neither make this investment nor depend on a fallible supply.

Off-farm production techniques such as food processing and an orientation toward the productive use of electricity can be introduced together.

The prospect of wind energy needs to be studied carefully in each area. Although useful applications for wind powered devices in agriculture could be suggested, the need for such devices must be timed for periods of high wind and phase of agricultural activities. As examples, windmills could conceivably be used to pump water to higher levels in the southern valley, opening up the possibility of expanding irrigated agricultural production to the second and third terraces of the narrow valleys; however, the periods of high wind occur during the period of low agricultural activity.

Sites for "mini-hydros" and turbines are presently being explored in the higher regions. For the Bolivian lowlands, the most important unexplored source of energy is the force of the river currents. Whereas in the highlands even very small streams and elaborate chute canals are used to power water mills, the potential of the fast, all-season lowland rivers has not been generally utilized in the traditional technology. The potential exists for hydroelectrical generation from paddlewheels secured in mid-stream flows.

Given the scarcity of cash crop income in the highlands and the cost of hiring labor and transportation in the tropical lowlands, the small farmers must maximize their cash expenditures. Although in both areas, some of these expenditures are at the unnecessary inflated prices typical in small local rural stores and some expenditures are essentially hedonistic (i.e. purchase of puro or trago=alcohol) in general, family cash resources are shepherded into production, food and not improvements in health, environmental sanitation, water supply etc. Expenditures for health services, such as transportation to medical facilities, medicines, physician's services are made only in health crises, if at all.

Sanitation

Latrines have failed, not only because they are too sparsely distributed to meet immediate needs, but also because they are inconvenient in terms of rural dwellers' life patterns. A plan to collect and immediately recycle human wastes (i.e. in seed beds; for biogas production) may be acceptable because of the wide use of animal dung for fertilizer and fuel. In general, any regulation of where human wastes are deposited or how they are eventually deposited is at this time surmountable only intensive education.

Reinforcement of the notion of wastes as an energy resource by analogy to animal dung may prove more culturally acceptable than instilling the ethnocentric Euro-American sanitary avoidance of human wastes. For this reason, the notion of recycling wastes for a special, new agricultural use, such as hotbed compost, has fair prospects of social feasibility.

Health: Diet

Nutritional improvements to the diet and thus to the basic health of individuals would be warmly welcomed by most rural campesinos. Reliance on starch staples (potatoes in the altiplano, maize in the valles and rice and yuca in the tropical lowlands) is forced by poverty, not choice. As an apologetic commentary to their 36-hour recall of food eaten, every campesino interviewed voluntarily underscored the apparent lack of vegetables ("verduras") and meat. But their diets are overwhelmingly based on what they themselves produce, subject to seasonal fluctuations in availability. Food purchases are a luxury in their general household economic strategy. While a program to divert expenditures for noodles or lard to legumes (soya, lentils, tarhui) would be important to improve the diet of the urban sector, the central importance of agricultural production for household consumption for the Bolivian campesino must be recognized.

Seeds, growing technology and preservation techniques for vegetables, legumes and fruits and animal health supplies must all be diffused and supported by secure systems of distribution, in order to improve the campesino diet.

Health-Water

Although the need for medical services is acute throughout the country, it is difficult to install a preventative medical attitude in a situation where even health crises may be considered too prohibitively expensive, or too involved (i.e. trips to urban facilities) to merit action.

In the context of this problem, water is the mostly likely area where health conditions can be improved with AT interventions. Procurement of water for drinking, cooking, washing and yard domestic animals is a daily problem which must be met by every rural household.

Intervention in water quality at the point of improved water distribution (i.e. individual household wells or neighborhood and household taps on villages portable water systems) or at the point of the storage of water for household drinking and cooking is the most likely preventative measures to succeed, if it also makes water supplies more convenient.

Health: Housing

Improvement of the dwelling is the second most important tactic but here the problem of consumption oriented expenditures arises. In the normative course of events, the improvements of a household's income base is reflected in the upgrading of the dwelling. Thatch roofs, which harbor vermin, especially insects, are replaced by tile or calamina. Adobe stone and daub, wattle and daub, split cane or pole wall construction, which harbor the vinchuca among other vermin and which are subject to decay, are replaced with brick or walls are secured with cement facings; beaten earth floors are planked or tiled over. At each step in the improvement of the dwelling, more appropriate materials could be introduced—i.e. integration of solar panels for interior heating and hot water heating into the roofing element. The single improvement most important for health would be the sealing of interior wall faces, whether by plastering adding cement to the final mud facing, or producing locally an organic glue sealer, and similar treatment for the beaten earth floors. In terms of acceptability and availability a locally produced sealer is indicated.

Housing is an area conflicted by economic conservatism and prestige display. House construction of traditional materials is the single economy of poor Bolivians. Residence upgrading takes the form of a "lagging emulation" of prevailing middle income house styles. If solar water heating and or solar interior climate devices as compact roofing elements are developed and generally accepted in middle income housing, it can be predicted that such items will eventually be acquired by Bolivian peasants, as surely as their roofs presently upgrade with economic success from straw or thatch to tile to tin.

PART II

YURA: A TRADITIONAL
HIGHLAND COMMUNITY
IN POTOSI

YURA

INTRODUCTIONSite and Situation

Canton Yura covers an area of approximately 1907 km² or 736 square miles in Quijarro Province, Department of Potosi. The central town of the Canton is located approximately 120 km from the departmental capital. A road built to service mining centers transects the Canton, though the majority of the Yura settlements are located away from roads. Transportation, availability is limited to one bus (colectivo) which runs the Potosi-Uyuni route two or three times a week in the drier months and passing trucks. Traffic is light: 2-4 trucks pass a day and charge the same fare as the bus (\$b30 to Potosi). There are two truckowners who service the central town during the dry season. In the rainy season, when the river swells, provisions can be trucked only to an upriver point at best and brought in by burro or llama trains.

The Highland Desert Environment

Yura is located in an ecotone between broad areas which are classified under the Holdridge system as highland steppe, desert matorral, dry (thorn) forests and mountain thorn (e-MTE, md-TE, me-TE, md-TEM). The mountains of the Yura region are not extremely high, rising to only about 15,500 feet above sea level. Characteristic mountains are jagged, wind and water eroded vertical sandstone uplifts. A river system cuts through narrow river valleys in the Cordillera Central running generally from the northwest towards the southeast. The central river is the Yura, a tributary of the Pilcomayo. Rivers carry a large amount of water only in the rainy season and are separated by jagged peaks and dry arroyos. The Yura river carries a somewhat greater quantity of water than the other rivers of the region, which join it as tributaries. The valleys of the southern flowing rivers vary between 12,000 and 9,500 feet.

The area is extremely dry. Ground cover is sparse. Below the rocky peaks beginning at about 11,500 feet, ground cedars called p'uñu and low shrubs(t'ula; tara-tara) are interspersed with patches of sand. Some of these high altitude areas are a vicuña habitat, though vicuña have been killed by outside poachers. Below this zone there is a narrow strip of thorn forest where the low tropical ironwood thorn tree

¹These figures were estimated from a knowledge of the traditional boundaries of the canton and the relevant IGM maps of the area which include Carta Nacional Series H731 6434 III, 6433 IV and III, 6334 II and III, 6332 I, and 6331 (Yura), II, III, IV. Boundaries include the mojones, a series of mountain peaks which define the southern boundary beyond the southern plain of Phajcha; Ayilo Tacora, the northwest boundary of the canton and Chakilla, a hacienda bordering to the north.

chhurkis, cacti including the columnar witi (*Cereus* sp.), stovepipe and globular cacti such as the pulluay. Succulents, a few algarroba, low bushes and low hard spiny tuft grasses are thinly distributed. Only in the narrow valley bottoms is there more vegetation, and that is cultivated.

Because of the irregularity and usual inadequacy of the rains, agriculture is limited to the small intensively farmed plots along the rivers. All of the fields are irrigated by canals. Maize is the most common crop. The Yura also plant and care for a variety of cultivated trees such as willows, poplars and eucalpti.

Rainfall is limited to the summer months, from November to March. The heaviest rains fall in January. For the remainder of the year, the only rare precipitation is hail in the winter. Temperatures vary the most between night and day, but there is considerable seasonal difference. In July, the coldest month, the night lows can reach 14°F., while in the rainy season the coolest temperatures very rarely fall below freezing. During the warmest part of the day in the warmest season, the temperatures might reach 80°F, although places shaded by mountains are always cooler.

Settlement Pattern and Basic Infrastructure

The Yura live in more than a hundred hamlets (ranchos) along the river valleys. The settlements consist of a varying number of houses clustered into the named hamlet. Many of these hamlets are built at the mouths of ravines that join the larger river valleys. These ravines are dry except during heavy rainstorms allowing the Yura to wall and terrace the ravines and plant fields. Terraces, usually of a rough stone construction, as well as unterraced fields line the river valleys in the areas between hamlets. The small plots along the river valleys are irrigated by gravity canals, frequently many kilometers long between the place in the river (toma) where the river feeds the system and the last terraced plots served. Because the system depends on the slight slope of the river itself, the highest down stream plots are rarely more than 30 m above the river.

The central town and canton capitol is also called Yura. It is an "empty town" made up of a large number of town residences for the dispersed inhabitants of the entire canton: one room houses grouped around open patios. These houses are used whenever there is a reason to go to town: to consult the local political authorities or to attend the numerous festivals which take place in Yura. Permanent residents of the central town number about 120. The town is served with electricity from the hydrogenerating COMIBOL center at Puñutuma, 3 km. upstream. There is a school in the cantonal capitol through the second year of intermediary; students can complete high school at Puñutuma. The central town features a sanitary post. Telephone service which only connects to Puñutuma is in disrepair and mail service now comes through the COMIBOL enclave. There are eleven stores of la primera necesidad type, at least two of which double as bars, and six part-time bakeries.



Roof detail:thatch (Yura)



House Type (Yura)



Yura central town

According to the preliminary count of the 1976 census, canton Yura had a population of 6,265. Included in this count were the approximately 1000 residents of the Caracota mining camp, only about 30% of whom may be Yura, the COMIBOL enclave at Puñutuma of about 250 inhabitants and resident vecinos of Yura. The Yura themselves number just over 5,000. Although the population density of the canton is low, less than 7 persons per square mile if the mines are excluded, the Yura are concentrated along the river valleys where settlements are almost continuous. In between these settlements are the totally unpopulated hills and dry river valleys.

The Population

The Yura have been a self-conscious community of Quechua speakers since at least the early colonial period. Through work experiences outside the Canton many of the men have gained some facility in Spanish. Almost all of the women prefer to speak Quechua, even those who have learned Spanish in school. Men over forty tend to have relatively minimal mastery of Spanish, while younger men frequently approach facility in both languages.

About a third of the permanent residents of the central town are vecinos (neighbors) who do not consider themselves, nor are they considered by the Yura, as members of the Yura community ("de la comunidad"). Among the older adults, there are sharp differences in customs such as wearing apparel between the vecinos and the traditionally costumed Yura community members, though among the younger generation of both groups (age 22 and below) dress is modern—i.e., jeans, brightly colored store-bought clothing.

The vecinos are shopkeepers and functionaries identified with the urban national Bolivian commercial sector. The vecinos' shops are located in Yura town, and not any of the dispersed hamlets, to take advantage of the large clientele of Yura who attend festivals there. During a series of annual festivals, several thousand Yura come in from the hamlets to become temporary residents of the ceremonial town center.

SOCIAL ORGANIZATION

Ayllus

The people of Yura divide themselves into a number of groupings called ayllus, based largely on the specific location of their fields. These groupings exist at various levels of inclusiveness.

The maximal unit is the entire canton of Yura. Canton Yura is divided into four large major ayllus named Qullana, Wisijsa, Qhurqa and Chiquchi. The first two act ritually together to form the Upper Moiety; the last two, the Lower Moiety. Each of these four principal ayllus is sub-divided into smaller minor ayllus. The major ayllus of Wisijsa, Chiquchi and Qhurqa are each subdivided into two minor ayllus and Qullana has four sub-divisions. Each smaller ayllu is made up of people

who own lands assigned to that ayllu. The ayllu lands are not coterminous but do tend to cluster in certain larger areas of the canton. While a Yura can have lands in more than one ayllu, most people limit their main affiliation to the ayllu of their primary place of residence. The two principal levels of the ayllu have positions of service associated with them. [See Chart I-1]

CHART II: 1 The Ayllus of Yura --

A Table of Organization

Community: Ayllu Yura (Canton Yura)

Moieties (Parcialidades):	Upper		Lower	
	High Level Ayllus:	Qullana	Wisijsa	Qhurqa
Lower Level Ayllus:	Jatun Sullk'a Qhapaqa Agregado	Wisijsa Qullana Salwi	Jatun Qhurqa Sullk'a Qhurqa	Jatun Qhurqa Sullk'a Qhurqa

The Role of Men and Women in the Basic Socioeconomic Unit

Basic Socioeconomic Unit

The basic socioeconomic unit in the canton of Yura is the farm household, oriented toward subsistence production. The household may be a large extended family of parents and married and unmarried children, or it may be a smaller nuclear family, usually of young parents and small children. All campesino farm production, with the exception of an occasional few bushels of small apples, is destined for home consumption or for redistribution in ceremonial occasions. Most household chores and agricultural tasks are shared by men and women. Both sexes take part in the labor of planting. Men open furrows with a hoe or with an ox-drawn plow. Both men and women sow the seed. Women close the furrows with a hand-held wooden implement called a tharana or saug'ana. Both sexes do the hard work of tool weeding. Men and women take turns irrigating the plots. Men, women and children participate in the work of harvest. Both the men and the women transport sacks of produce and giant bundles of cornstalks on their backs from the fields. The farm livestock are tended to by both men and women. Generally children or young women take the goats, sheep and llamas to the slopes to pasture.

Domestic chores are also shared by husbands and wives. Women are responsible for most of the cooking and washing of clothes. Men take a serious role in child care (though older siblings often free the father of this duty later in life). Men do almost all of the chopping and most of the hauling of firewood. Women and children do most of the carrying of water. Other facets of household and farm labor are likewise divided between or shared by husband and wife. This includes house-building and rethatching, corral repair, marketing of apples, trips to the mill to have flour ground, and sewing and weaving. Men usually do any machine sewing and also weave the belts of the women's traditional costume. Women weave ponchos for the men, skirts and shawls (ajsus and llixilas) for themselves, blankets and carrying bags for general household use, and some other small items.

It should be clear from this description that segregated spheres of male and female work do not exist in Yura. (See also Harris 1978). Sometimes tasks are sex specific, but men and women labor in close proximity to each other and usually in cooperation. The decision-making process in the typical Yura household is consensual, with husband, wife and children expressing their opinions and desires on most issues. Occasionally a strong-willed husband, or wife, or even grown child, will exert greater control over household expenditures and allocation of resources than do other members of the household. The typical pattern, however, is open consultation among all mature household members. For example, the switch to tin roofing from thatch, the purchase of a kerosene-burning stove, or the use of truck-transported manure for fertilizer are decision in which both husband and wife and frequently the older children all take part. It must be noted that the operation of the fiesta system keeps individual household reserves of cash and other

resources low, since a large portion of the resources expended in the giving of a festival are lent to the sponsor by his hamlet-mates, relatives and ritual kin.

Mink'a Work Groups

Throughout the Yura canton planting is done by work parties (mink'as) in which the owner of the field provides chicha, alcohol, and festive foods for the group of neighbors and kin who help with the planting. No wages are paid.

Even vecino families take advantage of the mink'a tradition to have their lands planted. Campesinos are accustomed to the idea that the communal labor of planting is not remunerated with cash wages. The "host" provides only special foods and drink for the festive crowd. However, since vecinos never return the work of the campesinos who come to their mink'as, they must often coerce campesinos to attend their mink'as through manipulation of ties of ritual kinship, through the lure of ample liquor and often through disguised threats concerning debts of credit usually from the sale of alcohol. In addition to planting, the tasks of roof-thatching, corral repair, chopping and hauling firewood for chicha-making, transporting manure, weeding and the sectional repair of main irrigation canals, are all usually accomplished through the festive work party of the mink'a.

Unless hamlets (ranchos) are exceptionally large, several are grouped into larger social units on the basis of mutual aid relations. The pattern emerging from preliminary analysis of the data is for two or three neighboring hamlets to form a single mutual aid group. Sometimes dispersed small settlements are grouped together into a hamlet cluster. In such cases the hamlet cluster is usually co-terminous with the mutual aid group. In a technical sense, mutual aid "network" may be the more accurate phrase since an individual for any given occasion calls into play certain relationships of mutual aid and leaves others dormant. However, during the months of planting a cooperative work party with a fairly constant membership forms within each group of cooperating hamlets that usually includes representatives from all households. At other times in the agricultural calendar, in other types of labor and for other mutual aid functions, participation in work parties or in ritual celebrations of mutual aid ties is less obligatory, responding to exigencies of the moment and special compatibilities or friendships. These work parties may include kin or compadres from more distant hamlets who are not generally included and may exclude hamlet mates from whom one is temporarily estranged or who are simply preoccupied with other chores or events. The work parties at planting time are also given special form and continuity by the organization of the plowmen within each mutual aid group.

Formal Community Level Institutions

Yura has a wide network of links that bind together a very large number of hamlets and villages to form the larger community. The Yuras conceptualize extra hamlet ties explicitly. Indeed, at the present to "be" a Yura is to own lands in one of the ayllus, to acknowledge the force of the regional fiesta system, and to participate in ritual action in terms of the overarching organizational groupings that unite the entire area.

The System of Ayllu Authorities

One way that the hierarchical groupings of ayllus becomes manifest in social action is through the system of offices, cargos, that are associated with them. Some of these cargos, the alfereces of specific festivals, are most directly related to the celebration of a single ritual event—a devotional act with fundamental implications for social relations, the distribution of resources and even upward social mobility within the Yura sphere. Other offices have a civil aspect to their duties and require certain more utilitarian actions. These are the jilaqata, the alcalde, the kuraka, and, until recently, the postillon (a mail carrier). These latter offices, for all their civil component, also play a major role in specific fiestas. One thing to keep in mind in the following discussion of these civil authorities, and the same holds true for the festival alfereces, is that the office is always held by a man and woman together. Ideally, and in the great majority of actual cases, this means a husband and a wife. If either a man or a woman would like to take on one of the offices and is not married, then that person will take the responsibilities of the office with a parent or a sibling or some other close relative of the opposite sex. Normally the men take on the actual civil jobs involved, but the women spend an equal amount of energy in the preparations for the major festivals and in their realization. Both the man and the woman take part in the ritual activity associated with the office.

The office of postillon, whose responsibility was to carry the mail, was abolished some years ago. The position of postillon was the least prestigious in the hierarchy of postillon, jilaqata, alcalde, and kuraka.

The Office of Jilaqata, and Authorities of the Lower Level Ayllu Divisions

There are ten jilaqatas, one for each of the lower level ayllus. They each serve a term of one year. The principal task of the jilaqata is to collect the tasa, the "contribucion territorial" from his fellow ayllu members. He delivers the sum to his kuraka, who then carries the tax to the departmental Treasury in Potosi. The tasas are paid by the ayllu members at festivals, principally at Christmas and Corpus Christi. The jilaqatas are chosen by the kurakas and enter into service according to their moiety—the Lower Moiety jilaqatas enter at the "Hatun Fiesta," the Sunday after Easter (also call Cuasimodo) and the Upper Moiety enters at the festival of Corpus Christi.

The Office of Alcalde, and Authorities of the Higher Level Ayllus

Another cargo, more clearly a position of "authority", is the office of alcalde (Mayor). There are five of these, one each from the four higher level ayllus and one from a subsidiary region to the south called Phajcha. The alcalde of Phajcha is grouped ritually with ayllu Qullana.

The alcalde works for the mestizo corregidor, serving him in both "official" duties and household and farm chores. In the former, the alcalde might be sent to a distant ranch to bring someone accused of a crime to the office of the corregidor. The alcalde appears with his staff of authority, the kinsa reyes, and informs the person called that he must accompany him to Yura. Rarely does anyone resist. In the range of personal services, the vecino corregido may send an alcalde to irrigate his fields, carry water, or collect personal debts. Alcaldes are also tasked with the organization of the repair of sectional main irrigation canals before the growing season begins and its maintenance during this season. The section alcaldes have the power to levy fines in proportion to the size of individual's plot served by the canal.

Alcaldes are chosen by their ayllu's kuraka and serve a one-year term. During that year the five rotate in their service with the corregidor, serving a total of two and a half months each. All the alcaldes enter their posts at the festival of Reyes in January which is considered the alcaldes' festival.

The Office of Kuraka, Maximal Authority of the Higher Level Ayllus

The position of kuraka is perhaps the most interesting of the offices. There are four kurakas in Yura, one for each of the higher level ayllus. The characteristics of this post vary considerably from the ones below it. First, there is no set term of office; the kuraka may serve from three to five years or more. Secondly, no specific festival is set aside for the kuraka. Indeed, he is required to attend all fiestas in the central town of Yura and other hamlets of his ayllu, to "accompany" the authorities or stewards responsible for the festival. Finally, it is the kuraka who chooses all the other posts, while the community chooses the kuraka. When a kuraka feels he has served long enough, or when a significant number of his ayllu think he should change, then the ayllu meets to select a new candidate. A moral element comes into play in the selection of the kuraka. It is said that "anybody" can be a jilagata or an alcalde but that only responsible people of character should be chosen as kurakas. The most important aspects of the post are the administering of the system of civil and church festivals and mediation in disputes among the contending groups within the ayllu, among the ayllus, and with the vecinos authorities.

Ritual and Redistribution as an Aspect of Ayllu Offices

A great deal of the effort involved in passing a cargo is that expended on the festival obligations associated with each post. For the alcaldes, the Feast of Kings (Reyes) and the Octava of Quasimodo are

primary; for the jilagatas, Corpus Christi, Quasimodo and Christmas. For the postillones it was Christmas and San Juan. All the authorities participate in the celebration of Carnival. All this requires a considerable outlay in resources and labor, vast quantities of corn for chicha, animals for food and money for buying alcohol. However, it is during the festivals that much of the "meaning" of the cargos is expressed. In the festival of Kings, for example, all the alcaldes, those entering and those leaving the post, prepare chicha, buy alcohol, and organize people to help with the passing of the fiesta. The llujsipuj alcalde, the one who has completed his year of service, is obliged to provide considerably more than the yaykuj, the alcalde just starting his term. Around each of the ten couples there forms a contingent of relatives, hamlet-mates and friends who will accompany them during the length of the festival. The kuraka goes to the home ranch of the entering alcalde and, after a full day of pouring libations and drinking, he accompanies the new alcalde and his "tropa" (troop) to Yura. The men of the troop play musical instruments--wooden flutes and drums--and provide the musical accompaniment that will be heard during the days of the festival. The various troops install themselves in the patios of the alcaldes, where the music and drinking lasts until late in the night. The following morning the swearing-in of the new alcaldes takes place in the patio of the corregidor. Usually a large crowd is present, and even at this early hour the majority of participants are inebriated. The past alcaldes are crowned with garlands of flowers, the entering alcaldes with red wool. All the staffs of authority are placed on the altar set up in front of the corregidor. After a lecture by the corregidor and the taking of the oaths of office, there is usually a short, unfocused meeting between the kurakas and the corregidor with comments from all present. Then the tropas reform, and the real heart of the festival, the mutual visting, begins. The alcalde and his troop represent the ayllu for the purpose of the festival, and the peregrination from one patio to another, in a stereotyped order of visits, stresses ayllu and inter-ayllu relationships. The visitas continue for up to four days with the troops leaving their patios each day to make the rounds of the other nine patios. During the last days of the festival the troops of musicians, besides visting the other patios, also dance to the central square and then around the four corners which are considered the ayllu altars, ending up at the center, the Rollo, a monument which is one representation of the unity of the entire Yura ayllu.

Yura is organized and integrated by this system of "civil" authorities and festivals which incorporates a large number of villages spread out over a considerable area. A great deal of what the authorities "do" are ritual, symbolic acts which express sociopolitical links and make manifest elements of integration. This system of political and ritual roles remains the framework for mobilizing and organizing (as well as conceptualizing) the totality of Yura. Other posts and organizational elements exist but there are at a more local level and few region-wide coordinated activities are involved.

Offices in the Dispersed Settlements

A local-level civil cargo that has no ritual aspect to speak of is the post of comisionado. These are found in the larger hamlets all over the canton, usually with two or three in every river valley. The comisionado deals with minor problems which crop up from time to time in the hamlets resolving disputes over damages caused by grazing animals or calming fights that break out at public gatherings. He also functions as a messenger, and may be called to the corregimiento in Yura to receive announcements to carry to his community. The comisionado is appointed by the kuraka of his ayllu. The post is often conceived as a type of punishment; it was said that people who fight and who are hard to get along with are chosen by the kurakas to serve as comisionado.

CHART II-2:

AYLLU

AUTHORITIES IN YURA

<u>How Selected</u>	<u>Name</u>	<u>No. Serving</u>	<u>Some Duties</u>
By higher level ayllu consensus	Kuraca	4	Deliberate all major group decisions; mobilize all Yura.
Appointed by higher level ayllu Kuraca	Alcalde	5	Serve <u>vecino corregidor</u> : Ritual duties, organize canal clearing.
Appointed by ayllu Kuraca	Jilaqata	10	Collects the <u>tasa</u> from ayllu members, ritual duties.
Appointed by ayllu Kuraca	Comisionado	Numerous, 1 per rancho	
Appointed by <u>vecino corregidor</u>	Corregidor Auxiliar	Numerous, 1 per rancho	

Other Formal Community Level Institutions

Bolivian Rural Civil Authority Structure

There are three offices in Yura held by the vecino residents of the cantonal center. The maximal authority of the canton is the corregidor. A corregidor is at once a sheriff and a justice of the peace. The town of Yura is also constituted as a municipality and has a mayor, a post currently occupied by a woman. Finally, each canton has one or more registro civil (civilian registrar) who records births, deaths and marriages, issues birth certificates and performs civil marriages.

At the local level of the dispersed hamlets and hamlet clusters, the Bolivian rural civil authority structure is represented by the post of corregidor auxiliar. In Yura, this post was created in 1957. The corregidores auxiliares act as delegates of the corregidor. The creation of this position has not been very successful in extending the authority of the corregimiento into the hamlets. Rather than turn to the assistant "justice of peace" selected by the mestizo authorities, those involved in minor problems will turn to the relatives or to ritual kin to mediate. More serious disputes will be carried immediately to the higher level vecino corregidor in the central town. The corregidores auxiliares now frequently limit their activities to the "sectional" schools, the one or two-teacher schoolhouses that in recent years have been built throughout the canton.

Tensions arise between the two authority structures: the traditional ayllu authorities and the Bolivian rural civil authorities. Tensions become apparent when the vecino residents make a decision which will involve labor contributions by the campesinos. For example, a town meeting dominated by Yura vecino recently decided that the "Nucleo Escolar" in the center of town would be expanded by the construction of several additional classrooms. Part of the agreement with the funding agency commits hundreds of person-days of unskilled labor which is provided by the indigenous population. If this project becomes a reality, the kurakas will be expected to mobilize each of their ayllus to this labor.

Kurakas emerge as the most important figures in mediating disputes of this type.

School Support Committees (Juntas Escolares)

The town of Yura has a rural núcleo escolar which employs twelve school teachers and has seven grades, that is, through "segundo intermedio". In Yura, although most all the students are campesinos, the town vecinos take an active voice in setting school policy. This follows from the fact that the teachers and the town vecinos enjoy a very similar social status; indeed, in a few cases these categories overlap. However, the local committee which provides support for the school, the Junta de Cabecillas Escolares, are almost always campesinos. This group evaluates and carries out the requests of the school teachers; they do

not normally initiate activities. One project which involves the Cabecillas of Yura is the huerta escolar. This is a large field close to the river's edge that was to be planted by the cabecillas in order to test new varieties of apple and to raise a crop that could be sold for the benefit of the núcleo. It was planted for a few years but in 1978 it was not. Due to the extreme scarcity of fodder, animals which were herded into the huerta to graze on the grass have destroyed most of the fruit trees set out. The huerta has not been a success.

Other junta escolares exist in the ranchos to provide support for the sixteen sectional schools scattered throughout the canton. Around each school a small committee of campesinos has been formed to help the teacher in transporting his belongings to the community, to be at the disposal of the teacher when he or she needs help, and to provide a base for mobilizing the community when some improvement or construction at the schoolhouse is needed. Committee members usually serve a year, although motivated individuals may serve longer. The juntas are set up soon after the arrival of the school teacher at the school in March.

The school situation is complicated by the existence of a school operated by the Corporación Minera de Bolivia (CONIBOL) in the enclave community of Punutuma a short distance up river from Yura. Punutuma is the location of a small hydroelectric plant built in 1905 to provide power for the Huanchaca mines in Pulacayo. With the nationalization of the mines after the 1952 Revolution, Punutuma was incorporated into the COMIBOL system. Although a number of plant employees come from Yura ranchos, the town is more closely linked economically and socially to Potosi and Uyuni than to the local regional social system. Many of the Yura employees are middle-aged and obtained their employment at the plant during a point of expansion some twenty years back. Some so employed were Yura town vecinos, others were socially mobile persons with campesino backgrounds. Nevertheless by now their children study in the city, and many have brothers and sisters who have left the area permanently to reside in Potosi, Uyuni or other Bolivian cities. Even the economic impact in Yura and the ranchos of the Punutuma plant is minimal. The Punutumenos do occasionally buy or trade for some foodstuffs produced by campesinos, however, most of their income goes for goods brought from outside the region—beer, noodles, rice and staples of the urban diet; consumer items such as radios, bicycles, tape recorders, clothes, even a few refrigerators. Beside the plant pulpería, Punutuma has its own set of small stores, and almost all trade generated by the workers goes there. Punutumenos do not spend their money in the tiendas of Yura and buy from campesinos only rarely.

Likewise, although Punutuma's school is larger than Yura's and offers more grades. Like the town it forms an enclave. Some older children from the town of Yura and from the ranchos around Punutuma attend the school. This, of course, decreases the potential number of students in the núcleo in Yura. The Punutuma school has its own institutional and financial support through the COMIBOL bureaucracy and does not radiate out into the ranchos in the way that Yura's núcleo, through its sectional schools does.

A Paper Sindicato

No sindicato campesino ever existed in Yura. The canton was an area of Tierras de origen and no hacienda of importance was founded within the region. A small pastoral hacienda, located far to the south on the border of Yura, has existed since Colonial times and continues to be home for about twenty families. The pressures for land reform felt in other areas of Bolivia just did not exist in Yura. Agrarian Reforma Agraria entered the Yura area about four years ago, as part of the its program to re-title campesino lands all over the nation. The new granting of titles being processed in La Paz will give joint title to the ayllus, not to individuals. Therefore, the route that most campesino communities followed in establishing a sindicato campesino in association with the agrarian reform was not followed in Yura.

Some of the vecino residents of Yura, however, were deeply involved in MNR politics and one man became chief of the "southern command," while another was elected a deputy in Congress and serves in the same capacity in the new government of Guevara Arze. The interests of these activists were urban, and they made no attempt to shake up agrarian organization in Yura, not even to the extent of founding a sindicato campesino. In 1978 a "paper sindicato" was established by the vecino corregidor, affiliated with the confederation that forms part of the Ministerio de Asuntos Campesinos and Agropecuarios. This organization has accomplished little and at a public meeting in June, 1979, there were audible rumblings from some quarters that the directorate should be renewed.

No cooperatives or growers' organizations exist in Yura.

Contact with Outside Agencies

Catholic Church Organizations

The Church has a long history as a major institution in Yura, but in recent years, from about 1955 on, it has played a marginal role. Around that time that last resident priest left Yura, and since then the presence of the Church has gone almost unfelt. Only at the fiestas of Quasimodo and Corpus did a priest come regularly to offer mass, at the same time baptizing the children and marrying the young couples. The priest officiating at these festivals was changed every year or two and no continuing links were created. The priests frequently charged large sums for masses, and were reputed to leave fiestas much richer men than when they arrived. The situation improved in 1974 when the area came under the care of two Galician priests who have abolished the many abuses of previous years. Although they have undertaken construction projects in Yura, the large size of the area of southern Potosi to which they are assigned prevents them from spending extended periods of time in Yura canton. Their emphasis is on pastoral work, and is less oriented to social action than some other religious people working in the countryside in Bolivia.

In 1978 the researchers attempted to mobilize public opinion around the possibility of inviting Accion Cultural Loyola, ACLO, to Yura. It was hoped that ACLO, a dynamic social-action organization centered in Potosi, could provide institutional backing for the organization of cooperatives or self-help groups among the campesino population. ACLO expressed interest in the prospect of going to Yura, and several exploratory meetings were held. Interest grew, although communications in the area are primitive and the scheduling and organizing of meetings posed problems. Unfortunately, before the proper groundwork was laid in order that ACLO could concentrate some of its resources in Yura, a jurisdictional dispute arose with another Church-related organization, CEAMCOS.

ACLO had scheduled a meeting in Yura to introduce itself and to discuss its programs in June, 1978. Although the notice was passed through signs, letters and personal visits, attendance at the first meeting was light. Usually meetings in Yura are only held during festivals, for it is then that the campesinos come into the center from the surrounding ranchos. A meeting held on a date apart from a fiesta, as was the first one of ACLO'S, is likely to attract only those living relatively close by. The same day a very successful meeting was held in Thatuka, one of the larger ranchos of ayllu Qullana, and a three-day cursillo was scheduled for a date two months in the future. Later a second meeting was held in the town of Yura, and this time interest was greater. Unfortunately, by then the director of CEAMCOS had demanded that the director of ACLO explain why he was encroaching on "her" territory. He pointed out that ACLO would not duplicate the services offered by CEAMCOS of adult literary and women's club functions. ACLO promised to concentrate on the improvement of agriculture as a primary goal in Yura. Nevertheless, at a national conference of umbrella organization, Eseuelas Radiofonicas de Bolivia to which both ACLO and CEAMCOS belong, the latter's director offered a resolution that the Department of Potosi be divided geographically between CEAMCOS and ACLO. The provinces of Quijarro, the Lipes and Daniel Campos would "belong" to CEAMCOS, while ACLO could work in Linares, Chichas and Saavedra. The resolution, phrased in terms of a large organization (ACLO) trying to push aside a smaller one, (CEAMCOS) was approved. ACLO was obliged to cancel its activities in Yura, and turned over its cursillo in Thatuka to the Agricultural Extension. As it happened, the agent of the Extension was not interested in travelling to Thatuka and no course was held there.

Agricultural Extension

Other contacts with institutions outside Yura remain limited. The Agricultural Extension, an agency within M.A.C.A., has an "iten" or post for Yura, but their agronomist did not like the town after spending a year there, and has spent the last ten years in Uyuni. During the researchers' two-year stay in the canton of Yura, the extension agent visited twice, both times within a single month. He and a colleague offered a cursillo in general agricultural techniques, especially in fruticulture and in vegetables. After the three-day course was over,

there was no attempt to follow up on the instruction given, nor was any assistance offered for obtaining the seed or fruit stock necessary to implement what was taught. Since that time over a year ago the Agricultural Extension has not returned.

**Servicio Nacional de Desarrollo de la Comunidad
(National Community Development Service-NCDS)**

Another office that has had contact with Yura is the Servicio Nacional de la Comunidad. Last year a school teacher during his first year in Yura made an application to NCDS to expand the núcleo escolar by building three new classrooms and a small theater. One day in the early months of this year a team from the NCDS office arrived to announce that the government had approved the proposal; the community should be prepared to sign a contract committing the people of Yura to one-half the cost of the project, an amount close to \$b200,000 (US \$10,000). The community was stunned by the news, because it had been the school teachers's strategy to secure financing before attempting to communicate his plan to the campesinos and the town vecinos. Many people, hearing of the project for the first time, questioned the wisdom of such a large commitment of resources, including the making of adobes, the offering of hundreds of labor-days, and a sizable cash contribution. They pointed out that the school at present was only attended by about half the number of students it could house. However, such a free gift of money could not easily be refused, and the project continues, although with little active support by the people for whom the school is being built. Although NCDS philosophy emphasizes physical infrastructure, the "promotor" from their office attempted to organize a local committee to act as a base for mobilizing the community around the public works. This committee, due to labor migration and illness, has not functioned.

Comité Cívico Potosino

Another civic group, the Comité Pro-intereses Yura, was founded last year during the time of a widespread move in canton capitals to establish a committee with ties to the activist Comité Cívico Potosino. This latter organization was one of the few voices that spoke out against arbitrary actions of the Banzer regime in its last years. Yura's local version foundered on the factional problems that had arisen earlier between the town mestizos and CEAMCOS. Two committees were formed, neither received official recognition from Potosí, and both have not attempted to function. These latter committees were formed without the inclusion of the campesinos in a significant role.

CORDEPO

The DDC of Potosí is currently building a portable water system for the central town of Yura. CORDEPO often responds to settlements' requests for urban and transportation infrastructure expanding its strength as in civil engineering and public works construction to small urban places like Yura's "empty town."

COMIBOL

The YURA have a variety of relationships with COMIBOL — the national mining company. Some are employed at the Punutuma plant and the freehold homes and fields of other are nestled at its borders. Punutuma is an enclave of approximate modernity with 24-day electricity, row housing projects "given" to the miners by Presidents of the Republic currying their favor, a cinema and Saturday Night Fever youth dances featuring the original artists in bootleg disco tapes. As a "demonstration project" in architectural technology, its model has had limited impact. Neighboring Yura houses are still solidly stone and thatch though in recent years both adobe bricks and tin roofs have become more popular. Though a youth culture solidarity emerged briefly centered around the school, cinema and dances, the incident of latrines destruction by downstream Yura has split the group. Representatives of certain secondary service occupations are supported by COMIBOL or the miners and their services do trickle to the Yura. The Punutuma blacksmith for example manufactures the Yura steel tip element for the traditional plan from heavy vehicle springs and the charcoal burning store used by the town vecinos.

MIGRATION AND SOCIAL CHANGES

Although Yuras have maintained many organizational and conceptual features from the past, they have not remained untouched by the changes of this century. In the decade of the 1950's many Yuras began to seek seasonal work outside the canton, leaving Yura when the yearly round of agricultural tasks permitted. The most common destination during the first years of labor migration was Argentina, to work either in agriculture or in unskilled labor in the cities. As time passed, some remained permanently in Argentina, obtaining better jobs as carpenters and skilled laborers. With the inflation in Argentina and the policies of development followed by the Bolivian government, most Yuras now prefer seasonal jobs in the department of Santa Cruz, especially in the harvests of sugar cane, rice and cotton. Others work in construction in Oruru, Cochabamba and Bolivian cities. As people have become more aware of the money economy their need for cash reserves has grown. Outside work provides a means to obtain money, since opportunities to earn cash income within the canton are extremely limited. For the most part, Yuras working outside the canton return to their homes to plant, to take part in festivals, and to take years off when they do not wish to work as day laborers.

Labor migration has had a serious impact on life in Yura and represents the most significant factor in current patterns of social change. The periods of time spent outside Yura vary widely, from three months to several years. Most of the labor migrants coordinate their movements with the demands of the agricultural cycle. The predominant pattern is to leave Yura after the harvest and the major festival of Cuasimodo (the Festival of Our Lady of the Encarnacion of Yura) for the winter months of June, July and August. Some return for the planting

season in October. If elderly parents or spouse are willing to manage the planting alone, then a man may remain in the labor migration zone until later in the year. Often young men return for the important festival of Reyes in January or for Carnival in February or March. Few married men with wives in Yura stay away longer than six or eight months. Unmarried people, both men and women, may remain in the agricultural zones of Santa Cruz or in the cities for years at a time without returning to Yura. We estimate that some 70% of Yura men between the ages of 15 and 30 leave each year to work outside the canton while approximately 20% of the women in the same age group do so.

This pattern of labor migration has wide implications. Most importantly, it means that the labor available in Yura has been significantly reduced. Not only during the agriculturally dormant winter months, but also during the crucial period of the planting season is a large percentage of the potential labor force absent from the region. One result of this seems to be diminution of the size of family herds. In the past, sheep, llamas and goats were regularly taken to distant highland estancias to be pastured. Now, with the decreased number of family members present in Yura during most of the year, this practice has had to be reduced and sometimes even abandoned. Oxen are still driven to the estancias but these can be left there to fend for themselves with only occasional visits by family members. The small livestock cannot be left to graze along but rather must be watched constantly in order to protect them from attack by pumas, foxes and condors. With no one available to pasture them full time in the estancias, they must be kept close to the homestead where family members can take turns caring for them. Fodder, however, extremely sparse on the slopes close to the ranchos due to overgrazing, and these areas cannot carry a heavy load of livestock.

Another more indirect effect of labor migration on the size of herds has to do with the replacement of the extended journeys to lower, distant corn-growing valleys by irregular work in the cities or in the industrial agriculture zones. These trips, which frequently lasted two months and more, augmented the local corn production with more corn from outside the canton. One needed large numbers of llamas to carry out these trips and greater efforts were made to maintain the herds. With the orientation to wage labor outside Yura, the need for llamas for transport has been reduced.

The wholesale labor migration of the majority of the male population has created a situation in which much more of the burden of planting falls to women. The absence of the males who are working outside of Yura means that the makeup of the cooperative work groups doing the planting has changed. Many women must now organize and carry out the planting of their own fields and their husband's by themselves, something that happened before only in cases where the husband was deceased or disabled. As of the present, enough men still return for the planting season so that in combination with those who have not left there are a number adequate to carry out the male work of plowing. The system works only because of the intensified labor input of the women and of these men who have remained or return for the planting season. If the scale of migration were to increase, the cooperative work groups could become so reduced in size that the planting of fields necessary to

the subsistence of the families of absent workers would be impossible to undertake. The eventual breakdown of the cooperative mink'a system could ensue and the subsistence base of migrating workers would be destroyed.

Another problem related to the lack of available labor in Yura is that certain "public works" projects are no longer carried out. In the past repairs on terraces and ravine retaining-walls were accomplished by cooperative mink'a labor in the winter season. New terraces were also constructed at this time. Although terrace walls are still occasionally repaired, there has been no building of new terraces for many years.

The gradual reduction of the fiesta cycle seems also to be a result of increased labor migration. Passing a fiesta requires a major outlay of resources, both "social" and economic. The shortage of men in the age group most involved in labor migration has made it more difficult to bring those resources together, and thus has led many to argue for an overall reduction in the festivals celebrated. Indeed, this year has seen the abolition of the large and formerly important festival held at Christmas and the reduction of two others that traditionally lasted more than a week to four or five days.

In the last twenty-five or thirty years labor migration has become thoroughly integrated into the yearly round of activities in Yura. Moreover, a whole complex of motivations to leave Yura now exist, from the desire to see the world to the necessity to earn cash to pay the costs of sending one's children to school. With the increase of the Yuras' participation in the money economy (which at this point is still mostly at the level of household consumption) labor migration is sure to continue since as long as it provides the only reliable source cash income for Yura campesinos. Permanent migration, though it does occasionally occur, is not increasing at a rapid pace, since in the labor migration zones the Yuras find themselves at/on bottom of a larger and even more exploitative socioeconomic system than the one to which they are accustomed in Yura. Presently, the majority of Yura labor migrants return to their place of origin to marry and settle on landholdings that are small but undisputedly theirs. The danger lies in the possibility that the process of labor migration could increase to the point that local Yura forms of social and economic organization can no longer be maintained due to the loss of population. If this happens, Yura will undergo a fundamental change in the structural elements that give the area its unique cultural identity, and it could lead to the eventual total depopulation of these highland valleys.

TECHNOLOGY AND PRODUCTION

Limitations on Generalizing Yura Technologies and Production to Other Areas of Bolivia

The technology described below represents Yuras' adaptation to an arid, high valley and mountain environment. The ecological zones which the Yuras use have a limited geographical distribution in Bolivia. Most of their territory is highland desert.

Most critically, however, the Yuras are able to cultivate maize as a principal crop in high (9000'+) valleys sheltered by steep sides. Similarly other high valleys of the southeast-running river drainage systems located approximately between 66° and 65° West of Greenwich and between 18° and 21° degree south of the Equator can support maize cultivation.

In general, the particular agriculture of the Yura can also be practiced in other areas of Potosi and parts of western Chuquisaca. The areas which are most like Yura include:

Calcha
Turupalca
Cayza
La Pampa
Potobamba
Tacobamba
and Cotagaita

In the northern segment of this restricted zone, between 18° and 19° S., communities which practice the valley bottom agriculture also have access to additional ecological zones: a high puna pasture and lower altitude valleys. The Macha ethnic group of the Norte de Potosi are an example.

It is important to emphasize that although principles of the sociopolitical organization described above for Yura can be generalized for many Aymara and Quechua speaking areas of the Altiplano and high valleys, the Yura agricultural technology has a more limited distribution. While Yuras grow potatoes and raise llamas for example, their importance is diminutive compared to the centrality of high-altitude tuber and grain production and reliance on llamas in higher, wetter altiplano areas of traditional agriculture.

Agricultural Land Tenure

Most Yura households cultivate at least ten and often many more diminutive plots. We have estimated total usufruct land holdings per household to vary from roughly one quarter of a hectare to one hectare. This figure refers only to irrigated plots of intensely cultivated valley land. The steep arid slopes of the Yura area are suitable only for pasture. There is virtually no rainfall agriculture in the canton. The more verdant marshy areas on the slopes are each named and usually several families from the nearby valley hamlets will have long-standing traditional claims to pasturing rights at these spots. Where little flat land borders the rivers, stone terraces of up to five and six levels are maintained. Crumbling terraces are usually repaired but new terraces are only very occasionally constructed today.

Inheritance

Both men and women bring lands to a new household unit. When a young couple marries, both sets of parents usually present the couple with a few small plots of land. More transfer of land follows as the

parents grow older and gradually retire from the heavier types of farm labor. The final inheritance of remaining plots and farm buildings occurs when the parents die. Usually those children who have lived close to the parents and helped them during their old age will receive the bulk of the remaining inheritance. Theoretically sons and daughters inherit equally, but if holdings are extremely small, sons will inherit more than an equal share and daughters will be encouraged to marry men with adequate landholdings. Younger brothers in large families of many sons often try to marry a woman whom by being an only child is the sole heir of both parents' landholdings.

Transfers and Titles

Rights to pasture lands are not bought and sold. The irrigated plots can however be bought and sold. This occurs relatively frequently especially among relatives. Plots are also commonly traded. Colonial and republican titles to lands exist, however, only one sibling, usually the eldest -- male or female -- keeps the titles. The Brigadas Moviles of the Agrarian Reform visited Yura in 1972 and the Agrarian Reform is currently in the process of granting communal title for the ayllu lands, the "tierras de origen." Under each ayllu heading, the agents of the Brigadas Moviles made lists of all the landholders in each ayllu. Since many people hold lands in more than one ayllu there is a lot of duplication in the lists being made of the ayllu landholders. One's right to ayllu lands has for centuries been and continues to be validated by the payment of a tax, called the tasa or "contribucion territorial", to the jilaqata of the ayllu to which the plots belong.

Crops

The principal crop grown in the irrigated plots of the Yura valleys is corn, that is, maize. A number of varieties of different colors and qualities are cultivated for different uses. The plots planted in corn far outnumber those given to any other crop in the areas of Yura where corn can be cultivated. In the higher ends of the valleys where corn can not be grown, wheat, broad beans (habas) and potatoes are the principal crops. In the lower or more protected parts of the valleys where corn can be cultivated, most campesino families plant only a plot or two of potatoes and edge their corn fields with rows of broad beans. Squashes, oca, quinoa, onions, and occasionally carrots or beets are cultivated in even smaller quantities. In the corn-producing areas approximately eighty percent and sometimes more of a household's fields are planted in corn. Corn in the Yura area is the backbone of the simple diet. It is eaten at every meal in the form of mut'i, loose cooked grains. It is ground and made into porridge or cooked dry and eaten in a damp cornmeal form. It is also eaten frequently as hominy. The diet of corn is complemented with broad beans, potatoes, squash, oca and onions, frequently cooked in soups. Carrots and beets are generally served only in festival dishes.

Most Yura households have one or more small walled-in gardens of apple and peach trees. The climate, due to the altitude, is too severe for peaches to produce well. A November frost, i.e., late spring, often

destroys the buds. The harvest of the hardier apple trees is more reliable but the fruit is small and often bitter. With better stock and other pruning and cultivation techniques apple production in the Yura area could possibly be improved.

Domesticated Animals

Most households keep a small herd of ten or fewer llamas. These are primarily for transport and wool and are rarely slaughtered for meat. In a few areas of the canton where pasture is more abundant some families keep larger herds of llamas. These families sell animals during the winter months, mostly to kin or ritual kin, to be slaughtered for the purpose of making a year's supply of jerked meat. Goats (or occasionally sheep) are kept and pastured on the rough slopes and, after harvest, on the stubble of the valley fields. The size of goat and sheep herds vary greatly from one family to another. Some families invest a major portion of their time and resources in large herds of, say, one hundred animals. Most families keep only small herds of ten or twenty to have a ready supply of meat for festivals, sacrifices, marriages, etc. Most households have a donkey or two and a few chickens. A very few raise rabbits (the long-eared variety) or a pig. Most households at the height of the developmental cycle own a yoke of oxen. These animals are left for most of the year to graze in their high pastures with only periodic visits by the owners to check on them. At planting time the oxen are brought down to the valley hamlets to be used for plowing the fields. They are kept in corrals near the houses and fed a fodder of cornstalks as long as the supply lasts. The oxen are then led back to their pastures (with a great deal of attendant ritual) and the rest of the planting proceeds by hand. Some very few cows which are occasionally traded but more generally serve as a reserve of wealth.

Small animals are kept in the houseyards, especially some chickens and an occasional pig. Guinea pigs are not kept in Yura, although a very few households raise rabbits. Animal corrals housing llamas, goats and sheep frequently adjoin the patios. A fine haze of manure is visible on clothes and face at times when the animals are tended. The oxen, when they are not in the highland estancias, are also kept close by the house. Animals are usually led to water and drink from the river or from irrigation canals.

CHART II-3 Continued

"Pardy Tiempo" (Rainy Season)

Temperature

Nov.-April

Daily highs of up to 85° F; chilly nights about 40° F and rare night frosts occurring about every third year sporadic, microlocalized frosts in February.

Precipitation

In November and December, occasional daily rainstorms of about one hour duration; in January and February afternoon and night rainstorms nearly every day interspersed with a few clear days.

Wind

Winds come up before rainstorms

Agricultural Activities

November	Continued planting of maize, beans, ocas
December	Continued planting of potatoes
January	Second complete canal system cleaning at St. Andrews
February	"Qhuray" -- hand hoeing and weeding
March	"Qarpay" -- irrigation
End of March	Apples harvested
April	Fields cut, corn piled Potatoes and ocas harvested Shucking and drying maize
April	Potatoes dug and stored
May	Maize left to dry Maize carried into storage

Orientation of Agricultural Production

Almost all production within the canton of Yura is oriented to subsistence. Extra apple production is usually taken to market centers outside of the Yura area, where the apples are exchanged by the costal for equal quantities of potatoes or ch'unu or are sold for cash by the arroba or even by the dozen. Persons from areas of Yura that are poor in corn bring ceramics, wool or meat to the corn-rich areas and exchange those items for dried corn at traditional barter exchange rates. Yura families centered in the high and barren southern region who have no access to corn fields in other areas of the canton make journeys during the winter months with caravans of llamas to the broader and more fertile valleys near the Pilcomayo and beyond, where the exchange rates for corn are more favorable. People from the high but more fertile northern ends of the valleys are able to sow wheat and barley. They have their extra wheat production ground and then transport the flour to the corn-producing parts of the valleys (where wheat is rarely cultivated) and sell it by the arroba for cash. Wheat is also occasionally exchanged for dried corn.

A handful of vecino families in the canton produce extra corn on their larger land holdings. Since vecinos eat more rice and noodles rather than corn and do not need large quantities for chicha-making, they more easily have a surplus than campesinos, even those who are not land poor. Only rarely is the surplus corn produced by mestizo families shipped to Sucre or Potosi to be marketed since the corn can be sold locally at the price of \$b60 (U.S. \$3.00) for 25 lbs. The corn is usually sold to campesinos who require additional supplies of corn to festival giving or for home consumption to augment a poor harvest. Those families from the southern edge of the canton with inadequate corn lands rarely buy corn with cash, instead they make their journeys toward the Pilcomayo and exchange ceramics for corn at traditional rates.

Storage

Storage facilities for farm products in Yura are simple but fairly adequate to the people's needs. Corn is usually stored in earthen bins and occasionally in large ceramic jars in dark, cool stone or adobe houses. Meter-deep round excavations are made in the houseyards of the storage of potatoes. These are lined with straw and filled in with straw and dirt after the potatoes are put in. Potatoes will keep for up to six months under these conditions. These structures are called phinas in Quechua. In the marginal areas of the canton where people make journeys with llamas to lower valleys for corn, this corn is stored upon return in small freestanding stone silos called pirwas that have high window-like doors. Dried meat (ch'arki), squashes and other vegetables as well as the harvest of small apples are stored in cool, dark, little-used rooms.

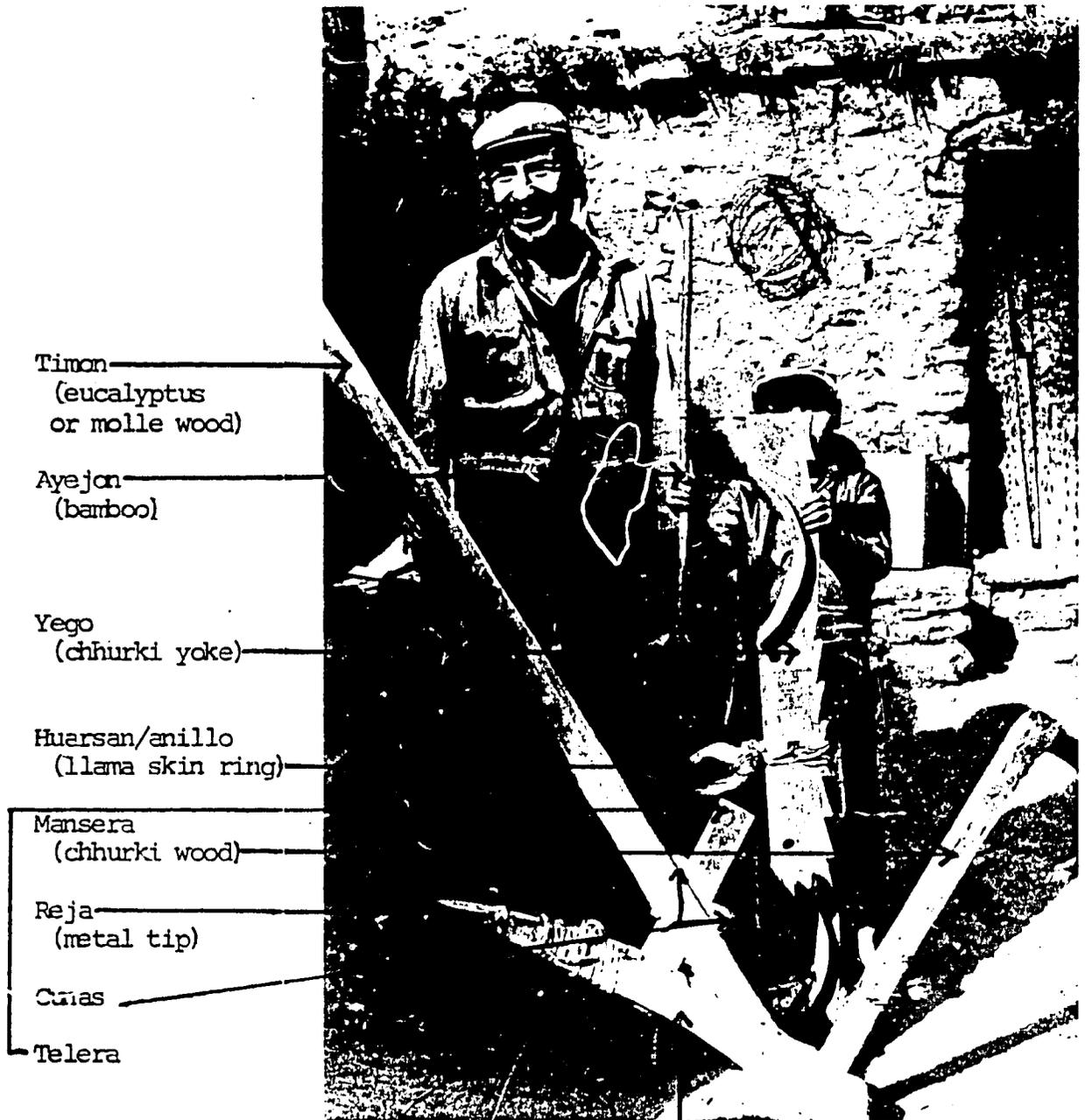
Tool Inventory

The tool inventory of Yura farmers is small although agricultural technology in the general sense is decidedly more complex. The plow used is of wood and is lashed by a small yoke to the horns of the bulls or oxen with woven llama wool ropes. The ploughshare is of steel and is fastened to the plow with leather thongs. The use of the footplow (uysu) has been long-bladed hoe called a liuk'ana is used for making furrows (when it cannot be done with the oxen-drawn plow) and for weeding and forming the paths for irrigation water in the fields. Short-handled shovels (pala) are used for digging and for the cleaning and repair of irrigation canals. A small scythe, called a jusi is used for chopping wood. There are small slingshots, used principally to kill birds or frighten them away from planted fields. The braided ropes of llama wool and the woven sacks as well are essential for transporting produce.

Special Agricultural Technologies

In addition to this basic tool inventory one must include knowledge of certain agricultural techniques in a listing of the Yuras' farm technology. The use of irrigation canals is foremost in this list. The techniques for construction and maintenance of canals from three to ten kilometers in length, the organization involved in the cleaning and repair of the canals, and the methods for preparing the fields for watering form a complex body of information without which cultivation in the Yura valleys would not be possible. Moreover, the construction and maintenance of terraces along the irrigation canals in many parts of the valleys means increased land surface for cultivation. Another very important aspect of farm technology is the periodic (usually annual) enrichment of these intensely farmed parcels with large quantities of natural fertilizer — usually llama or goat manure and a special earth mixture known as huy.

The rotation of crops is also practiced, however, this technique is of limited usefulness since the bulk of one's fields must, of necessity, be planted each year in corn. Nonetheless, parcels planted in potatoes or broad beans or other vegetables in one year are always planted in corn the following season. Yura farmers recognize that the addition of adequate manure to the soil each year is a more effective method to improve production given the limitation on the possibilities for crop rotation. Since land holdings are frequently miniscule, fields are rarely left to fallow. Other aspects of Yura farm technology include seed selection and storage and, in regard to livestock, the utilization of distant high pastures and construction of stone corrals. The methods of food preservation mentioned in the discussion of storage facilities are also important elements of Yura farm technology. Chief among these is the process of drying or "jerking" meat through a combination of exposure to sun and cold. Ch'unu is not made. Temperatures do frequently fall below freezing during the winter months of June and July at night; however, these nights of frost do not occur with sufficient frequency or continuity for successful ch'unu-making.



Timon
(eucalyptus
or molle wood)

Ayejon
(bamboo)

Yego
(chhurki yoke)

Huarsan/anillo
(llama skin ring)

Mansera
(chhurki wood)

Reja
(metal tip)

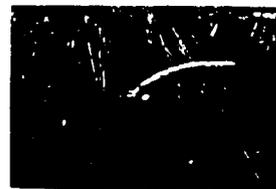
Cunas

Telera

Cabeja (chhurki wood)

The Yura Yoke and Plow

Agricultural Tools- Yura



The "Toma" where water
is deviated from the
Yura River to a canal



YURA IRRIGATION AND
FIELDS



Stone irrigation
canal



Terraced field with piles of organic fertilizer

Problems of Agricultural Production

Clearly, one of the major problems in the Yura farm production system is the scarcity of arable and irrigable land. Parcels are small and scattered. Production is scarcely adequate for subsistence needs. Another problem endemic to this arid area is the inadequacy of natural pasture and fodder for livestock which, of course, limits the size of herds and thus the amount of meat protein in the average diet. Another serious problem is the uncontrolled shifting of the course of the rivers which carries away entire plots and undermines the terraces, as well as preventing the farming of most of the flat river bottom lands.

Supplies of seed, particularly for potatoes and garden vegetables, are not reliable. Apple and peach tree stock is unimproved and modern techniques for increasing orchard production are not known. Were such knowledge disseminated through government programs, most techniques would be out of reach for these farmers since the necessary cash to invest in such improvements is so hard to come by. In spite of the existence of several national level programs designed to provide credit to the small farmer in Bolivia, no such credit is available to Yura campesinos.

Disease among Yura livestock, particularly goats and sheep, results in the loss of many animals. There are no veterinary services available to these farmers, nor is there a local extension agent to advise them on special problems. It is common for those who keep goats to lose threequarters or even ninety percent of the newborn kids to unidentified disease in spite of long hours devoted to special care and handling of the newborn.

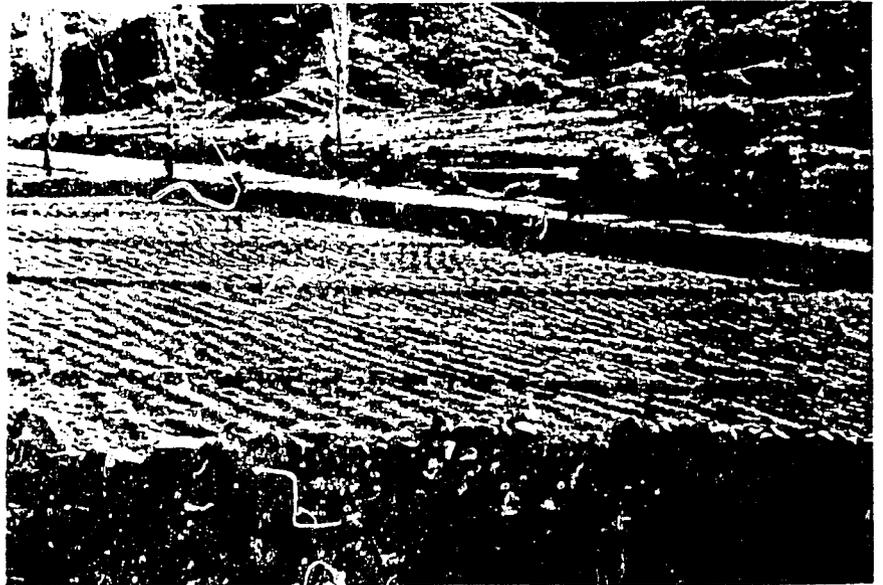
The campesinos of Yura have learned through the hard experience of centuries not to expect services or aid from their government. Their technologies are of the simplest sort, long-tested and proven as reliable when the goal of farming is recognized as subsistence production for family use. Yura methods of cultivation do not hold the promise of expanding production and increased rewards, yet neither do they deplete or destroy the fragile semi-desert environment. Expressed needs concerning their farm technologies are few. Given the small scale of their cultivation system -that is, tiny plots in the narrow high valleys and given the limitations imposed by the necessity of irrigation and the availability of water, innovations to increase production drastically would be unfeasible.

Little possibility exists of putting more land under irrigation in the Yura area due to the inadequacy of the water supply. Most of the small rivers in the area are already drained nearly dry during the periods of heavy demand for irrigation water. Communities further down the river courses regularly have no struggle with communities up river to receive their fair share of the irrigation water. The larger Yura River in the central valley supports a small hydroelectric plant. Where the water is diverted to the canal which feeds into the plant, little surplus water remains. Below the plant the water flow is ample and additional irrigation projects could possibly be undertaken.

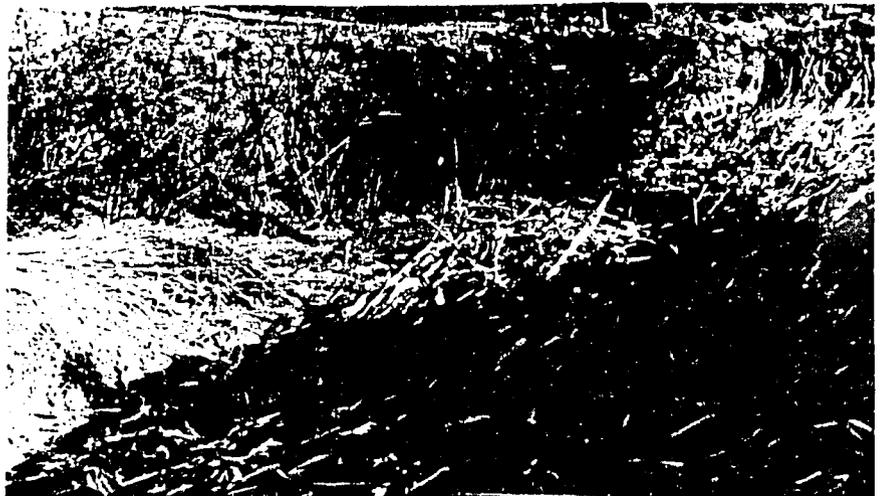


Surkus (small dirt irrigation channels) - Yura

YURA
FALLOW



Fallow field with llamas grazing



Corn stalks stored in field corral

Expressed needs in agriculture

Yura farmers frequently remark upon the scarcity of fodder and pasture for grazing their livestock. They would be receptive to some innovation, were it not costly, that would permit them to increase their supplies of animal fodder without having to devote their very limited plots of irrigated land to its cultivation. Yura farmers would also be receptive to methods, again given that they were not expensive, of improving their apple and peach production. Instruction in pruning techniques, grafting, and disease control could be given through short "cursillos" in the communities where interest is demonstrated. Another weak point in the farm production system with which Yuras express dissatisfaction is the supply of seed, especially for potatoes and garden vegetables. The lack of veterinary services is also a recognized problem.

Cottage Industries

Cottage industries in the Yura area are engaged in principally for the satisfaction of farm and household needs. Llama wool ropes are braided, the ox-drawn plow and yoke and the short-handled hoe are manufactured, clothing and carrying sacks are woven. In the entire canton there is one silverworker, one flutemaker, and a handful of hatmakers (who manufacture only the traditional Yura hat of black velvet). A few vecina women make and sell the simple dresses worn by the campesina women under the outer garment, the ajsum, that they weave for themselves.

Weaving

Weaving is definitely the most widely engaged in cottage industry in Yura. It also employs the most sophisticated production techniques, although the tool industry is simple. Most Yura women and many men weave. Women, however, do the bulk of the weaving. They use a horizontal ground loom of two poles lashed to four stakes. The loom is laid out to the size of the item to be woven and then secured. Women spin undyed llama wool to produce threads of natural colors -- brown, beige, black, grey and offwhite. Sheep's wool is spun and used in the naturally-occurring colors; it is also dyed and then spun. Alpaca wool is used if it can be obtained. Alpaca wool is of finer quality than llama wool and is thus highly valued for the weaving of special garments. Alpacas cannot be kept in the hot and dry lower altitudes of the Yura valleys, thus alpaca wool must be bought or obtained in exchange for corn from traveling merchants who come to the Yura festivals or directly from alpaca herders in nearby altiplano areas. Yura women also buy synthetic yarns at \$b 20 the skein which they respin to create a fine, durable thread. Often women buy the bright colors they need for the finely woven decorative portions of the garment in synthetic yarns to save themselves the extra time and labor of dyeing sheep's wool.

Men weave women's belts, called canaris, on small, upright wooden frame looms. Occasionally men will offer these belts for sale in a vecino's shop but usually men weave these belts as gifts for response to requests from female relatives or ritual kin. The belts are woven from

dyed or natural wheep's wool that is spun by the men with a special twisting technique called mismi. Men also usually do the braiding of llama wool ropes. Weaving is done primarily during the winter months when agricultural tasks are at a minimum.

Women weave everything but the belts for their own costumes. Women spin throughout the year but they seldom set up their looms until after the harvest has been stored away in May. Women weave carrying cloths, bags and sacks, brightly-colored blankets, ponchos, ajsus, children's clothing and ritual items. Some still weave the traditional men's garment, the unku, for their husbands. Few men, however, still wear the traditional dress. The knee-length red and black bayeta pants of the men's costume was made by one or two men in each community who knew the technique.

Charcoal Making

The only cottage industry in the Yura area which is market-oriented, in the sense that it is exclusively directed toward bringing in cash funds, is the production of charcoal. In some parts of the canton firewood is in scarce supply. Older informants speak of gradual deforestation of the slopes of the more densely populated valleys. However, in the less densely populated areas ample stands of the tough indigenous thorn trees, chhurkis, exist. Campesinos who have rights to the wood in these areas sometimes convert this hardwood to charcoal. Charcoal is produced in sealed fires on the open slopes. The charcoal is usually sold to vecino families within the canton at the current price of \$b 80/quintal, that is, U.S.\$ 4.00 for 25 pounds of charcoal. There is no marketplace of any kind in the canton, thus those with charcoal for sale transport it by burro or llama to the houses of potential customers where they offer it for sale. Campesinos themselves rarely use the expensive charcoal, thus the market for the sale of charcoal within the canton is restricted to a few vecino families.

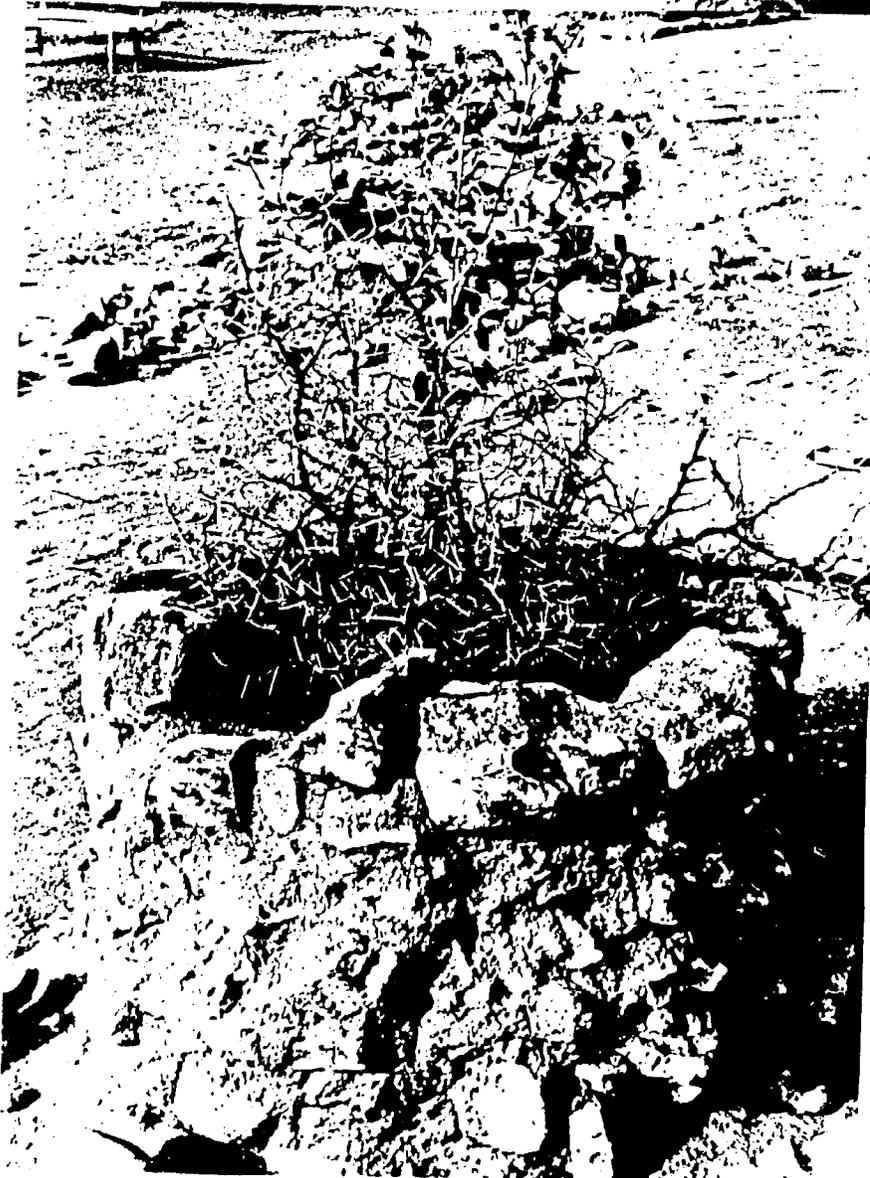
Pottery Making

In a small number of hamlets on the southern edge of the Yura area, men specialize in the making of pottery. These ceramics are hand-molded and are baked in large outdoor bonfires. No pottery wheel is used. A variety of shapes and sizes of pottery are produced: small flat bowls for serving, medium and large-sized pots for cooking, large narrow-mouthed jars for carrying water and fermenting chicha, and even larger wide-mouth jars for making chicha. These ceramics are seldom sold for cash. Rather they are transported by burros or llamas or even on human backs to areas which produce a surplus of corn, and there are exchanged for dried corn at established rates. Most items are worth once or twice their volume in dried corn. Again, since no markets exist in the area, the potters travel up the valleys offering their wares in exchange for corn at the hamlets through which they pass. Occasionally deliveries are made for them during the previous years's selling round.

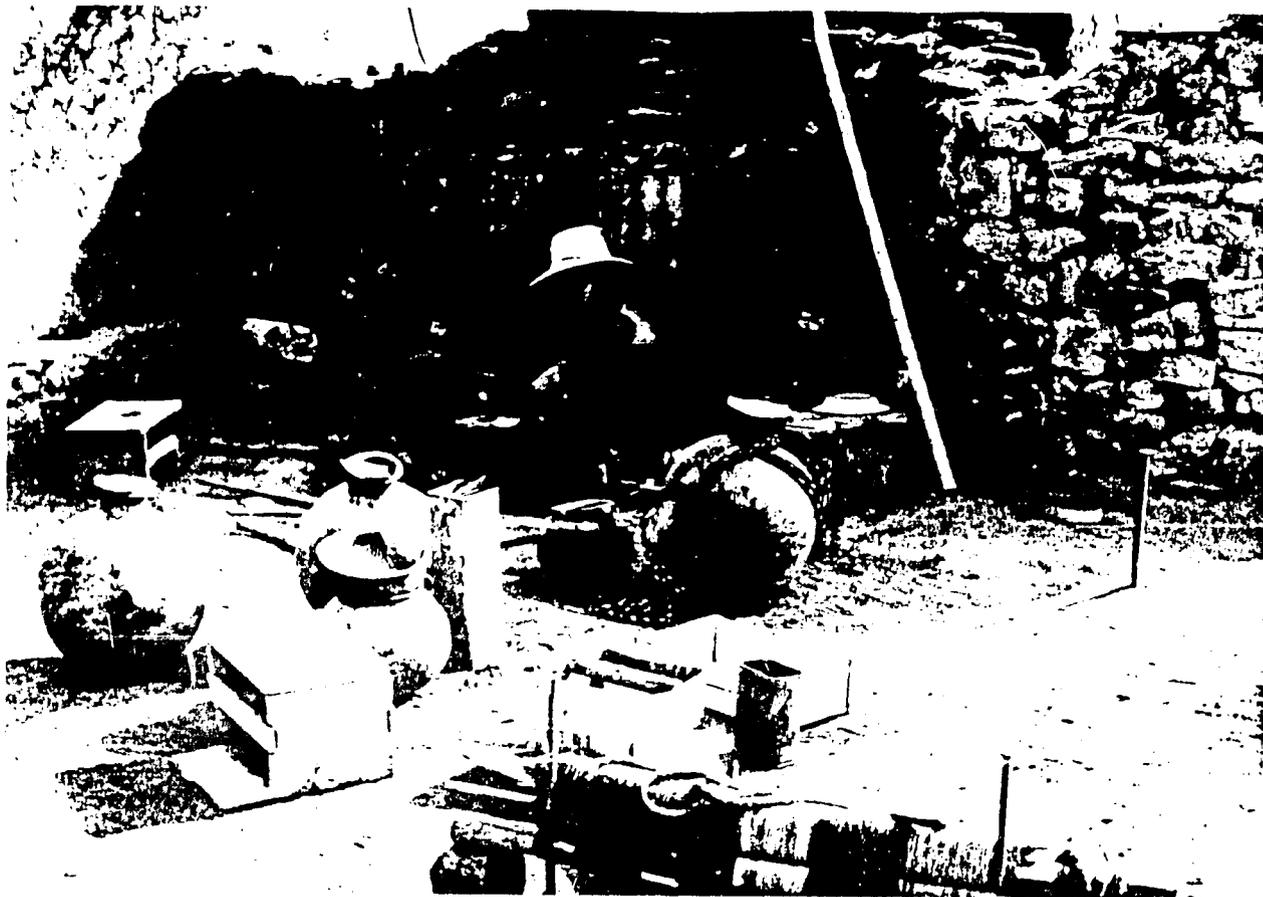
The Chhurki- a thorn
ironwood of the high
altitude



YURA TREES (For view of cultivated
poplars and eucalyptus, see other
plates)



A tree grows in
Yura: eucalyptus
in the plaza pro-
tected by its own
stone well and
thorns



Yura patio/ outdoor kitchen-note cooking area and loom



Vecino townsmen kitchen-note charcoal stove

YURA KITCHENS

Beer Brewing

The brewing of corn beer by all Yura women must also be considered a cottage industry since it occurs on such a large scale and with such frequency. The huge bulk of beer production, easily 99 percent, is destined for the satisfaction of ritual and social commitments. Very occasionally a woman will make a small batch of chicha to sell by the cupful in the central square during the festivals which attract a fair number of outsiders -mostly traveling merchants and their families. Since hundreds of gallons of chicha are served free of charge by the sponsors of a festival to all participants, the sale of chicha at festivals is not a serious money-making proposition.

The cottage industries described above are all small-scale and destined for local use. The technologies employed are simple and involve principally materials that are produced locally or occur naturally in the region. The weavings, the pottery, the charcoal, the corn beer are all produced by ancient, long-tested methods which admit of little innovations. In weaving some innovation does occur. The current use of synthetic yarns is an example. Women are currently expressing a need for cheaper and more dependable supplies of such yarn than the small selection of high-priced skeins brought into Yura by mestizo shopkeepers and traveling merchants who come to the larger festivals. Aniline dyes must be obtained from these same sources also at high prices, and weavers likewise express their dissatisfaction with this situation.

By and large, however, the people who work at weaving, chicha-making, the production of charcoal or of pottery do not see any need to change the techniques or introduce new elements since these industries are precisely adjusted to local conditions and local demand. The principal problem in these cottage industries is the absence of a wider market which would encourage commercialization on a larger scale for the purpose of augmenting cash income.

Domestic Energy Sources

Energy sources are very limited in Yura, and the average individual uses only a fraction of the energy consumed even by urban Bolivians. For cooking, wood and brush are most often employed. Small bundles of firewood may occasionally be bought from people passing through from the south, but this provides a much smaller portion of fuel for cooking purposes than the brushes: muna, t'ula, and other low bushes that grow on the dry hillsides. Brush is collected daily, often in the afternoon by Yura as they return home after pasturing animals. For making chicha wood must be obtained, and to pass a fiesta, in which great quantities of chicha are produced, a special wood-collecting work festival is called by the festival sponsor. At these times, the sponsor and those who come to help him go to his montes, the specially set-aside areas where trees such as chhurki and giwina grow. Access to these named montes is obtained through inheritance, and many Yuras hold titles to them that date from the Colonial period. Historical documents show that these wooded areas were extremely important in Colonial times when they were used to provide wood for the production of charcoal, which was sold in



Above, a marán; below, a qhuna



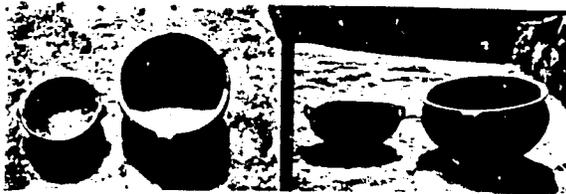
Maran variants



Water mill wheel



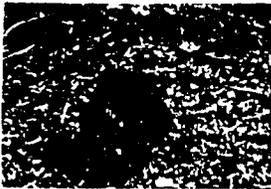
Water mill canal
to force water to
power water wheel



Almuro-dish used for carrying corn 14" dia.
and almulito, smaller model 9" dia.



P'uru-jar used only
for carrying water



Manka or Olla- the basic pot for
cooking with water



Wirkhi-pot used for
making chicha beer
and for preparing
the masa dough for
breads



Jik'i-a pot for toasting barley
for milling oats and for cooking
with water the lawa gruel



Mankas

CERAMIC UTENSILS OF YURA

that era to meet the great demands for tribute imposed by the Spanish regime. These montes are not used to provide firewood for everyday purposes, and the present system of gathering brush for fuel involves a great deal of labor input in the continual search for fuel for daily use. A very few people have bought kerosene stoves, but kerosene, which is sold in the vecino stores, is often not available and is priced by Yura town merchants at five times the controlled price in the city. There is no attempt to create artificial heating beyond sitting close to the morning cookfire.

As for lighting no satisfactory methods exist. The central town of Yura receives electricity from Punutama, but this service is subject to disputes and benefits a fraction of the Yura population. Most people rely on candles which are extremely expensive. Due to the extortionate profit margin in the Yura stores (candles, for example, cost 80% to 100% more than in the city), the use of such items has to be closely controlled. Many people buy a mechero, a small lamp made from a beer can with a wick; this burns kerosene. Again, none must buy the kerosene which, when available, is expensive. Another source of light are the miners' carbon lamps, but the fuel is unavailable except through contacts in the local small mines. The highly efficient kerosene pressure lamps currently cost between U.S. \$80 and U.S. \$120, and are out of the price range of the great majority of Yuras.

Residential energy needs are systems of cooking and providing light that involve less labor input and are less expensive. Kerosene offers perhaps the easiest solution, since both stoves and light sources using this fuel are available less attractive. Electricity would be the ideal alternative, but the high cost and uncertain supply of kerosene make these alternatives, but to date electrification in Bolivia has been premised upon large capital inputs for the installation of generating plants and grids to carry power to the consumer units. The program of rural electrification, which has recently been focusing on the Betanzos area in Potosi has no plans to work in Yura. Even in Betanzos, lines overpass dispersed hamlets and houses. To the best of our knowledge, nowhere has rural electrification reached areas with such the highly dispersed population distribution which is encountered in the canton of Yura.

The sources of energy for production are mostly human and, in second place, animal. Animal traction power, in the form of teams of oxen, is employed in those fields which are large and flat enough to permit its use. Edges of the field, small plots, and terraces are turned by human labor using the liuk'ana stick. For the rest of the agricultural season, as detailed above, human labor is employed; this includes watering, weeding, harvesting, and carrying the crops and the fodder from the fields. Animal power is again called upon in the form of llamas and burros for transporting goods between ranchos and for more extended trips. Solar energy is currently used mostly in food processing, especially to drying corn, meat and apples. Wind power is tapped for winnowing wheat and quinoa. Water power is used to turn the grindstones of the handful of mills found today in Yura. The use of

water in agriculture has been "technologized" in the form of the elaborate irrigation canals that are maintained with a high degree of labor input.

It is clear that the greatest difficulty of the present use of energy resources is the overwhelming reliance on direct human labor; farming in Yura is very hard physical work. The main "labor-saving device" is the scratch plow. Its use has been expanding, since within living memory there were fewer yokes of oxen, and fields were often turned by the traditional Andean foot plow, called here an uysu. People are accustomed to their present productive methods, although they might welcome innovations that would relieve them of some burden of the work. On the other hand, it is important to remember that such solutions would have to require a relatively low level of capital investment, since it is unlikely, as mentioned earlier, that agriculture in Yura could successfully be re-oriented to a cash-crop economy -- and without cash crops, and the concomitant possibilities of using a credit system, capital investments must be "absorbable" into a family economy based on subsistence and augmented only by wage labor migration.

Water used in the household for cooking, washing and drinking is carried either from the rivers or from irrigation canals that feed from them; there are no wells in Yura. The water contains organic pathogens from several sources. The enclave COMIBOL town of Punutuma dumps raw sewage directly into the central Yura River from its public toilets, its small hospital, and its slaughterhouse; this pollutes the water for all communities downstream. Small mines in the area such as Putuma on the Taru River also pour their effluents, both organic and chemical, directly into the rivers, in some cases ruining the water even for agricultural uses. Manure, not artificial fertilizer, is used to keep up farming productivity; when the fields are irrigated, water flows through them into the lower canal, carrying with its elements from the manure. The river water itself carries a heavy load of silt, which creates more problems of use. A recent study by the Corporacion de Desarrollo de Potosi, carried out to study the feasibility of an eventual installation of a water system for the center town of Yura, documented the high levels of organic pollution in the groundwater to a depth of ten feet. (The walls of the test shaft collapsed before a deeper reading could be taken.)

In-house storage of water is in large clay pots or in metal alcohol cans. If the water were pure, the storage would be relatively sanitary, though the silt content of the water does build up in the containers and is only rarely removed. Dishes are washed, but in the same polluted water that is used for all other purposes; soap is not used nor is the water heated, due to the expense and effort involved.

Environmental Sanitation

In the ranchos of Yura, latrines are not built (although in the central town a few, rarely used, were recently constructed in proximity to the nucleo escolar). People defecate behind and between houses or in

some area closeby, making no particular practice of moving to a greater distance from their house patios. In the central town of Yura, many of the abandoned house ruins serve as places to defecate. From these customs two problems arise: First, in this predominately dry climate the excreta dries over time and mixes with the dust which becomes ubiquitous in the many windy months of the year. Second, where there is little distance separating the area used for defecation and the houseyard, great swarms of houseflies breed which take advantage of the proximity to move back and forth between the excreta and the living space, becoming a special nuisance where food is being prepared.

Laundering is done either on the riverbank or by the side of irrigation ditches. Clothes are usually washed in large metal pans and rinsed in the river or canal. Soap may be used, but most wash without it or with a natural mineral formation found on riverbanks, cullpa.

The most intractable problem of sanitation in Yura is the lack of a potable water supply. Yuras are distinctly averse to the thought of fecal contamination of their drinking water. One notable expression of this came in June, 1979, when a group of campesinos and mestizos destroyed some new toilets which had been installed next to the river in Punutuma. However, they hold other explanations for disease beyond the germ theory. This means that no efforts are made to purify the water because there is no good reason, according to their lights, to do so. Another factor is the lack of awareness of techniques. For example, a household-level system of purification using a solution of elemental iodine could be effective, but is unknown in the area. Purification is made more difficult by the lack of sources of fuel and their expense; it is highly unlikely, given the shortage of firewood, that Yuras would be willing to boil their water before use.

The contaminated water supply combined with the inadequate disposal of human wastes mean that epidemic disease takes a very heavy toll on human life. About one-half of all children born will die before the age of five, most frequently due to forms of gastroenteritis and infectious diseases for which there are vaccines. The most common among these are measles, whooping cough, and even smallpox. No vaccination program is practiced in Yura; attempts to bring vaccines to the area have been stymied by Yura's own sanitario, a young untrained "medic" who apparently does not wish to undertake the task of vaccinating the children. Parasitic infections are endemic among both children and adults; our own experience indicates that the water supply carries amoebas, the protozoa giardia lamblia, and various forms of parasitic worms. Life span for adults is in the range of forty years, with the cause of death most frequently related to infectious disease, especially tuberculosis, typhoid, hepatitis and pneumonia. Another sanitation-related disease for which no figures exist due to the fact that it goes unrecognized is Mal de Chagas. This is a form of trypanosomiasis carried by a large, soft-bodied insect, the vinchuca, which lives in house thatching and in irregularities in house wall surfaces. The vinchuca is a bloodsucking insect and transmits this disease for which there is no cure. Nevertheless, the vinchuca is not

the serious problem in Yura that it is in some other rural areas of Bolivia, such as the low lying districts of Chuquisaca and Tarija. Finally, sanitation problems combine with an abuse of alcohol and the low-protein diet to create a situation in which even minor infections can lead to death.

Yuras recognize the gravity of this situation and have often spoken of the need for improved medical care. The doctor in Punutuma, who is on the COMIBOL payroll, only accepts patients who can produce an authorization from the plant administration. This rules out treatment for most campesinos. The sanitario is untrained and unmotivated to learn more. No doctors come to Yura to treat the residents.

Another need expressed by the Yuras is increased availability of medicines at a reasonable price. The sanitario does not stock medicines for sale. The only sources of medicinal drugs in Yura is in a tienda run by vecinas, they charge well above the established government-controlled prices, frequently sell outdated medicines, and they expect anyone they "help" to work in their fields after paying the cost of treatment.

The Yuras have already taken active steps to try to decrease the pollution of their waters by the enclave town of Punutuma. An educational program could make people more aware of the dangers of polluted water, and could act as a further catalyst to try to improve this situation. Such a program could also help the people become aware of the need to devise more adequate ways to dispose of human waste.

APPROPRIATE TECHNOLOGY FOR THE YURA

The Yuras have devised a series of indigenous "appropriate technologies" to subsist in the arid, semi-desert conditions of their mountain environment. Their most pressing expressed needs include:

- 1) improvement of forage available to their domesticated animals
- 2) purification of water destined for human consumption
- 3) availability of garden vegetable seeds and orchard improvements
- 4) better supplies of energy sources for cooking and illumination
- 5) increased availability of medical and veterinary services and medicines
- 6) alternative sources of cash income other than wage migration.

From an analytical perspective, several types of appropriate technology may be acceptable to the Yuras.

Water Purification

The Yuras are conscious that their water may be impure. Several factors must be taken into consideration in recommending solutions to this problem:

- 1) Water is scarce and only seasonally available in quantity.
- 2) What water is available is critical to their sophisticated system of irrigation agriculture.
- 3) Wells are rare; the prevailing water source is from the rivers; water is carried in jars from these sources.
- 4) The settlement pattern is extremely dispersed: there are very few houses in each rancho hamlet; hamlets are distant from each other — some 5,000 Yura are distributed over 736 square miles.

These factors indicate the most appropriate water purification technology would be one which could be carried out in each household, rather than settlement level systems involving potable water tanks, tubes and faucets.

An additional factor can be taken into account to recommend which household water purification system would be most appropriate. The Yura presently produce charcoal for an extremely limited market: the local vecinos and Uyuni clients. Also, the principle of filtering water through charcoal is known and practiced in some localities. A charcoal filtration system, perhaps combined with boiling water if fuel sources could be improved, may be the most appropriate.

Sand is also available in the rivers for use in filtration. Wayne Frost of VITA discussed a simple design which modifies two cooking pots: the Yura are able potters. All elements are in place to introduce a simple purifier. However, in order to motivate the Yura to purify water, the health dangers of their present contaminated human water supply would need to be presented. Explicit cause and effect relationships between pathogens in contaminated drinking water and the diseases which take such a heavy toll of their people, especially their young children, need to be explained. They are already aware of and react angrily to obvious contamination of their water and should be receptive to further explanations.

Restoration of Upland Vegetation

Improved availability of their traditional wood source of fuel for domestic energy use and improved forage are empirically related: both the bushes and low trees which are their primary wood source and major pastures are located in higher altitudes, up and away from the intensively cultivated valley floors.

Plans for the improvement of grasses and forestations would require careful technical studies. The dryness of the area and the existing agricultural productive use of the runoff water in the irrigation systems are critical considerations. Theoretically at least a solution may exist to at once improve the forage area and promote the growth of higher altitude bushes and trees which can — as an ecological plus — regulate a sufficient down flow. Control of water through its retention

by floral root systems in higher altitudes may also control erosion. At present, the riverbanks of the valley floor cannot be used for agriculture and even the agricultural terraces built into the river valley sides are occasionally swept away in the sudden rush of flood water after maximal rains — "the salute of the water" as this is called in Quechua.

High altitude reservoirs to capture this rain are another plausible alternative. Their construction and the construction of feeder canals which could provide water to higher altitude grass and forest areas as it moved down the mountainsides to join the valley floor irrigation canals are within the technological capacity of the Yura. Constraints include the diminishing availability of labor during the season when even the existing canals are maintained and rebuilt and the current configuration of the land.

The mountainsides have deep gully washes and soft soil; mountaintops are sharp peaks and there are few flat areas along the slopes. The configuration seen today may represent several hundred years of ecological degeneration since the time when the Yuras were forced to prepare large quantities of charcoal as their tribute payment to colonial Spanish. Similar configurations of denuded landscapes and gulleys characterize other areas of historic peaks of wood cutting or charcoal preparation, for examples. Chuquisaca, bare today but which was known for the lush cedar forests cut during the colonial period, or Piura and Tumbes, the forests of which were cut to fuel Republican era ocean ships.

The presently poor forage situation encourages the herding of goats. Goat herding is one response where forage degenerates among traditional herding peoples. Ultimately however the omnivorous goats further destroy the vegetation cover. The Centro de Desarrollo Forastal identified the problems of goat overgrazing in another area, Tarija, in a July 1979 report.

At present the Yura maintain their most useful animals with difficulty: the llamas which produce wool, milk and meat and the cattle which as oxen provide traction and as cows milk as well as meat. The dried corn is carefully preserved from May until October to feed the oxen when they are brought down from the high pasture.

Apple Production

One plausible source of forage is presently unused. The Yura protect their existing apple orchards with stone walls so as not to allow animals in. In a few orchards, alfalfa is intercropped with the apple trees, cut and fed as forage to animals.

The Yura do not prune their apple trees at present. It may be possible that pruning could be so timed as to remove some leaves as well as the annual twig growths and thus provide a new source of forage: no worse than the willow leaves and algarroba leaves and crop stubble which are the forage available to llamas, sheep and goats in the winter.

Apple production is presently the Yura's only feasible potential cash crop. They are already marketing as many apples as possible, but the basic production needs a variety of improvements. Improvements would be welcomed. The apple growers among the Yura undertook production naively; they often grow apple trees from seed. Because they do not prune trees at present, it is questionable whether the apple trees are able to experience a sufficiently long period of dormancy over the Yura "winter."

Technical information about apple cultivation would be welcomed and could take the form of short courses presented in the ranchos or at the capital of Yura during their major festivals. It may also be relevant to begin nurseries where apple seedlings can be grown in a protected environment so that Yura will not be growing apples from seed. Seedlings would of course have to be planted during the dormancy period in the winter. Again the problem of seasonal unavailability of labor might appear as a constraint, but conceivably the increased production of a cash crop might diminish the wage migration to Santa Cruz in this season.

Solar Cookers

Solar cookers could be patterned into existing cooking patterns in Yura. In contrast to other groups in higher, colder ecozones, the Yura often cook in outside sheds or in the case of chicha (corn beer) preparation, in exterior patios. Low cost solar cookers which can produce sufficient heat to boil large quantities of liquids in the heavy ceramic pots currently used might be welcomed. In other altiplano zones, solar cookers are impractical: kitchen cooking areas are annexed to or integrated with sleeping areas to the warmth produced by early dawn and sunset cooking fires can be enjoyed as the only source of warmth besides body heat.

Solar cookers might also be welcomed by those altiplano women who prepare food in open markets or at festival gatherings. Even in the case of Yura festivals, much of the food and chicha preparation requires the assembly of fuel sources at the locale where gatherings are held. A more portable and practical alternative to bundles of wood gathered near the ranchos and carried long distances to the congregational festivals might be acceptable.

Solar cookers current designs are, however, too expensive or involve materials difficult and costly to obtain. Research to develop a model base on tin reflectors is recommended.

Health & Environmental Sanitation

The acceptability of latrines or other methods of human waste disposal requires an understanding of the pathologies which fecal matters can produce. The problem of dried fecal matter polluting the air might be solved by latrines, but the problem of flies as a disease vectors might remain. A somewhat far fetched alternative might involve recycling wastes as compost into enclosed apple nurseries to potable hotbeds.

The dwelling of the Yura provides adequate protection from night frosts, rain and wind. Infestation by the Mal de Chagas insect vectors is an unrecognized problem. Solutions could include:

- a) replacement of thatch with a nonorganic roofing material.
- b) lime stuccoing of interior walls, or
- c) a simple insecticide - a "roach motel" which would attract the vinchuca.

The attempt to "modernize" one's house by replacing the traditional thatch roof with a metal sheet roof (calamina) in fact degenerates the interior climate of a house, making it colder at night and hotter in the day. This is an extremely widespread architectural innovation in Bolivia, prized as a status symbol and for better protection from rain. It is unlikely that Yura or many other highland people would be interested in solar panel roofs which can produce interior heating and hot water: they are an outdoor people who spend little time indoors. However, an alternative to the semidysfunctional calamina roof which protect dwellings and stored materials better than the traditional thatch might be sought. Since calamina is already a consumer item laden with a mystique of prestige, alternative material (perhaps hard plastic lined with styrofoam) could be similarly priced.

Health problems besiege the Yura and their animals. Throughout this discussion, the need for providing the Yura with information about the relationships between the diseases they experience and some of the causal agents has been identified. What is needed more than an "appropriate technology" is an appropriate attitude on the part of health professionals charged with delivering rural health services in Bolivia. The specific problems which the people of Yura face were discussed above.

Again, the mechanism of providing information, demonstrating new techniques and making goods and services (in this case, medicines and the professional services of human and animal health workers) available at the culturally defined points of congregation can be asserted. Preventative medicine can be taught, as easily as the proper care of apple trees and the use of solar cookers, in special booths set up at the festivals where and when Yura gather. At these introductory events, extension workers can make appointments with the leaders and elders of the dispersed ranchos to give further courses, demonstrations or offer special services (vaccinations, veterinary services) in the localities.

This method is recommended as a general approach to the dispersed rural people of Bolivia. In the case of Yura and other ayllu-organized groups, the absolute dispersion of these populations on the land creates a constraint for traditionally conceived adult education, agricultural extension, and provision of medical services. But these people are not so geographically dispersed 365 days a year. On those other days, they can found together in large numbers, ready to entertain and to be en-

tertained by numbers, ready to entertain and to be entertained by the introduction of new ideas, new technologies and new resources, as they enjoy festivities at their ritual centers.

In the case of those dispersed rural groups which are not organized around maximal unit and ayllu capitals, the most typical maximal point of their congregation together is more often the market town or rural marketplace. The regional market days when rural residents come together are well known to every regional resident. It's Saturday for the Cancha de la ciudad de Cochabamba and Cliza on Sunday, etc. In Betanzos, a Potosi town where the Agricultural Extension is active, it can be favorably reported that their office, where campesinos set out their produce for sale, was observed to be open and actively attending clients on a Sunday market day. By contrast, the Rural Electrification office which faces the Betanzos cancha, was closed at the same opportune moment.

The setting up of booths at weekly markets and at important local and regional festival events was used with some success by the Servicio Ecuatoriano —a volunteer organization modeled on the U.S. Peace Corps at the suggestion of an anthropologist. This point of introduction for all appropriate technologies is itself a culturally appropriate methodology if not technology.

The Socio Political Constraints to Technological and Social Change

The researchers are of the opinion that the system of ayllu offices represents the best starting-point for gradual innovation of technology or organizational forms in Yura. The Yuras have shown little interest in the creation of new groupings such as sindicatos campesinos. Even the Juntas Escolares do not function well. The traditional authority roles continue to thrive and their characteristics provide what could be democratic and egalitarian "board" for mobilizing the population behind certain kinds of changes. It goes without saying, of course, that a great deal of groundwork would have to be done and the changes well conceived before the ayllu officers (carguyojs) would be convinced of their necessity and would be willing to commit themselves. Technological changes would have to respond to the priorities of the Yuras. Successful changes could not be imposed from the outside. At this point, technological changes are probably not as urgent as other kinds of re-orientations which would require little new technology, such as the availability of certain basic public services.

A problem that arises in any discussion of change in Yura, even change supported by the indigenous authorities, is role of the vecinos. If they are included in a project, they would expect to be in charge of it to the exclusion of the campesinos. If they were left out, they could potentially denounce any program as an attempt to cause the campesinos to rise up against them. Since some of the vecinos have friends and relatives that are active in politics at the national level, plans would have to be formulated to deal with such an eventuality as pressures from people in positions of power. Regardless of the changes brought about after the 1952 Revolution, the wide gap between the urban

mentality and the realities of Andean campesinos has not been closed. For all the respect granted the shrine of Tiwanaku and the memory of Tupaj Katari, Bolivians in the cities can conceive of no other policy towards indigenous peoples except for assimilation to the urban world view. For the most part, urban Bolivians are uneasy about campesinos attempting to change the institutional structures of the countryside. Up to now, only projects that have the backing at some level of the Church have been able to work relatively unhindered for structural changes in the countryside of a more progressive nature. This may change with the installation of the new civilian government, but one should not be overly optimistic.

Projects that would introduce innovations in Yura, then, should ideally accommodate input from the campesinos themselves. Projects should contain a considerable element of education and public relations, both to convince the campesinos in their own language of the viability of the proposed changes, and to deal with potential objections on the part of the vecinos. Finally, any proposed project should be designed around the normal activities of the Yuras, including the fiesta cycle and the continued pattern of labor migration. Small scale projects centered in several key hamlets rather than in the central capital of Yura are the most likely to be successful.

How to Find an Ayllu

The sociopolitical organization described above is in its detail unique to Yura. However, ayllu organization which incorporates many dispersed hamlets, villages and isolated households into a coherent named unit with a defined capital is more widespread in Bolivia. Likewise the system of hierarchial levels of authorities is more widespread.

Cantones which are most similar to Yura in sociopolitical organization are Cayza, Turupalca, and Tomave.

Other areas in Bolivia where the ayllu principle of organizing dispersed populations and the hierarchial authority system can be found include the following:

Norte de Potosí: Laymis, Pocotas, Machas, Ravelo or
Murumuru and K'ultas

Cotagaita in the Far South of Potosí; Calcha

Carangas on the Oruro altiplano

Condos

Waris

Lipes

Authorities

In each canton where the ayllu organization prevails, THE SPECIFIC TITLES OF THE HIERARCHIAL AUTHORITIES WILL HAVE TO BE DISCOVERED. Terminology varies locally. For example, the consensually selected head of each major ayllu in Yura is known as a kuraka or Tata Mallku (Father Condor). In some areas, the maximal authority title is mallku; in others, jilaqata — which in Yura is the title for an authority of minor ayllu rank appointed by the kuraka — is the term used for the maximal authority.

One variation is the interpenetration of the cantonal authority system with that of the ayllus. The office of mallku (= kuraka) has disappeared in Ayllu K'ultas of Canton Cruce K'ulta. The maximal ayllu authority has become the corregidor, a post which is occupied by a campesino in a postAgrarian Reform situation. The present corregidor of K'ultas is a young, unmarried man who has not taken responsibility for major festivals, thus he is "out of character" as an ayllu authority and his power derives from the sub-prefect who appointed him. Alcalde majoris a single post which rotates among the five ayllu alcaldes. There are also five caciques, one for each ayllu, who perform the functions assigned to the jilaqata in the Yura system.

Sindicato organization has replaced the system of ayllu authorities in some areas. Sindicato organization is strongest in areas most heavily affected by Agrarian Reform. These areas include most of Cochabamba, the communities around Lake Titicaca and to a lesser degree, Chuquisaca.

In the former estate of Compi, an Aymara speaking community near Lake Titicaca, the rank term jilaqata was used under the hacienda system for the straw boss who worked for the administration and is used today to designate the head of the free communities. Sindicato organization is also strong (Buechler and Buechler 1971).

In other rural areas where Agrarian Reform was not as important, sindicato organization has also replaced or merged with the traditional ayllu hierarchial authority structure. Among the Kallawayas in Charasani, there was little influence from the hacienda system, yet the people of Kata ayllu have embraced the sindicato organizational structure. In this case, the various sindicato leadership positions have been ritualized: that is, their duties include specified festival obligations similar to those of the alcaldes and jilaqatas of Yura (cf. Bastien 1978).

Among the Machas of North Potosi, the ayllus which are centered in the puna (high pasture) areas have maintained their traditional authorities, but in the valley areas where haciendas were interspersed in resource areas used by other Machas, the communities have also embraced sindicato organization (Personal communication, Tristan Platt).

Other areas which can be included are most of western highland Bolivia (Altiplano and high valleys) in the departments of La Paz, Oruro and Potosi; some areas further north on the Altiplano in La Paz Department, and Ayopayo and Tapacari in Cochabamba.

Areas definitely excluded from the sphere of ayllu sociopolitical organization would be Tarija, eastern Chuquisaca, Camargo, most of the Cochabamba valley, Santa Cruz, Bene and Pando.

Ayllu organization is not exclusive to Quechua speakers. Aymara speakers are also organized in a similar manner in the designated areas. North of the Salar de Uyuni in the Altiplano, groups tend to speak Aymara and to the south, Quechua; in the valleys running east and northeast from the Altiplano, there is a mixture of Aymara and Quechua speaking groups.

As in Yura, in the areas where the ayllu system occurs, the maximal unit may also be the canton and the principal place where members of all subdivisions congregate to join together in rituals and to maintain their social ties is also likely to be the capital of a canton. Historically, the canton capitals frequently coincided with the reducciones founded by the colonial regime. Colonial doctrinas (a parish unit) tended to be established as cantones in the Republican era. Except in areas where there has been a post-1952 fragmentation of the old Republican cantones into several cantones (cf. Buechler 1968), the canton capitals of the Bolivian altiplano and high valleys of the Cordillera Central in the areas specified are likely to be the capital and an important ritual center of the maximal ayllu.

Cantones where ayllus flourish may also be distinguished by their stability as a geopolitical unit. The canton in other areas of Bolivia is a focal point for status aspirations. After Agrarian Reform, "both free communities and ex-haciendas are vying for the position of canton capital." In the period after Agrarian Reform,

"both free communities and ex-haciendas are vying for the position of canton capital. ...A common belief is that if one "recreates" canton capital in miniature, complete with a central plaza surrounded by two-storey houses, a church, a town hall, a weekly market, a few stores, telegraph connection, and perhaps a major school, one has the indisputable right to the honor of being named a capital. ...If a newly established village acts as a nodal point for two or more systems: education, marketing and/or peasant syndicates, it may gain sufficient power to assert itself as canton capital."

(Buechler 1968:50-51)

In general, the ayllu organization principle is found where tierras de origen exist, in those Aymara and Quechua speaking high altitude areas where the hacienda system was less prevalent. THE PRECISE BOUNDARIES OF THE AYLLU ORGANIZATION WILL ALSO HAVE TO BE DISCOVERED LOCALLY TO IDENTIFY KEY LOCAL GROUPS. The education promotor Donato AymaRojas of INDICEP has published a preliminary map and ayllu distribution by community, province and number per title of the ayllu authorities for Oruru Department (1977). The work of the anthropologist Javier Albo (1972) in Jesús de Machaca has revealed the intricate relationships between the distribution of hierarchially organized in symbolic and geographical space. As tierras de origen are registered in the name of the ayllu collectivities, a critical mapping of the social spatial organization of Bolivian traditional communities will emerge.



HUAYTU: A NATURAL COLONIZACION COMMUNITY IN SANTA CRUZ, BOLIVIA.

HUAYTU

INTRODUCTIONSite and Situation

Huaytu is a national colonization community which covers an area of approximately 60 km² east of the Surutú river in Ichilo province Department of Santa Cruz.

The colony is strung along 8 km on an improved dirt road which connects at Buena Vista to a highway running west from Montero to Yapacani, the largest of the three national colonies in the Surutu River drainage. The incipient urban center (radio urbano) of Huaytu lies 15 km from the provincial capital of Buena Vista and about 100 by road from the departmental capital, the city of Santa Cruz. A colectivo (small bus) and an open truck serve Huaytu daily during the dry season, leaving the colony in the early morning for Montero and returning from the regional market town in the early afternoon. Both charge a passenger \$b 15 to Montero. There are at least 10 trucks owned by colonists ferrying sugarcane out daily during the safra, and daily up to 30 "madereros," two (open bed semis) from Huaytu, haul huge logs through the colony during the dry season. During the rainy season access becomes capricious: the road into Huaytu crosses two tributaries of the Surutú with crest waters become impassible. The road has recently been improved and bridges are under construction.

The lands of the colony itself are located on a wide (3-4 km) slope between the Ucurutú hills to the east and the Surutú river at between 350-450 meters above sea level. West of the Surutú where many of the colonists have secondary lands, foothills rise sharply to the 1000 + m. Serrania Mataracu range.

The Tropical Forest Environment

Huaytu lies in the broad region in Santa Cruz classified by the Holdridge system as wet tropical forest (bh TE). Much of the colony's landbase is presently in barbacho, though this second growth of the tropical forest is also impressive. At the eastern edges of the colony, in areas of sharp gulleys, and in the surrounding hills is the monte alto: the unmitigated Eastern Bolivian tropical forest in full florescence. The Serrania across the Surutú is the focus of intense lumbering activity. The forest cover is thick, except near the river where there is a natural seasonal pasture in a flood zone. The area is watered by several streams and tributary rivers (quebradas).

In the proliferation of species supported by the tropical forest, the colonists have found friends and enemies. A number of wild tropical forest fruit bearing trees are recognized and protected so their fruit may be gathered seasonally. A wild tuber qualusa, is gathered as is the remaining quinine bark and other medicinal plants. Hunting of deer, large rodents, pecarries and other animals and fishing are important. The enemies for the colonists include the snakes, which

molest even the cleared hardpan areas around houses and abound in cleared fields; the great number of bichos (parasites) which infest colonists' innards and skin, and critically, the Anopheles mosquito. Malaria still plagues the colony. Weeds are an enemy attacked with machetes and shovels.

Settlement Pattern and Basic Infrastructure

Huaytu is a line community. The Army laid Huaytu out into 180 lotes each 100 meters wide facing the road with matacu palm and tabique construction houses spaced opposite each other every hundred meters. Although lote ownership has been consolidated by some colonists reducing the number of households who own at least one lote to 123 and several households may be grouped on a single lote, the march of houses along the road remains the basic settlement pattern.

A lote was the nucleus of operations during the house and road construction and was reserved as a town center in the original colonization plan. Nothing remains there except one of the two town cemeteries. A radio urbano has been designated in the middle of a colony where a school (the Nucleo Campesino Escolar Huaytu), a sanitary post, Catholic and Evangelist church, Club de Madres depository, several stores and a pool hall are located. Part of the lotes fronting the road in the area designated as the radio urbano was expropriated. Housesites of less than 100 sq. meters are being sold at \$b 400. Twenty-nine houses have been built there, a total of 60 urban housesites have been reserved. Although plans have been laid for an urban street grid, market and plaza, the "plaza" is still being used by its ex-owner as a pasture and only housesites facing the road have houses.

The colony was originally laid out in 8 sections, but at present the colony is divided into three: la Primera, la Segunda y la Tercera. The radio urbano already described is in the Segunda. Lote consolidation is more marked in the Primera where a broad area encompassing lands still owned by the Estancia Huaytu ranchers and consolidated lotes are used as pastures. There is a building marked Sede Social 16 de mayo 1er Sección which was originally built as a private school by the people of La Primera, now rented out. One of the three soccer fields of Huaytu lies behind this building.

The Tercera has a number of pulquerias bars and, as though in protest, a 7th Day Adventist church is being built in the sector. One brickworks is near the bridge recognized as the border of La Segunda and La Tercera and another is setting up shop in the Primera. A molina where rice is husked and corn ground is located in the Tercera.

Population statistics from Huaytu were not located. How many people there are depends on whom is counted. There are an estimated

LIST II- 1 (Huaytu, Santa Cruz)

ANIMALSRODENTIA

<u>Local names</u>	<u>English</u>	<u>Latin</u>
Capiguara	Capibara	Hydrochoerus Hydrochæris
Jochi Pintado	Spotted Paca	Cuniculus paca
Peji	Agouti?	Euphractus sexcinctus (Quirquincho de Seis Bandas?)
		or Dasyprocta sp.? (Jochi collarado)? Dasyprocta punctata, dasyprocta azaree Dasyprocta aguti

PECCARIES — ARTIODACTILA, TAYASSUIDAE

Puerco de tropa (or Chancho)	White lipped Peccary	Tayassu Albirostris (puareoespinæ Hystrus punctatz)
Puerco espina		
Taitetú	Collared Peccary	Tayassu tajacu
<u>Taitetusa</u>		A black peccary

EDENTATA

Kirikincho	ten armadillo	Dasybus
Quirquinco?		
Churetchi or tintincho (Quechoa)	armadillo	
tatu	anteater	

CANIDAE

Zorro	Crab eating wild dog	Cerdo cyn Thous (lowland savannahs)
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PROCYONIDAE

Lobo	a skunk	potus flavus
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FELIDAE

Tigre	jaguar	Panthera onca
Gato pintado	?	?
Gato montes		
Qitu (?)	Geoffrey's cat	Felis geoffrevi
Juali	?	?

ARTIODACTILA, CERVIDAE

Urina	Brown Brocket deer	Mazana guazobira
Guazo	Red Brocket deer	Mazana rufa or americana

NunleysCEBIDAE

Marimona	Spider Monkey	Atales paniscus
Oso	a monkey	Cebus paraguayanus
Mono michi	nocturnal monkey	Cebus sp.?

PERISSODACTYLA

Anta	Brayilian tapir	Tayassu Albirostris river plain dwelling tapir
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LIST II-2 (Huaytu, Santa Cruz)

SNAKES

<u>Local name</u>	<u>Identification</u>	<u>Characteristics</u>
Casabel	Rattlesnake Crotalus sp.	no rattle
Cascabel puó	Rattlesnake Crotalus durssus terrificus	
Sicuri	Eunectes marinus Anaconda	earth colored with a high bite
Yoperojobobos Hasayecito		fer de lance?
Sirpiente pitón		
Sirpiente del agua		
Tirare		
Mazo		
Boyé	Boa constrictor	
Vivera Coral	Coral snake Microrus annellatus bolivianus	
Vivera Verde		common, harmless thin light green snake

156 households with an average number of 5+ coresident relatives yielding an estimated 760 persons. In addition, there are laborers, a population which fluctuates in permanency and size between about 200 and 1000; about twenty persons who are resident health, education or community development workers and their families and a number of persons who are part-time residents. In sum, the population of Huaytu can be estimated at about 1000.

Density in the area of the colony is therefore high: 16/hectare. and residentially concentrated in a thin 1.6 hectare strip.

SOCIAL ORGANIZATION

Brief History

Huaytu will celebrate a Silver Anniversary in 1980; it was inaugurated as a national colonization community on May 16th, 1956. The Bolivian Army had worked between 1955 and 1957 to build its road, build starter houses, sketch the basic limits and recruit colonists from the highlands. The land base of Huaytu was nationalized in 1955 from three cattle ranches, Tacu, Huaytu and Amoro, under the provisions of the 1952 Agrarian Reform law. Several of the original colonists were actually Agrarian Reform beneficiaries who had worked on the estancias as iniquilinos or pastereros. One of them, now age 85, recalled that when she came to work on Estancia Huaytu about 1912, there were only three houses and 20 inhabitants; by the early 1940's the number had grown to 70. The pasture lands of the cattle ranches were developed by contractors. One of the most aggressive was a woman from Santa Barbara who brought in crews of "Llaneros" to cut, burn, clean (basuriar) then seed pastures. She wielded a machete and axe along with her men and was paid by the hectare for the pastures they created out of the tropical forest. Pastures were then maintained by resident pastaros and the cattle tended by vaqueros who were allowed to plant 3- 4 hectare plots for subsistence of their households. Each of the three estancias had about 70 residents. The iniquilinos were those who rented additional land from the estates, or would perform supervisory tasks as estancias "capatazes."

Six companies of soldiers came to build Huaytu; with their cabos, sargentos, tenientes and four captains who are remembered by name: Balcazar, Ramira, Valverde and Rios. They built themselves a cuartel, a chapel, the officers quarters and under the direction of the former estancia capataz, built "matacus" for each settler family. They offered colonizers a lote, reputedly 50 hectares in size, housing, tools, food, free medical attention by an Army physician and sanitarios (paramedics), and a chappada (picnic) or an asado (roast dinner) on Sundays.

The problem the Army faced was recruiting colonists. As one settler who predated the arrival of the army explained,

"No habia a quien traer. Es yungas ya. Muy apegado a los cerros estaban." (There was no one to bring. This is the hotlands. (People) were stuck in the mountains.)

Highlanders were reluctant to move into the lowland malarial zone; it was an era before the swell of seasonal wage migration to the sugar and cotton fields of Santa Cruz familiarized highlanders with and acclimatized them to the llanos.

Col. Rios has a particular place in Huaytu history. He was frustrated at the small number of persons who were accepting the offer to take the opportunity to colonize Huaytu publicized at local Agrarian Reform offices in Cochabamba and elsewhere. He went to Tupiza, Potosi himself to recruit colonists personally house to house. Although few of the original colonists he recruited from Tupiza remain in Huaytu, their settling in Huaytu promoted the virtual annexing of Huaytu as a part of several southern Potosi valley communities.

After two years work, the Army contingent moved on to build Yapacani. The first five years of the colony were the most difficult. Many colonists from the highlands died or returned. A woman from Villazon, Potosi who had been working as an agricultural laborer with her husband in Tupiza when Col. Rios appeared to recruit colonists explained the reason why so many other Potosinos had left:

"No se acostumbró pues. Se incho los pies, tenían mal de ojo, bichos y esta bora bora que se infecta el piel. Se murieron muchos por el paludismo."
(Just never got used to it. Their feet swelled up, they got an eye sickness, parasites and the bora bora skin disease. Many died of malaria.)

In the mid-1960's Cruceño national colonies of Huaytu Yapacani, Cuatro Hititos, Aroma and Carranda were developed under contract by the Corporación de Fomento Boliviano. A resident agronomist was stationed in Huaytu for three years and medical services were provided to the colony. A sanitary post was built, and has been staffed by a sanitario or nurse ever since.

A new influx of colonists began in the early 1970's. The developing cotton plantations of Santa Cruz found they could draw from the pool of seasonal migrant workers who came to cut cane. In a four year period until large scale cotton production was mechanized, individual cotton empresas recruited throughout the highlands, luring laborers with open job announcements on local highland radio stations. Allyn Sternman has noted that whereas men cut cane, anyone can pick cotton so that whole families migrated together. An unusual aspect of seasonal wage migration is that certain migrants remain in the area after the seasonal demand slackens to seek other work. Both the

absolute increase in the numbers of seasonal workers coming into Santa Cruz and the composition of the labor force resulted in an increase of highlanders seeking wage labor opportunities and land, often purchased with those wages.

The Population

Cultural Groups

The people of Huaytu are culturally heterogeneous. There are two major groups: people from the "interior" (gente del interior) and the "cruceños": people born in Santa Cruz department and descended from populations long resident there. The cruceños use the outgroup term "colla" for the highlanders. The highlanders use the outgroup term camba for the traditional inhabitants of the llanos. Within their group, the highlanders are more likely to refer to each other as "paisanos" (neighbors from a place of origin). The cruceños call themselves and are often referred to as "Orientales."

Within these major groupings there is further heterogeneity. The largest group of Colla are Quechua speakers from Tupiza and other provinces in southern Potosi. Smaller numbers of families are from the departments of La Paz, Cochabamba, Oruru, and Chuquisaca and other parts of Potosi.

There are fewer Orientales. Several families have a long history in the Buena Vista area, but this common place of origin is transacted by affiliation with two distinct cultural backgrounds: Hispanic and Chuquitano.

Still other Huaytu Cruceños are members of the Chuquitano, and Guarayo ethnolinguistic groups who have migrated into the area.

In a sampling of the birthplaces of the male and female members of 90 couples, (N 95 men; 96 women, one woman having remarried), the heterogeneity of the community was dramatized. The results are given in Chart III-1.

A culture is a whole lifestyle. The cultural differences among the Huaytu colonists affect all aspects of the life of the community, not only determining some of the social and political groupings and which language is used, but also details such as how maize is cultivated. There will be many references to distinct production practices and technologies confined to one or the other of the wider groups in the second part of the study. It is worthwhile to survey some of the differences in background of the various groups, and their attitudes toward each other.

CHART III - 1

BIRTHPLACES OF MARRIED ADULTS

	N	MEN	WOMEN
		%	%
Potosi Department (total)	54		41
Province of Nor Chincas			
Cotagaita	12		3
Estarca	3		4
Laitapi	2		2
Province of Sur Chincas			
Tupiza	8		11
Province of Modesto Omiste			
Villazon	1		2
Province of Daniel Campos	1		-
Towns not identified by			
Province in Potosi			
Palo Mayo	1		-
Unspecified	26		19
Santa Cruz Department (total)	16		15
Buena Vista	6		4
San Isidro	1		1
San Asuncion } 2			-
San Ignacio } 3 Guarayos	5		2
Cordillera } 2			-
Concepción } 4			1
Buena Vista area } 2			2
City of Santa Cruz	-		1
Unspecified "Orientales"			
/Crucenos	1		4
Cochabamba Department	12		13
La Paz Department	6		7
Ingavi	1		1
Unspecified	5		6

	MEN		WOMEN	
	N	%	N	%
Chuquisaca Department		5		3
Sucre	4		1	
Monteagudo	-		1	
Unspecified	1		1	
"Del Interior" Dept. unspecified				
Argentina	1		1	2
Unknown	-		-	12
	96			95

* Includes the deceased and each couple in joint and stem households

CHART III-2

Endogamy/Exogamy in Marriage Patterns

PARTNERS FROM SAME REGION

COLLAS	N	%	N	%
Husband and wife both born in the same department				
I.e. both Potosinos, Pazenos of Cochabambinos	50			62.5%
Husband and Wife both born in different departments				
"del interior" i.e. Potosi- Cochabamba	12		15	%
CAMBEAS				
Husband and Wife both born in Department of Santa Cruz	12		15	%
PARTNERS FROM SAME REGION				77.5%
COLLA-CAMBA MARRIAGES				
Husband born in "interior", wife an "Oriental"	3		}	7.5%
Aymara-Chuquitana				
Potosino-urban Cruceña				
Chuquisaqueno-Crucena				
Husband born in Santa Cruz, wife born in interior (both Guarayo-Potosina)	2			
International (husband Argentina, wife Cochabamba)	1			
Sub-Total	80			
Incomplete data	16			
Total	96 unions			

Orientales - Traditional Buena Vista Hispanic

Buena Vista was founded as a Jesuit reducción over 300 years ago, bringing together into a single settlement the dispersed aboriginal population and Spanish settlers. The area developed cattle ranches and cacao plantations near the close of the 19th century. A mixed Hispanic/native cultural ecological adaptation emerged among the campesinos. They have spoken Spanish and maintained some base reference household in Buena Vista for generations, but like the Buena Vista Chiquitanos, prefer to practice a slash and burn agriculture at new sites every other year.

The Orientales manifest a great sensitivity to the Tropical Forest Environment as a heritage from the aboriginal elements of their cultural mix and an elaborate courtesy and courtly sense of social ritual, which distinguishes their archaic Spanish heritage.

One Buena Vista traditional Hispanic "Oriental" expressed an outrage at the cultivation techniques of the collas, newcomers. She was upset that some collas sow so many plants that they could not take proper care of each, that they allowed their plants to "suffer and die" because they did not hand water them (chalar) if there was a dry spell in the rainy season, that they ignored to collect the wild fruits growing on their property. She concluded with a value statement:

"La planta es como gente. Necesita cultivo. Necesita saber su dueño que no se pudifica la fruta. La planta es viva!" (A plant is like a person. It needs to be cultivated. It needs to know its owner (have guidance) if its fruit is not to putify. A plant is alive.)

The Orientales were observed to show great interest in individual plants, even inspecting seedling maize, and commenting on different growth rates and leaf compositions. The Orientales of Huaytu as a group grew a wider variety of crops and fruit trees, hunted and fished more often and geared their production more closely to maintain a rich diet for household consumption.

One Oriental gave his version of why Campas are healthier than Collas which contained a summary outgroup stereotype:

"The Colla doesn't eat," he said. "If it's worth money, the colla would rather sell it, trying to buy their truck. The Campa always keeps a clean shirt to dress up to go to town, to a fiesta but the Collas are always dirty, never change even to come to a fiesta, never wash. Collas don't eat fruit. They see it as too valuable to eat. They don't grow vegetables. The Campa wants to eat well, to have his chocolate in the morning and taste the juice of each sweet fruit."

The Orientales practice a more intensive form of agriculture geared to the maintenance of a variety of permanent cultivations and moving small chagueado plots carved out of the monte alto. Their traditional agriculture is premised on a low population density, on great extents of virgin tropical forest. Their traditional adaptation includes market orientation. The Buena Vista Hispanic "Orientales" traditionally both hired out their own labor for wages and to gain access to cultivation areas located on lands locked in estancia properties and make sharecropping arrangements with the local Chiquitanos. They were the peasant workers for the estancios patrones, and themselves minor seigneurs before the subordinated ethnic group. With the help of this group, the Hispanic peasants were able to produce for the market to meet those needs they could take from their immediate environment. This tradition remains the strong basic strategy among Huaytu Hispanic/Orientales.

Orientales-Chiquitanos

The Chiquitanos are believed to be the native aboriginal group of this area of Santa Cruz. Their agriculture, house form and many items in their material culture inventory differ little from that of the Hispanic Orientales. They speak their own language, have a greater knowledge of the medicinal and food value of wild plants and many observe native religious rites centered on shamanism.

Chiquitanos figured among the original colonists of Huaytu, as area laborers who were awarded lotes by the Army and as Agrarian Reform beneficiaries. The relatively greater abandonment and subsequent aggrandizement of lotes in La Primera where the old estancia Huaytu and the southern rim of Huaytu where another estancia lay may be attributed in part to the abandonment by the Chiquitano agrarian reform beneficiaries. The Chiquitano traditionally resided in very small ranchos and had a dispersed residential, as well as agricultural, settlement pattern. Their motives for leaving may be attributed to a cultural reaction against the density of the instant colonization or to their usual practice of abandoning lands after a few years use: given their practices, they would have "used" the small lote within four years. Many of the Huaytu Chiquitanos moved on to the colonization area of Carranda when it was opened up, and on again to settle the most remote subsidiary rancho colonies of the Huaytu area: Pozo Azul, Recompensa, Carbones and Agua Blanca which were founded as lumber camps. The Chiquitano preference for chagueado production in monte alto also characterizes many of the Huaytu Orientales, who have moved across the Surutu river to reside in Paulillos or at least occupy chagueados there.

The present Chiquitano residents of Huaytu include both colonists with lotes and landless laborers whose only access to land is through sharecropping.

Orientales-Guarayos

The niche of seasonal laborers who reside in remote ranchos left by the Buena Vista Chiquitano colonization of the quebradas of the

Serrania Mataracu has been filled by another native Santa Cruz group: the Guarayos. The Guarayos' homeland is located in San Ignacio de Velasco, near the border with Brazil, an impossibly expensive plane-trip away. Guarayos were brought as indentured enganchos (a semi-slave condition) to the emerging city of Santa Cruz and Montero area beginning a half century ago.

One Guaraya resident of Huaytu described how she had been captured by a labor contractor and "conceded" to his wife. While she was a cook "in the power" of her patrona, she met another Guarayo who worked for the labor contractor. Together, they left their patron and found work which lasted for 30 years at the San Aurelio sugar mill. She has never again seen her San Ignacio husband or children.

She settled in Huaytu eight years ago and was given a housesite on the lote of one of the several colonist patrones her family has developed. She, like another Guarayo family of landless laborers of Huaytu, resides in a stem family unit, with her husband, a married son, daughter-in-law and grandchild.

When asked if there were many differences between the way she lived in San Ignacio and how she was living in Huaytu, she replied that the house they had built was the same; the food was the same. But she signalled the important difference:

"A qui todo comprado mismo para comer. Compra monte. Trabaja para comer. En San Ignacio no se vende comida. No ganan plata. Los que no tienen se regalan comida. " (Here everything (must be) bought. They buy the forest. They work to eat. In San Ignacio, food is not sold. They don't earn money. Food is given to those who have none."

The Guarayos' special skill in weaving matacu palm into roof thatch and mats, on which they sleep but which others use as a surface for drying grains and seeds, have aided them in filling the Chuquitano niche as personal retainers to the families with whom they also farm.

More Guarayos are moving into the area, as long term plantation laborers take the opportunity of colonization to return to a tropical forest adaptation. Twelve Guarayo families have settled in the new Ucurutu colonization northeast of Huaytu, and now depend on the seasonal wage labor opportunities provided by the Huaytu colonists as their cash income. No Guarayos in Huaytu own lotes.

Guarayos and Chiquitanos are actually more fluent in Spanish than many of the Quechua- and Aymara-speaking "Colla" colonists of Huaytu. This can be explained by the Chiquitano's and Guarayo's interpersonal interactions with Spanish speakers and by the smaller communities of their language speakers. (Cf. Riester 1976; Hermosa V. 1972)

The Orientales do form a group in Huaytu as they prefer to work with each other and form long-term contractual work and sharecroppers relationships. Orientales avoid the Huaytu cooperatives and producers groups, and are more enmeshed in wider social relationships in the Buena Vista local area than the colonists from the interior.

Collas

A myth surrounds the Colla colonists that they come to make money, buy a truck and leave. The Orientales stereotype the Collas with this motivation; many Collas may believe the myth. Reality varies. There are Collas living in Huaytu who already have their truck and show no signs of leaving; on the contrary, several of them have built up estates and operations which could not be liquidated easily. There are Collas among those colonists who have lived for the longest time in Huaytu (See Migrant Cohorts, below). Many Collas died in Huaytu: in one of the larger families among the early colonists, seven members died one by one and the lone survivor made her way back to the highlands. Many left beaten, without their truck, and accepting whatever price for their holdings. Others have left Huaytu but have stayed in Santa Cruz Department, settling in Montero or Santa Cruz.

The Potosinos

There are two sub-groups of Potosinos, one sub-group of six families the altiplano province of Daniel Campos where high altitude agriculture (potatoes, Quinoa, lisas etc.) on temporales (rain watered fields), llama herding and salt mining are practiced. Two of the six heads of family are brothers and another are neighbors from Daniel Campos who settled together after one of the four had discovered the opportunity of Huaytu. The other two families are from the Uyuni salt flat. The Daniel Campos were vecinos of towns, rather than from an ayllu-organized group.

The majority of the Collas in Huaytu are from the southern provinces of Potosi. Ecologically, their places of origin are similar to Yura: agriculture is in narrow, irrigated valleys. Socially, the far southern valleys differ from Yura. Traditional community organization was destroyed by the massive emigration to Argentina. Members of Southern Potosinos families living in Huaytu include children and one spouse born in Argentina. Agriculture in the southern valleys is geared toward fruit production, including grapes. The greater commercialization of agriculture has stratified the farmers into agricultores and smallholders who employ peons, and the landless or land poor who work as peons.

There were Potosinos among the original colonists of Huaytu, a fact which apparently created a chain reaction. Most southern Potosinos are fill-in colonists, who replaced those who left, buying up their lotes, and who participated heavily in the cooperatives as vehicles to land access.

The migration from Southern Potosi has not abated. New families have established themselves in the last ten years. One more recent

migrant from Tupiza poured out his success story:

He came from Tupiza at the age of 13, which is not an atypical age for the first migrant labor experience of the highlanders. He came to Santa Cruz to work the safra (sugar canes) but his patron (employer) called him an "ayudante" and wanted him to cook, which he considers unmanly work. His patron bought him new clothes rather than paying him a salary. Outraged, he fled to Huaytu, where he knew he would find paisanos from Tupiza. They immediately offered him a job: room, board and half hectare of the rice chagueado which he would help prepare as his first task. He sold his harvest, and bought another half hectare, continuing to work for field shares until he went away to serve his military obligation.

After his military service, he returned to Tupiza, where he became reacquainted with a young woman he had met in Huaytu when her family was working there seasonally. Eight years ago, they decided to return to Huaytu. Because his land lay outside the colony, they bought an "urban" housesite where they built a house and established a store. The store particularly caters to Colla tastes, offering potatoes, onions, and rocotos as well as the usual beer, cigarettes, kerosene, sugar, etc. He purchased 50 hectares in "La Banda" and is working a total of 13 hectares, 5 in La Primera and the rest in La Banda. He employs two resident laborers, one from Cochabamba, one from Tarija and maintains three dependents: two minor children and his father-in-law. He is 26, his wife 22. He concluded his story by explaining that Tupiza is a single irrigated valley which has good fruits, but which is very narrow. and by declaring that the "Oriente is the expansion of Bolivia."

Cochabambinos

"En el tiempo de Paz Estenssoro ya se extendio la familia de paisanos collas por todingas partes."
(In the time of Paz Estenssoro then the family of the Collas extended itself to all parts.)"

The opportunity to colonize Huaytu was particularly publicized in Agrarian Reform offices in Cochabamba, at the time an important political base of the governing MNR party. In the mid-sixties, Cochabamba, rather than Potosi, was the majority place of origin for Huaytu Colla colonists. At present the Cochabambinos are a minority, and many of them have come in since 1970.

Reconstructing the Cochabambinos presence in Huaytu from discussions of individual cases, it appears that it was the Cochabambinos who experienced the extremes of the colonist fate. Great numbers of the original 180 were Cochabambinos and this group suffered the heaviest death rate. Yet between the mid-sixties and early seventies, it was the Cochabambinos among the Collas who rose from the status of colonist to the status of commerciante, with or without a truck.

Montero and the city of Santa Cruz can be considered as part of the phenomenon of "new towns" which has been detailed for other areas

of Bolivia. (See Preston 1972; Rural Urban Transformation in Bolivia, Barnes de Marschall 1970) These are alternative commercial centers which channel the produce and commerce of campesinos in areas where Agrarian Reform made widespread structural changes in the land tenure and agrarian production system. In the "new towns" upward mobility was accommodated; vestiges of the patronal channels of debt "marketing" in the old commercial centers could be avoided. From the perspective of Huaytu, it was the Cochabambinos—a group which are famous for their open markets, "chola" market women and general orientation to commerce, no matter how "petty capitalist" —who personned the rise of this phenomenon in the national colonies. Huaytu ex-colono Cochabambinos now have stores or stalls in Montero; a smaller number are settled in Santa Cruz and act as market intermediaries— particularly as rice dealers. One Potosino in La Tercera has the most splendid mango orchard in Huaytu. Only he can commercialize his mangoes, which are so common in Santa Cruz that they have no value, because at the moment the mangoes ripen each year, a Cochabambino appears to buy them and to truck them away. Colonist farmers face constraints of time and resources to commercialize their produce in a sophisticated manner. In trying to make money from the production of their limited land base, the historic Cochabambinos explored commercial opportunities fully. They may have been given an early start in far-flung marketing activities by the food customs of the Colla colonists. The two-way exchange of potatoes to feed the Colla colonists for tropical products was logical, profitable and continues to underlie the regional small scale commerce. The heritage of the Cochabambinos is in the links of Huaytu to larger markets.

Aymaras

Aymara speakers from La Paz were settled among the original colonists, were joined by others and have proliferated—one mark of successful adaptation. The Aymaras are from communities of origin in the altiplano situated both near Lake Titicaca and inland. Part of their success can be attributed to unique orientations among the Aymaras who came. One family had converted to Seventh Day Adventism before colonizing Huaytu and through this religious affiliation, had access to special educational opportunities and to the mutual aid of their "hermanos" (Church brethren). Another family included a paramedic trained practicing in a mine in the 1930's who combined this training with Aymara folk medicine. Not by accident has this family taken on a Chuquitano son-in-law: Chuquitunos are the local folk medical practitioner.

Although Collas from other areas return occasionally to their place of origin, the Aymaras have routine annual returns, and go to the if they are ill. The Aymara families maintain reference households and landrights in their place of origin. Of all the Collas, their colonization Huaytu most closely resembles the ancient Andean strategy of occupying an "island" in a vertical archipelago of ecological zones, together with representatives of other base homeland communities. (See Murra 1965.)

Other Collas

The colonists from Chuquisaca, Tarija, Oruru, and those from La Paz who are not Aymara, each represent particular individual cases; one came as a soldier to Huaytu; another heard about Huaytu while working in Tupiza; several first came to the colony as migration laborers. Far less than the block Colla subgroups do they display distinct cultural patterns.

Individual physiological and cultural adaptation of Collas to the llanos has clearly been an important factor in their success or attrition as colonists. Those who have made the adaptation are in a sense, no longer Collas. A man from Chuquisaca who has been in Huaytu since its founding summed up their situation,

Nosotros del interior hemos tenidos problemas a qui de familiarizarse allano. Los que quedan ya no se acostubran afuera. La familia no se acostubran al frio, a la (falta de) movilidad, al terreno accidentado. Ya queda uno como huerfano en su tierra natal.

"Those of us from the interior have had our problems familiarizing ourselves with the lowlands. Those who stayed here no longer feel comfortable away from here. One's family cannot accept the cold, the lack of transportation, the rough terrain (of the highlands). One becomes like an orphan in the land of one's birth."

The Laborers

The resident laborers attached to households, both the single men and the families, are largely highlanders. The Guarayos and Chuquitano live in separate households though each has a defined set of colonist patrones.

Sources of seasonal laborers at the rice harvest peak are diverse. Different colonists have adopted distinct strategies to compete.

The Orientales contract with local Buena Vista area laborers paying in advance as soon as their fields are sown and thus their labor requirements can be estimated. One Oriental colonist stated he prefers not to hire Collas because they do not like the food he serves. Yet before regional cultural peers in his local Buena Vista work group, the food he serves (chocolate,, coffee, fancy horneados, rice, meat and no potatoes) helps him attract workers.

Colonists from the highlands who maintain social ties in their community of origin may draw upon cousins and neighbors as seasonal laborers. Highlanders who have worked for Huaytu farmers in the past may spontaneously or contractually reappear at harvest time.

For those who are forced into the open labor market to hire a seasonal labor force because they lack personal ties to a labor supply,

For those who are forced into the open labor market to hire a seasonal labor force because they lack personal ties to a labor supply, there are further alternatives. The low budget alternatives involve laborers from subordinate ethnic groups: the "barbaros," as the colonists call them. Colonists can turn to labor contractors—patrones who "hold in their power" up to a hundred Chuquitanos or Cordilleras (from Ayacuiva or Entrerios). These contractors collect per hectare fees for weeding or harvesting. Colonists can also take a truck to the Brazilian Station in Santa Cruz where the remnant groups of native Tropical Forest peoples have established a camp. Colonists call out their offer and load laborers on the truck. Although the "barbaros" of the Brazilian Station are the least expensive of the directly hired laborers, colonists who have used this alternative complain the "barbaros" eat too much and harvest too slowly: an ideology which in turn justifies their lower daily wage rates.

The high budget alternative is to contract laborers from the Federacion de Campesinos del Norte central headquarters in Montero. This federation is a loosely organized labor exchange where migrant workers can shape up and bunk until they are hired as farmers seeking work crews. The Federation was requiring in 1979 a minimum guaranteed daily wage of b\$ 50 (US \$2) per day plus food and transport. The Federation does not control the situation and has little idea where migrants go once they get on trucks. Migrants shaping up for work both scab the Federation rate by accepting lower day rates or the tarea arrangements which are common in area and negotiate even higher rates, up to \$b 70/day. Laborers available in Montero are reportedly "ajenos de aqui-pecnes no mas": migrant laborers from other areas of Bolivia.

Migration Cohorts

Original colonists

Of the Agrarian reform beneficiaries and other Orientales who received their original lote titles from the Army, eight families remain in Huaytu. In this group, only two of the original 16 adults (man and wife) have died, and two of the families have divided into two households as children grew, married, had children and formed separate households: one on the same lote; another on a purchased lote. One of the original colonists sold his lote into the Tercera to buy in near the old Huaytu estancia where the ex-inquilinos are clustered.

Ten soldiers accepted lotes in the colony at the end of a compulsory military service spent building the Huaytu road and starter houses. Three remain in Huaytu. One died recently and his widow remains. Of the living ex-soldiers in Huaytu, two of the three have been widowed. The other five families left; of the adult colonists from this group, seven of the 20 died in Huaytu. In three cases, widows left after their ex-soldier colonist husbands died.

Eleven of the families brought by the Army from various parts of the country to colonize Huaytu (los traidos) remain. Three of these are composed of a widow and children; one man is a widower who lives with his married son's family. In this group, 18 of the original 22 settlers are alive.

Only these 23 families survive from the original 180, which indicates an attrition rate among the original colonists of 87%. None of the original colonist families which remain are from Cochabamba.

As original settlers and survivors who were founders of Huaytu, this cohort of colonists are among the most committed to the community and figure in its leadership. One of the traidos is president of Sindicato Huaytu; one of the surviving ex-soldiers is the president of the road and bridge committee and was in the founding leadership of one of the cooperatives. Two of the men are leaders in church groups. One of these, an Aymara from La Paz, leads the Adventist group; the other, a Buena Vista Oriental, organized the construction and furnishing of the new Catholic Church and had earlier organized the initial construction of the radio urbano school.

The economic condition of the original colonists today varies. Two of the widows are impoverished. One of the ex-soldiers reports one of the largest land holding of any Huaytu colonist: 90 hectares. The majority of this cohort still reside on their original lote. The Orientales tend to have monte alto reserves and chaqueados in other areas as well, particularly in Santa Barbara, Paullilos or La Banda. The men of this group are recognized as informal leaders of the community and have a deep respect relationship for each other.

Those who bought in before 1970.

The majority of this group are among the most commercially oriented of the Huaytu farmers. The truckowners are in this cohort, as is the owner of the mill and a widow who has the largest herd on dairy cows, grazed on four consolidated lotes in developed pasture. Chuquitano and Guarayo families of landless laborers, however, also fall in this group.

The cohort overlaps with and is dominated by the Quechua-speaking Potosinos: 3/4 of the cohort are from Potosi. They arrived between 20 and 15 years ago, replacing Cochabambinos, buying them out and like these predecessors, orienting production to create a surplus for investment and profit. This sub-cohort also overlaps with the formal membership in two producers' organizations: The Asociacion de caneros and the Cooperative La Chichena.

Some in the group are Cochabambinos. The remainder are those Buena Vista Orientales who bought in shortly after the first colonists left and have been established in Huaytu as long as twenty years.

Newcomers

Colonists are still arriving in Huaytu: more Potosinos, a new wave of Cochabambinos, new Guayayos, and people from more dispersed areas. The newcomers are young couples and if the newcomers have any group coherency, it is as better educated, more dynamic and younger heads of households who are proud of successfully rising through a combination of hard work and luck from the status of laborers to the status of landowners through their work as teenagers and young adults.

The Younger Generation

Huaytu colony has been a community long enough to begin to produce a new generation of adult colonists. One of the ex-iniquilino original colonists' families has representatives of four generations. Among the ex-soldiers and traidos original colonist families in Huaytu, there are several with representatives of three generations: children brought to Huaytu have children of their own. Sons and daughters of families who settled in the 1960's raised in Huaytu are beginning their own families.

The current children of Huaytu are overwhelmingly Huaytu born. Analysis of the students registered at the Huaytu school as of September 1979, ranging in age from 6 to 16, revealed that 78% had been born in Huaytu. Another 9% were children coming to the Huaytu school to complete their basic or intermediate education from one of the subsidiary colonies where their families resided. Their median age was 11. The majority of the remaining 19% of the children had been born in one of the subsidiary colonies or elsewhere in nearby Santa Cruz Department: Buena Vista, Yapacani, Montero, a hacienda, etc. Only thirteen children (6%; N=211) resident in Huaytu and attending school there had been born outside Santa Cruz and among the older students (ages 14-16) in this small group; their younger brothers and sisters had all been born in Huaytu.

This pattern is encouraging and hopeful. It suggests that despite the high rate of attrition in the first years of colonization, a community—which by definition regenerates itself—does exist at Huaytu. People have "dug in." The few young couples raised or born in Huaytu display a strong commitment to the place.

When the children of Huaytu join them as adults the future of the community will be mapped. One of the long-term colonists from Chuquisaca summed this up:

Aqui se queda. Los niños han nacidos aquí. . .
La nueva generación no está dividida. No dicen:
"Soy Cochababino, soy Pazano." Son Huaytu.

Here one stays. The children have been born here.
The new generation is not divided. They don't say —
"I'm a Cochababino...I'm a Pazano." They are Huaytu.

Household Composition

Definition of the Co-resident Household

The co-resident household unit in Huaytu can be defined as a group of people sharing a common kitchen and other living quarters and resources. In Huaytu, the architectural integration of a kitchen with sleeping quarters is extremely rare: estimated at less than 1% and absolutely limited to Collas. Sleeping quarters may be divided into separate rooms under a single roof, wings of a building or separate buildings. It is commensality, the common eating and common preparation of food which defines the basic household unit. In several cases, more than one nuclear family, the male heads of which are related as father and son as brothers, share a lote and resources but maintain separate households: i.e. each family has its own kitchen.

Size of the Huaytu Households

The average size of the Huaytu household is 5.39 related co-residents plus an estimated .4 permanent resident nonrelated laborers: about 6 people. The range in the number of related co-residents discovered in the survey is from a minimum of 2 to a maximum of 20.

CHART

Range of Household Size: Related Co-residents

Number of Relatives Residing Together	% of Household Surveyed
2-3	29%
4-8	65%
9-12	5%
13-20	3%
N-501	<u>100%</u>
93 households	

These range figures do not reflect the size of families, only residents. The majority of the households had absent family members for which the household remained their reference residence. Absent members were predominantly young adult unmarried children. Young men were at the cuartel doing their military service; young women were studying or working in nearby market towns. The age of the heads of households split into two sharp groups: those in their midtwenties and those in their mid-forties. The older children of the latter group were either household heads themselves or absent. The majority of the members in most households were adolescents under age 17 and minor children. Both the younger and older household heads were organized in procreative families, with a ratio of about 2 adults to every 3 legal minors.

Some households had a wife or husband or parents of minor children absent.—off in another colony, staying with other children while they studied in town, or on an extended visit to their community of origin.

Related Coresidents

Five different types of households were discovered in a 93 household survey, and one additional type, was observed. The analytical types classify the kinds of persons related by descent or by marriage who reside together and form a coresidential unit. The important types for Huaytu are the following:

- 1) Nuclear: a man and wife living with at least one of their children. This is the most common. Sixty-three percent of the households surveyed were of this type. Three of these were ~~what can be termed~~ reconstituted nuclear families in which a widow or widower had remarried and the couple resided with the unmarried children or one or more of the former marriages.
- 2) Single parents: a father or a mother living alone with his or her children. Of the surveyed households, 13% were of this type. There were four widowers and one man who had been deserted by his wife living with at least one child and six widows and one deserted wife living with the respective children of each. One widower with six children ranging in age between 6 and 15 was in the process of courting in a visitante relationship one of the widows, who had two children. The reconstitution of single nuclear household was complicated by the distance and wealth of each household. The other single fathers were taking care of their children alone.

The widows had each inherited property. Four of the widows and the women who had been deserted were wealthy enough to hire laborers and three of these single mothers had sons over age 15 who worked their family property. The two other widows were impoverished; though each had a lote, both worked only 2 hectares for household subsistence, renting

land or making sharecropping arrangements to afford to hire laborers.

- 3) Extended types: Generational extended or Stem:representatives of three generations living together. Although 15% of the surveyed households could be analyzed as extended by generation, there were several distinct subtypes. In several of the households, grandparents were residing with grandchildren, and perhaps one of their own younger children, but the parents of the coresident grandchildren were not present. In most of these cases, the parents of the resident grandchildren lived in one of the surrounding colonies, and had sent their children to reside in Huaytu to attend school. In two cases, the parents had returned to the highlands, leaving behind one or more children with a parent's parent.

The migration status of the household affected the domestic power structure of the true stem households, where all three generations were present. Among the recent migrants and the land poor, an elderly widow or widower would be an attached dependent. Among the colonists with a longer history in Huaytu, the grandparent generation would be the clear authority over both unmarried and married coresident children and grandchildren.

Some of the stem households were extended not only lineally but also collaterally, that is, a single grandparent or grandparent couple was residing with more than one of their married children and the grandchildren from these unions. Three households of this type were among the largest in Huaytu, with respectively 12, 16 and 20 coresident kinsmen. Far from being poor households, these were among the richest, and all three households also included resident unrelated laborers.

- 4) Joint: formed by married siblings (brothers and their wives, sisters and the husband of each and children, etc.) The 6% of the surveyed households of this type each differed in exact composition. One household had been formed by a widow, her children, her widowed brother and his children. The others were all of married brothers or sisters and the respective children of each. The largest households of this type were composed of 13 persons—three brothers, the wives of each and the children of one of the couples and 15 persons—a man, his wife, his children, his wife's sister and her children.
- 5) Miscellaneous extended types The remaining 3% of the households were unusual. In one case, a man was splitting his residence between a house in "radio urbano" where two of his children, ages 14 and 8, habitually resided and another house on the family's Cheyo property where his wife and two other of their children resided. This man faced the special problem that he did not have an adult married child to send off to reside on his more remote properties, which is the more common solution.

In another of the unusual cases, a widowed man resided one of his own children and his orphaned brother - a type of single father and joint. Still further extended was the coresidential unit composed of a nuclear family and the children of the wife.

An additional generation graded type was observed which was not included in the 93 household survey. There are at least two independent households composed of elderly people each. They reside near but not within the houses of children, grandchildren, or grandnieces. There is also at least one case of two adolescent brothers residing alone in a Huaytu house while they attend school; their parents and other brothers and sisters live elsewhere.

Household cycle

The results of the household survey present a static impression of household composition in Huaytu. In order to understand all of these types, it is important to understand the basic family/household cycle in Huaytu and the division of labor within households.

The Army colonization project settled lotes and houses on couples. The original colonization project was premised upon the nuclear family and this remains the dominant household type. In the twenty-four years of the colony's history, children of original colonists have reached adulthood, many of the original adult colonists have died and others have left, selling out to newcomers and neighbors. Further, the colonists of Huaytu have expanded their land base into near-by satellite colonies.

There are important advantages to keeping a larger work group together under the situation of pioneer colonization. If a household cannot supply a labor force, labor must be hired. The logic of the joint households and the generationally extended stem households is based on the advantage of having a larger group of coresident males. The families specialized in sugar cane prefer this model because their work area is accessible to transportation. It is not necessary to reside together to work together, however; many of the young adult males who have grown up in Huaytu still work with their fathers or fathers-in-law but have established separate nuclear households. For those families which have lands in the satellite colonies, the strategy of fissioning off an available son or son-in-law to form a household near the land is attractive.

The nature of domestic work is also so time-consuming that unless a woman has a coresident mother or an adolescent daughter, another woman is attached as a peona, (domestic household worker).

There has been a great deal of turnover in Huaytu. For many, Huaytu has been a step in an upward mobility process which has taken them from

landless laborer through a landed colonist status and on to an urban-based occupation especially in commerce as a shopkeeper, rice or other commodity dealer intermediary, or truck owner. Among those who remain in Huaytu, many have not been able to convince their adult children to stay. Their children have moved to the market town of the region, Montero, to Santa Cruz or, especially among those brought down from the highlands as adolescents, back to their birthplace.

Death has played its role. Until the 1970's many of the vacancies in the colony were created as women were widowed and decided to sell out, especially to return to their place of origin or to move to an easier life in the urban centers in a Cruceno urban center. The situation of widows was structurally more difficult before the 1970's. At present, the colony is better established and colonists can compete successfully for a more ample regional supply of laborers. In the present situation, inheriting widows can attach laborers and with the disproportionate ratio of men and women in Huaytu, widows are soon courted. As a case example, one of the reconstituted nuclear families consists of a Potosina widow now married to a former Guarayo laborer.

Non-related coresidents

In the household survey, the presence of resident, full-time laborers was recorded for 20% of the households. This is probably underrepresentative of the actual percentage as this data item was not collected systematically. In the survey, administered to the intermediate students, 45% reported their families have peons: this percentage is close to an estimate from observation.

The number of attached peons vary from one to three in the cases recorded. Again, the maximum is underestimated as there are cases of attached peon families in which both adults and adolescent children all serve.

Arrangements with peons vary. Room, board and sharecropping is the most common arrangement. Single adult male laborers, assured of their board, can sell produce for cash. Skilled laborers also gain a salary (\$b 3,000/mo.-\$150 US maximum). Not all the attached laborers are men; the criada arrangement is made, particularly between families in the more isolated adjoining colonies and Huaytu families so that their daughters may attend school. Some of the long term attached peons are married; their wives serve as domestics and so do not have separate households.

The resident laborers' sleeping quarters were usually in the separate kitchen building or in a separate deposito or porch.

Long term landless laborers living in separate Huaytu households are in a different category. Of the households surveyed, 5% were households of landless laborers, including one Chiquitano and one Guarayo family. There are more in the community. These families have been given

a housesite space on the lands of one of their patrones. In some instances, they are caretakers for absentee landlords such as the old hacendado families. In other cases, they have a particularly close arrangement with one of their patrones which involves sharing a lot as well as sharecropping.

While these families of laborers are not precisely corresident, they are close, subordinate neighbors of a patron family and may share common resources such as a well or a storage outbuilding.

During most of the year for every other adult male Huaytu colonist, there is at least one adult male resident laborer. During the peak demand periods for agricultural labor, the ratio raises to 1:8-10. These seasonal laborers spend most of their time sleeping and eating in the fields where they are working, though when they periodically come into Huaytu, they have the right to eat and sleep around their employers home.

This is also the situation which characterizes a special group of longer term but still seasonal skilled laborers. The lumberjacks spend most of the timbering season up in mountain camps, but stop by their employers' households in between trips from camp to the sawmill. Hired drivers (choferes) are in a similar position during the safra; they eat and sleep at their employers' Huaytu house in between long stints driving cane and waiting in line at the sugar mills (ingenios).

Division of Labor by Sex and Age

Huaytu wives stay close to their homes. Visiting protocol requires that one stand at the barred gate of the fence around houses and call out, "Senora!"—not the name of the male householder. The people of Huaytu explained it was not good to go away and leave the house closed; staying home falls to the wives, unless the household contains a dependent elderly person or an adolescent woman.

The need to keep house attended seems to be an adaptation to the presence of the migrant laborers, particularly during the seasonal influx, there is a degree of anxiety concerning the laborers as unknown persons who will return to unknown places with unknown quantities of goods sacked from colonists' homes.

Few women work the fields, although the Orientales and recently migrated highland women are more likely to participate in the cleaning of burned fields and weeding. Many highland women who are accustomed to performing specified tasks in the cultivation processes of their homeland or who had a history of working as agricultural peonas themselves are idle or alienated in their new situation.

The quehaceres domesticas (housework) under Huaytu conditions are onerous enough to take an average of six person hours a day to

perform the minimal maintenance for a household. Any elaborations, such as the special food processing and preparation especially among the Orientales, or weaving among the highlanders, take extra time. Women are also the storekeepers; their attendance on customers is relegated by strict appointment only to their husband when they have to make trips to markets.

Men express a reluctance to see their wives and daughters "suffer" in the chacos, even taking upon themselves the task of cooking in remote sites for fieldhands so that their womenfolk neither have to come cook themselves, or bring cooked food in. During the peak uses of seasonal labor, women are more responsible for the task of procuring provisions and preparing weekly supplies of foods such as horneados (bread confections) or mote (hominy) which can be easily transported.

Childcare under Huaytu conditions is a struggle to keep young children alive. By freeing women from work in the fields with hired labor, colonists are making a long term investment in labor: the more time women have to care for children, the better are the chances that the household will produce more male workers.

Children are indulged among the Huaytu colonists, evading with laughter and tears the supervision of their older siblings, engaging in hours of both organized play (volleyball, card games) and roaming with their peers. Fathers are affectionate in Huaytu, spending time with their children when they are not in the fields, and staying home with the children if their mother has to be away, rather than relegating the task to older children or neighbors. Parents chastise their children verbally and threaten to give them away to strangers, but the physical punishment is administered by some of the schoolteachers who are consequently unpopular among Huaytu parents. Each household bears the memory of children who have died. The affection which is reaped on infants and toddlers makes their death more painful so care is redoubled on the living children.

At adolescence, the offspring of Huaytu colonists begin closely supervised sex role specific training. Most boys are trained for agricultural work. There are very few specialized craftsmen in Huaytu (two brick-makers, a tailor, two carpenters, a folk medicine practitioner) but the older of each of these specialists has apprenticed a son or grandson. Adolescent women become mother's helpers, fully integrated into all the maintenance domestic work.

School attendance drops off after the basic education is completed. Few sons and daughters are kept in the locally available intermediate prog or sent off to school in Montero or Santa Cruz.

Boys especially, integrated as they are so early into potential income producing activities begin a career of acquiring material goods—a bicycle, clothing, a motorcycle, and eventually, their own household by the age of 20. Premarital sexual activity is neither sanctioned, nor

in an atmosphere of tight supervision of the young women, is there much opportunity for its occurrence. Courtship is very indirect. The suitor of a young woman takes an interest in her brother or father's companionship. She sits silently, rarely addressed, while her suitor pursues his courtship of the men of her household.

This courtship tactic is not irrational, considering the importance of male workgroups in Huaytu. A proper son-in-law is one who can merge his reference male workgroup with that of his in-laws. It is groups of men who work together who perform the labor essential for the colonists' survival, produce household subsistence and income and who quite understandably are the important decision-making body.

Women have the opportunity to influence decisions if those decisions are made in their presence. This is the case if the male work group is coresident. However, many of the important work groups, such as two of the cooperatives, are not coresident. In this case, the women of better organized, more hospitable and more ample households where the men meet to make decisions are party to decisions, but other womenfolk are present with committed plans enforced by the consensus decision of the group. Women are aware of this mechanism and take pains to stock their households with items they can offer male visitors in hospitality, such as beer or cigarettes.

Men have more contexts and precincts available to them where they can lay in casual discussion the grounds for the consensus decisions which work groups must take: the pulquerias, the poolroom, the futbolista games and parties and worksites. Husbands resent the regular meetings of the Club de Madres, and compete with projections of their own male informal group meetings "to drink and talk politics". Women correspondingly display an allegiance of resistance to this unique context for women to gather.

FORMAL COMMUNITY LEVEL INSTITUTIONS

Bolivian Rural Civil Authority Structure

A corregidor appointed by the prefect is the political authority of Huaytu. The current corregidor was appointed last year. Perhaps because he anticipates being replaced by a member of the newly elected governing party and allegedly because he is more interested in his various businesses as a truck and mill owner, he is rarely present and rarely exercise any authority. The prefect and sub-prefect have been reduced to broadcasting him messages (i.e. orders to arrest) over Radio del Norte. The corregidor may consciously decide not to comply, or may never receive the messages.

Politically, Huaytu remains as an annex of the Buena Vista municipality. The alcalde of Buena Vista appoints an agent there. The people

of Huaytu are content with this status in the belief that if they raised their settlement to another status they would incur taxes.

Sindicato Huaytu

The political governing body of Huaytu is its sindicato, which has an elected president and board. The sindicato was originally organized among the colonists as beneficiaries of Agrarian Reform's colonization provisions. Although few of the current colonists are direct beneficiaries, having purchased their land, the ideological purpose of the organization remains "to defend the interests of the colonists."

The sindicato is in fact a democratic political association of all the colonists of Huaytu: its local government. Meetings are held irregularly, when there is a matter to be discussed, a plan to be approved. Vocals of the sindicato announce door to door the time and place of the meetings which are held in the Nucleo Escolar.

Two current dependent committees of the sindicato are the Junta (de) Auxilio Escolar and the Comite Pro Puentes y Camino. Each has an elected president who is responsible for assembling and directing the community's contribution of labor and collecting any assessments due for the building, improvements or maintenance of the school and road and bridges.

Producers groups

There are three active producers' cooperatives and a dormant fourth in Huaytu and an association of sugar cultivators. The production strategies of the two cooperatives are profiled in the second section (See Technology and Production; Agriculture; Cooperatives' Strategies).

Cooperativa La Chichera has ten members at present, having varied since its founding in 1961 between six and twelve members. The cooperative owns a tract of 470 hectares, all in "barbecho." The cooperative successively acquired a tract between the confluence of the Quebrada El Yeso and Q. Huaytu and the Rio Surutu west of the road into Huaytu; a 150 tract of the old Estacia Tacu and a 220 hectare tract across the Surutu in Paulillos. Little land is farmed communally at present and the cooperative must reach a decision this year on what to do with their lands, all of which lie north of the colony.

Cooperativa Huaytu Ltda. has eighteen members. It was organized four years ago by AZAR, a dependency of DESEC. Its land base is its' members lotes rather than a separate, distinct tract. Three years ago the cooperative signed a contract with ARADO, the successor organization to AZAR, for a five year period of mechanized farming.

Cooperativa 10 de Noviembre is in the adjoining colony of Espejitos. This colony is centered some six km. past the last households of the Huaytu

Tercera south, but as it lines a continuation of the Huaytu road, Espejitos is a virtual subsidiary colony. Most of the members reside in Espejitos, but others reside in Huaytu. The president of this cooperative resides in the Huaytu valio urbano and with other members commutes to work fields along the main road and a lumber road south of Huaytu.

The dominant cooperative is Hernan Busch Ltda. It was founded as an association in 1957 and organized as a cooperative in 1959. In 1977, the members of the cooperative voted to disband, but it remains incorporated and the founding leadership retains title to the original land grant: a 1,000+ hectare tract of land which lies on the west bank of the Rio Surutu opposite Huaytu Tercera. Some members reside there near a hamlet called "La Cooperativa." The majority of the members were Huaytu colonists with lotes.

The failure of this cooperative is attributed to the mismanagement if not outright embezzlement of a large loan from the Banco Agricola Boliviano for rice commercialization. According to one member who personally guaranteed the loan, the loan scheme was a "trampa" (baited trap) of one board of directors. Two of these directors are alleged to have embezzled funds from the loan, promptly leaving the community. They are reportedly installed in positions "above the law" as a policeman in Santa Cruz and a public commissioner in the Sucre mayor's office. According to another member's version, the directors used at least \$b 50,000 to purchase a truck, rather than to subsidize the cooperative members so that they could own their rice after the harvest.

In order to pay back the loan, members who had been guarantors had to provide part of the repayment. About the same time the fiscal crisis arose the cooperative had moved to divide the track into individual 50 hectare plots. The 1000+ hectare tract had been farmed in a mixture of communal and individual plots until that point. However, after 19 years, the size of members' individual chacos varied according to the amount of work each had put into clearing and cultivation. The ideal of common ownership had become a fiction. Those more actively farming the cooperative were pushing into common monte alto reserves. Pressure arose to determine limits for individual lotes.

When the membership equity fell into deficit as a result of the mismanagement or embezzlement of the loan, new members were seen as a source of capital for loan repayment. New members joining at the time also received 50 hectare plots. Whatever the ideology of ownership, the division was perceived as a land sale which provided an opportunity for settlers new to Huaytu to have access to land at low prices.

Asociación de Caneros

The association of sugar cane growers is a loosely organized group which shares a quota at the San Aurelio sugar mill south of Santa Cruz. The individual sugar producers who affiliate are given a fixed schedule for harvesting so the association as a whole can meet its 2 truck load a day quota during the safra.

Informal Community Institutions

Club de Madres

The Mothers' Club is a local chapter of the Santa Cruz Unidad Sanidad program. About half the mothers among the colonists are members, who pay a \$b 15/month service charge and \$b 50 per ration for the white flour, rice, vegetable oil, oats and powdered milk. Rations are distributed on Saturday afternoon from a small storehouse and meetings are held at the Catholic church across the road. Food is "sold" to create a capital fund for the club. Funds are to remain untouched for two years after which the club must submit a plan for an incoming producing project. The Huaytu club reported has \$b70,000 on deposit.

The club has been haunted by defections. Its president left the community for personal reasons without rendering an accounting to the club; although a new board was elected, it cannot be approved until the absent prior president closes the books. The mothers of Espejitos (a subsidiary colony south of Huaytu) recently presented a petition to withdraw and form their own club. Many families of Huaytu have disaffiliated because they are aware of the Caretas program's "Centros de Madres y Ninos" which like the Club de Madres distributes food rations for children but which does not charge the \$b 50 contribution.

Into the power vacuum, an educated competent young mother has emerged as the club's delegate and distributor without holding office. Mennonite women volunteers have been working with the club as a point of contact for home economics outreach and of congregation to teach lessons.

Futbol Clubs

Each section has a club. The clubs play each other or neighboring colony or Buena Vista teams on Sunday. The games and the pre-game club parties on Saturday night are the most regular social events in Huaytu and in the absence of a system of religious festivals, the clubs have taken the lead in organizing annual pan-Huaytu celebrations of civil holidays such as Mother's Day or Day of the Indian.

Churches

The Evangelist Church holds services several times a week. Its construction prompted the Catholics to build a chapel and a year later, the Adventists to build. The Catholics are visited by an American missionary priest who holds mass on Saturday evenings. Laymen are trained to conduct prayer services those rainy days when his jeep cannot ford the two rivers.

All of these organizations give expression to the sectionalism which besets Huaytu. Better-off colonist mothers are in the club; poorer mothers are not. The soccer teams incarnate the residential awkward rivalries. The futbol clubs also organize pan-community festivities. This irony can only be understood in terms of the Bolivian cultural mode of expressing rivalries among part communities (whether sections or ayllus) in the context of festivals for the whole community. That Huaytu colonists are divided not only by neighborhood, place of origin, and migrant cohorts but also religious affiliation seems, somehow, typical of the tensions of pioneer settlement.

Contact with Outside Agencies

Mennonite Central Committee

The Mennonite Central Committee has based several volunteers in Huaytu: a resident home economist and animal health specialist, who were succeeded by a "nurse," a "nutritionist," and two male "agronomists" as follow-up workers. One of the agronomists is the regional director of the International Heifer Project whose work requires broad travel. He has introduced heifers to two Huaytu families. The other developed drilling equipment and a simple well based on 6" diameter plastic tubes which run to water table. He charges a small percentage over the cost of materials to drill wells (maximum cost under \$50 for a 12 meter well). A dozen families have installed wells in a year; more have indicated interest.

This QMM volunteer is also involved in the animal traction movement, and has arranged demonstrations of horse-drawn plowing and harrowing in Huaytu, Tercera and Primera. An excursion to the Granja de Capacitación, where experimental animal traction is demonstrated, was also arranged. The basic scheme is to plow with equipment available from the MOC, and to keep land doublecropped in continuous production, rotating a legume, following the (Old Order) Mennonite Colonies and the Japanese colony. The MMC is also interested in introducing horse-drawn threshers for rice cultivation.

It remains to be seen whether this second demonstration project will be as successful as the well project. Plowing is only effective on destumped land. The demonstration project was launched on some of the oldest developed pastures of Huaytu. In the mid-nineteen sixties, a resident CEF agronomist continuously double-cropped three hectares using a form of animal traction with more explicit cultural familiarity -- oxen drawing a modern plow developed for llanos agriculture by the CEF. This early demonstration successfully introduced garden vegetables to Huaytu, but the animal traction model was not imitated despite the availability of both oxen and the especially adapted plow.

Neighbors of the Primera animal traction demonstration area criticized the effectiveness of the plow, pointing out strips of grasses which remained and defending the superiority of their intensive "plowlike" style of garden plot cultivation would pose and shovels. Weeds and grass respread may very well emerge as a critical problem for the recently initiated experiment. The technical solution involves a cropping system which will allow for animal traction weeding between

One problem of extending this technology of production in Huaytu would be internal contradiction regarding pasture use. Unless areas are destumped by other means such as pulling by trucks or tractors, developed pastures are the prime area for installing the proposed cultivation by animal traction. Yet the form of traction will require better pastures to support hard-working horses. Very few colonists families have developed pasture to spare for cultivation, and the vision of a land use pattern of pasture and continuous cropping are as would introduce problems of wind erosion and grass/weeds which are now avoided by the scattered distribution of pastures within permanent fruit crops and forest fallow areas.

SNDC

The Servicio Nacional de Desarrollo de la Comunidad has been involved in two projects in Huaytu: the expansion of its school and a bridge building. In both cases, the SNDC held meetings of the Sindicato Huaytu in which a special committee to direct the community's contribution were designated and a contract prepared by the Servicio was signed by "the community" as represented by those present as witnesses.

In the case of the school committee, the Servicio was reformulating a strong authoritarian by consensus preexisting school committee. The Junta de Auxilio Escolar was an ad-hoc neighborhood committee initially of La Segunda and La Tercera sections which had built the first classrooms and laid the foundation for a larger unit in 1963. Each year, the community had elected a director of this School Assistance Board. Each director had been able to mobilize the community labor and direct contributions in kind of materials for whatever plan of improvement he ordained.

A problem arose in the expansion construction under the SNDC contract: the community contribution was phrased in terms of unskilled labor and cash. Contributions were collected by the Servicio not only from Huaytu but other colonies which have Ciclo Basico primary schools. The logic of the Servicio expansion was to create at Huaytu a Nucleo Escolar to serve these other communities as well. The Servicio also procured all construction materials and hired skilled labor ignoring the Huaytu carpenters in favor of outside masons.

There are several effects:

1. Because the community lost control of the purchase of materials and contributed funds without ever receiving an accounting balance sheet detailing costs, charges of fiscal mismanagement were made.
2. Huaytu lost its community identification with the school as a collective accomplishment both through the comparative magnificence of what the Servicio built with the earlier gradually expanded and improved classroom buildings and through the dilution of responsibility for the school to other colonies.

3. The School Committee lost the consensus base which had made it effective to the degree that it can no longer meet requests from the schoolteachers to repair or maintain the school.

In the case of the bridges, the Servicio created a new dependency of the Sindicato Huaytu: the Comité Pro Puente y Camino. The prior organization of any necessary repairs of the road had been organized as a community effort by the corregidor.

Two bridges were required to make the road into Huaytu passable in all seasons. The first bridge was designed by SNDC and built only under SNDC contract. The second bridge is being built under a contract which also involves the Servicio Nacional de Caminos. The "Caminos" engineers voiced serious technical criticisms of the bridge designed and built by the SNDC: it is located in an illogical place, will require that the SNC build a 3 km double Z curve to connect the SNDC bridge to the road and will require the expropriation of developed fruit orchards and pastures: finally SNC engineers doubt the SNDC bridge can support the heavy truck loads of lumber and sugar cane (2-5 tons) which routinely use the road. Community people voiced the criticisms that the SNDC bridge has already cost the community "over \$b 500,000", that assessments have been collected unequally and, again, that no accounting of expenses was ever made to the community or contributors. Huaytu truck owners were assessed a special contribution although the trucks which use the road most heavily are from outside the community. Each resident was to be assessed \$b 1000. Not all of these initial assessments were collected when cost overruns prompted a second assessment of some but not all families.

The anger and alienation accumulated during the SNDC bridge project has been targeted upon the second bridge. Its contract was signed by the standing Comité Pro-Puente y Camino without a reelection or audit. This committee was not by that time acting with community consensus. The leader has himself become the target of malicious gossip alleging personal enrichment from the bridges due to his role as an intermediary between the invisible SNDC and the community.

The community has demonstrated its lack of consensus with the project by withdrawing labor. Although the relationship between the "Caminos" personnel and laborers from the communities are good and premised on the recent accomplishment of a road improvement which is a source of appreciation and pride for the entire community, an average of 4-6 men appeared each day over the course of several months. With the rainy season impending the two Servicios and the Pro Puente leadership turned to the sub-prefecto to enforce the "communities" contract. Every house which does not send a male worker on schedule faces a \$b50/day fine. This order was issued in late September with the goal of completing the bridge and road construction to connect the SNDC

bridge by November. It came at a time of intense agricultural activity. The wealthier members of the community have rebelled against the order which the corregidor declined to issue or to enforce, supported by his Tupiza paisanos in resisting the imposition. Only the poorer members of the community dare not resist. Median income colonists neither send labor nor has any attempt been mounted to collect fines from them as yet.

The president of the Bridge committee expressed interest in learning how to solicit a "Food for Work" ration so that the "boys" (hijos) could take home food rations as compensation. He is acutely aware of the unpopularity of the bridge which has undermined his previously unblemished respect as a community leader. He acts in the manner of a band leader working harder and more regularly to gain consensus to his example. He would like to revamp his position into that of a redistributive chief, but needs outside sources of things to distribute. As is he faces the knowledge that, trapped by the terms of the SNC/SNDC contract, he has surrendered his community to police, political authorities, and fines.

Other Agencies Working in Huaytu

FOMO, an extension agency funded by the Swiss government, recently attempted to give a course in veterinary medicine and cropping systems. It was so poorly attended that the course was cancelled. DESET/AZAR is working with Cooperative Huaytu Ltda (See below Cooperative Strategies).

Huaytu was one site where CIAT mounted its June 1979 individual farm economic survey. The Ministry upheld posts and auxiliary nurse or paramedic and the Ministry of Education, six school teachers. In 1966, Huaytu was one of seven communities where the Cornell University project gave direct medical assistance and preventive health courses. The three-month visit of this project made an important impact. The films the project showed, its courses, lessons and interpersonal relationship with and among its Bolivian staff were recalled in surprising detail, whereas Huaytu has forgotten even the names of the three Peace Corps volunteers who once served there.

The reading of social change project design, which can be surmised here is that neither resident volunteers nor brief courses are as effective as a germanic medium term resident intervention.

PRODUCTION AND TECHNOLOGY

Agriculture

Land Tenure

The holdings of Huaytu resident families from 0-199 hectares within colonized Huaytu, in individual properties and in usufruct rights to areas within the land base of cooperatives. The smallest land holdings within the colony are the residential housesites in the radio urbano. Far from being the most deprived of the colonists, those with only housesites within the colony include the wealthiest, with rights in cooperative lands in multiples of 50 hectares.

The normative holding of Huaytu colonists are the plots (lotes) which are all 100 meters wide fronting the road but which vary in depth. The army clearly surveyed the 100 meter width in laying out the colony, but boundaries other than the road and measured side boundaries were left vague. Boundaries such as the Rio Surutú for the southwest lotes and the Quebrada Negra to the east were cited. The distance between the road and the meandering course of the Surutú varies between 1.6 km and 3.8 km, consequently lotes southwest of the road vary between 16 hectares in the north and 38 hectares in the south. The eastern boundary named only one in a series of streams which roughly parallel the road in the Ucurutu foothills. In the early years, only Santa Barbara lay to the east: an old spontaneous colonization whose squatters were guaranteed title to their land under the Agrarian Reform. Some years after the Army left an Agrarian judge came to bestow titled at a cost of 37.50 each. In the mid-1960's titles were remade. An arbitrary boundary 2 km paralleling the road was designated as the eastern boundary, opening an area between Colonia Huaytu and Sindicato Santa Barbara which is known as Ururutu. Lotes northeast of the road are therefore more uniformly 20 hectares in size, though usufruct claims may be made deeper into the hills.

Over half the titles to the lotes are legally imperfect, according to one man who took the trouble to register the sale of his land in 1967. The sale has been the principal mechanism for the transfer of land; the buyers have been people who already have a presence in Huaytu. Inheritance has largely been to the spouse of the deceased; two cases of father to son inheritance were discovered. This pattern is governed by demographics—the colony has only been in existence for 24 years and the original colonists were primarily young couples.

The largest area under unitary ownership within the colony is a four lote aggrandisement of 87 hectares. The consolidation is also one of the larger areas in pasture, originally developed by Estancia Huaytu. The owner, a widow, produces milk under the Ypacani PFL contract, grazing ten cows of her own, 35 "a partido" with a colony outsider and numerous other animals. The adjoining lotes were each purchased, the first in 1959, the last in 1978. The smallest area under unitary ownership is .1 hectares in maize ; its owner also rents a two hectare plot from a

neighbor for subsistence production.

Subsidiary Areas Beyond the Colony

Huaytu land tenure and land use cannot be understood in terms of the geographical area of the colony land base proper. Huaytu farmers have gained access to nearby, subsidiary land bases. The important areas are as follows:

Espejetos and Amoro

Southeast of old Estacia Huaytu lay the adjoining estate of Estacia San Rafael de Amoro. Agrarian Reform distributed lands to its iniquilinos, though the cattle rancher remained resident, retained a core area, and managed to re-aggrandize his former estate as Agrarian Beneficiaries left and sold out to him and as changes in Bolivian land law allowed him to purchase areas at auction. His holdings reportedly total over 1000 hectares. This social pattern of ex-hacendados reasserting control has been documented for Chuquisaca by Heyduk 1973. As though fleeing his influence, ex-inquilinos joined by spontaneous colonists moved further south along the lumbering road which cuts parallel to the Sururu. They organized as a cooperative to gain title to the spontaneous colonization area: Espejetos.

Espejetos is a dependent colony of Huaytu in that the leadership and members of its cooperative are from Huaytu. Espejetos mothers have been members of the Huaytu Club de Madres, though a delegation from Espejetos recently asserted right to independent status in a regional mothers' clubs meeting in Santa Cruz.

San Pedro de Paulillos and El Carmen

Paulillos was originally a squatter settlement of the laborers of Estacia Tacú and Estacia El Carmen. El Carmen has a history as a ranch hamlet. Both lie west of the Rio Surutú north of Huaytu colony.

The road from Buena Vista branches before it enters Huaytu into a side road which leads to the hamlet near the site of the old El Carmen ranch, and further south, branches to a point opposite the former site of Paulillos. This hamlet was destroyed in a flood a few years ago; its residents have regrouped on a ridge above. Both Paulillos and El Carmen are highly dispersed communities.

Paulillos is an important subsidiary cultivation area for Huaytu. colonists have access to land there though ties of kinship to ex-iniquilino Agrarian Reform beneficiaries of its Sindicato or rent or purchase, prominently La Chicheña's 220 hectares.

El Carmen is less in Huaytu's orbit, though the communities work together on the bridge currently being built.

"La Banda": Recompensa, La Cooperativa, Cheyó

Two land tracts west of the Surutu in areas drained by the major tributary Rio Cheyó, each reportedly 1000 hectares in size, are the

most important subsidiary cultivation area for Huaytu colonists. One of these tracts was originally settled on a group of veterans of the Chaco War. Few of them ever farmed there, and the last of them was passing the word that his monte alto was for sale among Huaytu colonists this year. Settlement in the area is also highly dispersed though a small nucleation has grown up alongside a seasonally passable lumber road.

The second tract is that of the failed cooperative, Herman Busch. Its only nucleation is a hamlet of a few houses and stores called "La Cooperativa" among other names. Other houses, strung in a line community along the Surutú west bank or Cheyo are called "Cheyo."

Carbones, Agua Blanca, Pozo Azul

This group of spontaneous colonizations which have grown up along the lumber roads which penetrate the Serranía. Like the Banda colonization, residents have spun off from Huaytu, learning of the colonies as laborers in Huaytu, younger couples of Huaytu families, or even Huaytu families who have moved to the opening areas of more virginal forest and less population density by preference. The schools in this area are dependent upon the Huaytu Nucleo.

Santa Barbara, Ucurutu, Aguas Calientes

These three colonies flank Huaytu and Huaytu-Amboro to the east. These subsidiaries provide seasonal laborers, rental lands, and school children to Huaytu.

The existence of these subsidiary resource areas and dependent colonies gives Huaytu a distinct character as much as its age as a colony. Huaytu colonists are not locked into a predetermined landbase, surrounded on all sides by other colonists as are Yapacani and will at San Julian. Rather, like Colonias Antofogasta or Surutu, Huaytu is set in the midst of the space and resources of the Tropical Forest.

Crops

The most important crops grown in Huaytu are rice, maize, yuca and vegetables and fruit trees. Other important crops are: staple or cash crops, peanuts, beans, sweet potatoe (camote), sugar cane, soybeans, cacao, coffee, poroto beans and a variety of vegetables. The production of the most important crops are profiled in this section. The production cycle is detailed; technological aspects including tools and variations among Huaytu farmers are given for each crop.

CHART II - 1

HUAYTU

Agricultural Cycle

	<u>Weather</u>	<u>Agricultural Activities</u>
September	Heavy winds ("Sur s") Scattered showers at night at week intervals 32° - 34°	Preparation of "Barbecho" Sugar cane harvest Tamarind Harvest Gardens Planted
October	Light wind Interval between showers decreases from ever 7 to every 4 days 38° C	Burning <u>barbechos</u> for rice Sowing rice, maize, peanuts Tamarind, pineapple, Urucu and Chirimoya harvests 1st peanut weeding
November	Rainy 36° - 40° C	Finish Planting Rice Bean harvest Mango fruit harvest Second peanut weeding
December	Heavy rains with a few cloudy days Very little wind Hot	Weeding maize and rice Avocado, Achachairu & Ocoro harvests
January	Heaviest rains; river at flood levels little wind	Weeding Achachairu, Ocoro, & Guapurú harvests
February	Heavy rain, but begins to let up Occasional cold south winds Generally hot	Weeding 90 day rice harvest Maize harvest 1st peanut harvest Guayaba & Guayabilla harvest
March	Light rain Cold south winds	Principal harvest: Rice Maize and peanuts
April	Light rain Cold south winds	Principal harvest continues Citrus harvested: oranges, limes, lemons, mandarines, grapefruit Second peanut harvest
May	Sunny, strong south winds 20° - 22° C Nippy ("fresco") little rain, scattered showers	Prepare rice for sale Grapefruit harvest Gardens planted

June	Sunny, no rain Occasional strong south winds	Yucas and bananas planted Sugar cane harvest and planting Grapefruit, Guapura harvest
July	Sunny, no rain Warm	Sugar cane harvest Burning monte alto (new fields) Plant Maize & Yuca on rice <u>barbecho</u> Grapefruit harvest
August	Sunny, no rain Warm Heavy winds	Grapefruit harvest Sugar cane harvest "Frejoles Cafe" harvest Burning in <u>monte alto</u>

The Rice Cycle - Traditional Production and Technology

First Clearings

Rice is commonly the first crop planted on fields cleared in the monte alto (original forest or "high" regrowth). An area of three to four hectares is selected where the land is relatively flat and has good drainage. Trees are cut with axes; undergrowth is cut with sickles (hoz). This production step takes an estimated 30 person days per hectare and is commonly performed by small work crews over several weeks.

Cut bushes and timbered trees (tumbados) are piled and left to dry for at least a month during the height of the dry season: between July and early September. The fields are burned over a period up to 35 days falling partially in August. Burning monte alto requires 4 - 6 person days per hour. If the first burning does not adequately clear the field, a step is taken known as chaflear. The half burned materials (la chafra) is piled for reburning. Newly cleared fields are not immediately seeded. The field is left for a minimum of ten days to allow the deposit of ash to blow in the heavy winds of August and September and to allow ash to work into the soil with the first rains. There is usually a brief rain in late September and early October, "cuando se para un sur" (when a south wind dies down). A lone man will work piling larger refuse during this time, a step known as basuriar (removing garbage). A field newly cleared in monte alto is known as a chagueada, or by the more general term, chaco.

Barbecho clearing

Uncultivated cleared fields which have produced at least one crop are known as barbecho. Huaytu folk wisdom suggests it takes twelve years of fallow to restore field fertility. Any field left fallow for less than that time is called barbecho. Strategies vary among individual farmers in terms of the ratio of years of cultivation to years of fallow. The average ratio reported by a sample of 19 Huaytu farmers* — was one year's cultivation to 4 years' fallow before reuse; the range, however, was from 1:2 to 1:6. Production on the lotes, given their size, has promoted the solution of a 1:4 ratio. Either a single plot is used for 2 years, then left fallow for eight or a field is used for only one year and left fallow for four. Production in the hillier subsidiary cultivation areas used by Huaytu farmers is in longer cycles: 1 - 2 years cultivation then 8 - 12 years fallow.

If a field is used for two years in sequence, whether it is a chagueo newly cleared from monte alto or a barbecho, rice is not planted the second year. Rice field preparation therefore always involves clearing in the traditional practice. Clearing barbecho which has lain fallow for four to eight years requires from eight and up to 40 person days per hectare. The regrowth contains more low vegetation, consequently requiring more hand clearing of saplings, bushes and undergrowth. Huaytu farmers agree that it costs much more to prepare barbecho since they have to pay



Field prepared and planted in
"barbecho"—forest fallow



Barbecho plot after burning
ready for planting



SWIDDEN FIELDS
slash and burn
Huaytu

laborers; a man and available sons cannot clear barbecho alone.

The practice of burning fields at a time of high winds presents a particular problem in the lote locations. Lots are narrow — 100 meters. Winds from the southeast can propell a wildfire across lots which can burn neighbors' permanent fruit groves, pastures, dwellings and outlying rice storage shacks (galpones) before the fire extinguishes itself at a quebrada of monte alto or at the river. The only precaution taken is to burn a perimeter about a meter wide around the fields. If high vegetation surrounds the area, flames leap over this narrow fire lane.

Planting

Several varieties of rice are sown in Huaytu. The 90 days varieties used are Carolina Amarillo and Pico Negro, which are harvested Beginning in February. The five to five and a half month varieties are Bluebonnet, Dorado, Cateto and Carolina Blanca. Those varieties are harvested in March to April.

Rice is commonly planted with a tool known as sembrador or maquina sembradora. It is a simple device, which works on the principle of scissors and a posthole digger, burrowing a hole then depositing seeds from its beak-line bit when it is opened. The sembrador was first introduced by the Japanese and most machines are imports from Brazil which cost \$b 300-450. Their use is universal. Farmers either own their own or borrow from trusted friends. More rice seeds are planted on barbecho than on chaqueao anticipating that the rice must compete with more weeds ("el tupido").

All rice is planted by the end of October when the rainy season begins. Minor fluctuations in expected pattern of rain can prevent timely field preparation. Farmers maximize by planting in October, but if rains fall steadily instead of at the expected four to seven day intervals, they ca-not burn and can end up not being able to plant.

Weeding

During the months of December, January and February weeding is the most critical operation in rice production. Weeds are less a problem in "monte alto", where a newly cleared field is surrounded by the forest, than in areas near cultivation and barbecho in its fallow cycle.

Weeding (carpir) practices vary. Farmers with smaller areas in production weed more carefully. Weeding tools include machetes, shovels, and hoes (azadón). Tops are chopped with a machete then larger weeds are dug up and turning them over "so the roots stay on top." Some highlanders rake out weed roots. Laborers hired to weed and farmers with larger or more remote areas under cultivation weed

only slashing at roots with machetes and "killing" the weeds by beating them down with a stick. Crops other than rice are weeded more carefully.

No fertilizers are used. Fumigation with insecticides is practiced to combat the prevalent insect rice pest petilla. (Padissus sp.) and the qusano medidor which eats new leaves. Farmers who depend on rice as their primary cash crop fumigate. Several own simple backpack style fumigators and rent them to trusted friends at \$b 50/day. Rice grown in small amounts for subsistence is not fumigated and reportedly the spontaneous colonists "Mry adentro" (Poza Azul etc.) who speak only Quechua "do not understand" the principles of fumigation.

Farmers try to fumigate at least twice, two months into the five and a half month growing cycle and again four months in. The opportunity to fumigate is limited by the pattern of rain. Fumigation is considered effective only if it can take place during dry spell.

Problems arise in weeding which are related to the rice field site. While those farmers who are rotating a barbecho into production within the colony's land base may be using "weaker" (debil) plots than the new outlying chacos, the lote farmers enjoy the advantage that during the growing season they can travel easily on foot a few minutes to weed. They are able to distribute their own time and that of their family and any resident or otherwise attached laborers to weed whenever there is a break in the rain.

Those with rice fields at the two ends of the colony are in the best position, as they may walk for several hours or catch a passing truck to visit and weed their fields. The recent improvement of the main road has improved their position.

Those with fields across the Surutú river, however, must time their first weeding for late November before the river starts to rise in December. Any other assaults on the weeds of the remote patches must await opportune moments when the floodwaters recede, beginning in February. Since everyone who farms in the "banda" (on the west bank of the Surutú) has this opportunity at the same time, and often quite unexpectedly, each must try to hire a crew of laborers to cross the river. Some farmers with chacos in the banda have developed a pattern of split residence, moving from a base residence in Huaytu to a rainy season residence across the river. Other families fission a young couple to resident there. While from the point of view of rice production, they enjoy the best of both worlds—they place themselves in a situation of severe isolation for three to five months a year: they are cut off from access to supplies, to labor and to transmit out of the area. The incidence of malaria is highest during the rainy season. Only the more adapted farmers, particularly those of traditional Buena Vista Camba origin prefer this alternative. The threat of malaria also conditions the availability of migrant laborers willing to weed the remote west bank chacos. The only shelter for work crews is a rough

shack of matacu palm which they build them selves. During the weeding months, it is hot, muggy, muddy and mosquito-ridden: "mismo se puede picar mil al dia" (a thousand mosquitos bite y ou a day).

Those who accept are either more naive laborers, unaware of the conditions they will face—first time Colla migrants unaccustomed to rice production—or those migrant laborers who have spun off into a more permanent strategy of day labor in Santa Cruz. Highlanders stay in Santa Cruz during what is also the growing season of the highlands and its most festive social period only if committed to this strategy. These migrant workers are correspondingly more likely to bargain sharply for high wages. The rice farmers of the remote chacos faced with the short period when they can move labor in to do weeding have a poor choice of either high priced labor or labor new to rice cultivation. Many are simply unable to make arrangements and forego weeding altogether. Those who do not weed face an even greater problem at harvest time. Workers may simply refuse to enter a heavily overgrown field because of the higher risk of snakes.

Harvest

The harvest is the annual crisis of the rice farmers. Rice is harvested by hand. The most sophisticated technique involves cutting the head with a tool which resembles an American paring knife (cuchillo). Some rice farmers have harvesters run their bare hand over the head to pull rice kernels from the head stalk (la pala). To remove la pala, a despicadora can be used. Eleven people in the community own despicadoras: a model from Brazil which needs to be transported to fields on a truck bed. These machines are rented out at a price of \$b 15 per fanega threshed. Only those farmers who must sell their rice immediately at harvest time thresh in the field.

The labor intensive method of rice harvesting by hand makes the cost of hiring seasonal workers run high. One rice farmer estimated 27 person days to harvest each hectare: 3 persons working nine days per hectare. One estimated cost figure was \$b 2,500 per hectare. Another farmer stated his standard practice of hiring 17 peons for one month (March) to harvest four hectares. Individual farmers with 8 - 10 hectares will hire between 15 and 20 men for at least one month at a cost estimated at \$b 10,000.

The cost of harvest labor is difficult to assess across the board for Huaytu because payment and compensation practices vary. There are several distinct payment arrangements. Some harvesters are paid a set amount for each arroba of rice they pick, which involves the employing farmer in weighing each bag and keeping accounts. Harvesters may also be paid by tarea (task); the supervising farmer marks off 50m² squares (cuartos) in the field and pays an agreed amount for the harvesting of rice from that square. Finally, harvesters may be paid a day labor wage, which range from \$b 30-70 day. Each method of payment is riddled with perceived injustices from one perspective or the other. Payment per arroba clearly gives an incentive to the best workers but involves the farmer in the extra cost of providing bags, setting up a scale and keeping accounts.

When harvesters are paid by cuartos they may harvest less intensively. When harvesters are paid by the day, the amount of rice harvested by each will vary and there is little incentive for either fast or careful work.

Whatever the cash compensation arrangements are, farmers who hire laborers are obliged to provide them food. Here too arrangements and actual costs of provisions vary. Food is an important aspect of the laborers' compensation and they will rebel if food is not adequate or simply move over to another farmer's field to work. Food customs have determined the segregation of Colla and Campa work groups. Collas drink "yerba" (teas such as mate) and insist on a diet built around mote (hominy), potatoes, and wheat flour bread. Cambas prefer coffee or chocolate laden with sugar, rice, horneados (baked specialties) of rice and yuca, and adequate meat.

Both Colla and Campa farmers agreed that the cost of provisions was about \$B 4,000 to feed workers to harvest average sized (3-4 hectare) plots. Arrangements for the cooking of food also varied. The farmer's household might serve only as the supply point for various foods brought there from the market (i.e. potatoes, sugar) and produced there (a week's supply for 12-20 persons of baked goods or hominy), though some women cook daily and take meals to the fields and others set up a kitchen in the field. A field kitchen must be established in any case; the differences revolved around how processed the foods prepared are.

Laborers build temporary motacu palm shelters (chozas) as their dwellings at the field site.

Few rice farmers have the means to finance totally the harvest. Front money for provisions and the transportation of workers to the site runs at least \$b 1,000/hectare. Although rice farmers in the lote and cooperative areas have the option open to them of growing some 90 day variety rice to harvest and well in February to finance some costs of the main harvest, this option is not viable for the farming areas in the remote banda, because they cannot cross the river in February. The immediate current source of credit for rice farmers is from rice dealers (comerciantes). They will buy rice in the ground unharvested for about half the price offered for arroz en chala paid by mills. Farmers desperate to finance their harvest accept these terms, which give them instant cash to pay their workers and which transfer to the rice dealer the arrangement and expense of hulling, threshing, storing, packing and trucking rice.

Rice Sales

Rice is sold by the fanega. A fanega of unhulled, freshly harvested rice with a still high water content weights 408 libras (pounds) or 16+ arrobas (1 arroba=25 lbs.). Dry and ready for hulling an arroba yeilds about 2½ quintales (=10 arrobas). A higher ratio of 16 arrobas as harvested to 12 dry and shelled (paleado) occurs

with some varieties such as the "dorado." The wholesale price of dry, hulled rice was \$b 350/quintal in September 1979.*

Farmers however sell by the fanega. The price of unhulled rice (arroz en chala) was expected to rise to \$b 800/fanega in November, 1979. At the time of the harvest, the price of fanega is lower because so many rice farmers in Bolivia immediately sell their harvest crop to finance the harvest labor costs. Those who sell all or part of their crop in the ground to rice dealers settle for less. Prices paid by rice dealers for rice in the ground in 1979 ranged between \$b 300 and \$b 500/fanega; \$b 400/fanega was the most widely quoted price for this transaction at a time when the market price was \$b 720/fanega. In years when the rice price is low at harvest time (April) farmers receive less, generally about half the market price of any year.

The hypothetical microeconomics of the situation in 1979 prices are as follows. To harvest 1 hectare of rice, yielding a median of 10 fanegas/hectare, a farmer must meet a median total labor cost (cash payment, food, transportation and any fees to contractors) of \$2,500/hectare. If, to meet this cost he sells the crop in the field to a rice dealer, he will receive between \$b 2,000 and \$b 5,000/hectare, depending on the grade price and national price. If the farmer is able to meet harvest costs with his own resources or other forms of credit and store the rice for sale at a time when the market price fluctuates higher, a high grade crop could be sold for \$b 8,000. Further, if the farmer were to undertake the cost of hulling the rice, rather than selling rice en chala to mills and sell it hulled (peleado) he could command at least \$b 8,750 wholesale.

Each of these stages of processing require however that the farmer take on additional costs: \$b 15/fanega to thrush the rice from its head, if he does not own a despicadora; \$b 8 - 10 for each woven plastic bag which is in current vogue for transporting produce in Bolivia and \$b 20/quintal to hull the rice, plus additional labor and transportation costs. Selling rice in a more processed form is simply beyond the means of most Huaytu farmers, who accept the rice dealers' offers and may wind up in debt as a result. As one complained,

It is as though you pay with your own time
and land for the privilege of seeing the
peons take your money.

The first requirement for achieving higher prices is that a farmer own his rice free and clear after the harvest. There are several strategies to accomplish the end. 1) Planting half a hectare to one hectare in 90 day rice to finance the major harvest. 2) Assembly of a larger resident labor force, which allows for the distribution of costs across the year, reduces dependence on seasonal laborers and can be underwritten by distributing both risk and income with sharecropping arrangements. 3) Financing the cost of the harvest with other sources of income, particularly from small store commerce, trucking fees or the lucky sale of valuable timber on chaco plots.

Storage

Customs again vary in the storing of rice. Rice can be stored piled on raised platforms under simple pole shacks and matacu palm roofs for up to two years. Rice stored in this form is still on its head stalk (pala) and unhulled (en chala). The storage sheds may be simple small (4m²) chozas or more elaborate galpones (up to 20m².) Storage in open sheds in piles of headed rice allows air to keep the rice fresh. Loss due to mice, rats and birds is a problem. Theft is less of a problem because hunters favor cleared field areas and watch out for their neighbors' storage and shacks. Rice is rarely stored for the theoretical maximum period, rather only from May to about October. In the rainy season, spoilage can occur.

Not all the rice farmers of Huaytu store rice in this manner. The galpones are a Camba custom which has not been adopted by all the in-migrant rice farmers. Some Collas store rice en chala in bags in open sheds, either on the head stalk or already despicado. Some Collas even store threshed rice en chala in bags inside the windowless adobe depositos that only they build. This is a highland storage custom poorly adapted to the lowlands because when such bags stored in the dank, airless rooms are opened, a material is released which causes an instant skin rash on whomever opens or touches the rice. A Camba explained that a tiny insect lives in rice stored in this manner and it is its eggs which cause the rash. The actual agent may well be a mold.

Threshing

Rice is threshed from its head stalk with either a despicadora or by beating the heads with a heavy stick. Farmers who use despicadoras usually move the machine by truck near the field. Four men can carry a despicadora, for short distances, but not for long distances and not across a river or quebrada or up a hill. Rice storage shacks are located close to fields, so it is the location of the field site which determines whether the despicadora can move the rice, or whether the rice has to move on horseback in bags to the despicadora. Farmers prefer to move the machine because the combined cost of renting a thresher and a truck to move it is less than the investment in the number of bags required to move unthreshed rice to the machine and in the horse rental and labor costs of moving rice.

The hand threshing operation (aporiar) is preferred by those who raise small quantities of rice only for home consumption. Rice is beaten with a hardwood stick on the ground with garotes. The fine grained llave wood is preferred because it remains heavy when the wood has dried. The garote (beater) is a thin, heavy stick about 2 feet long, its handle polished by use.

Drying

Rice must be dried before it is hulled. There are no rice dryers in Huaytu. Those farmers who sell rice may take threshed rice in bags

to Santa Cruz cement platforms (canchas) where they pay a fee for drying rights or follow the practice of those who produce only for household consumption, drying rice on leather hides. Because of the problem of drying rice, few farmers are able to hold their harvest until November. Two conditions promote sale: rains begin and higher prices.

Hulling

Everyone who grows rice, even those with small amounts (the yields of one half hectare or less) faces the problem of having the rice hulled (peleado). In late 1979, only one rice peleadora was operating in the community: a large industrial model imported from Brazil which can peel a median of 15/fanegas an hour. The owner charged \$b 4/arroba to hull until October; thereafter \$b 5/arroba. He took advantage of the situation of the small, household oriented producers who formed the bulk of his customers. Because they needed sunny weather to dry rice they would use as provisions until the next harvest, he upped his service charge when the rains began. Further, the local miller will accept only a minimum of 2 quintales per customer.

The local hulling fee is the same as that charged by other Santa Cruz commercial operations. Its only advantage is that it is local; customers can bring their dried rice for hulling on horseback on Saturday or Sunday. Some farmers hull small quantities of rice in Huaytu to sell in Montero by the quintal. Their costs per quintal are thus \$b 20 for hulling and \$b 8 for transportation to sell at the \$b 350/quintal, market price. The only savings is on the slightly lower weight when transportation charges are approximated.

At the other end of the spectrum it is important to note that some of the very poor laborers with precarious sharecropping access to land tediously hull rice by hand for home consumption.

Yields

Yields per hectare is the consideration which underlies the rationality of producing rice for market on a succession of fields given the many cost constraints. Yield on new fields cleared from the monte alto averages well above 12 fanegas per hectare, as high as 15. Yield on barbecho on land followed eight years or less averages about eight fanegas per hectare.

Maize

Maize is grown in chagueado and in barbecho. More commonly, rice is the first crop grown on a chagueado and maize is planted in the second year, three to six months after rice is harvested. Huaytu farmers are aware of the potential to plant up to four crops of maize a year, but because of the problem of weeds, the predominant pattern is to concentrate on a single crop. People who have garden plots a tarea or so in size (.1 hectare) may double and triple crop maize and/or may multicrop maize in sophisticated intercropping patterns.

The more common cropping patterns are to plant maize 1) alone throughout a field as maiz turpido to produce horse and cattle fodder (huy), scattering a dense amount of seed or 2) intercropped in rows with yuca or bananas (see Yuca, below).

The notion that rice and maize are intercropped appears in the literature and in the CIAT sample from Huaytu. However, no Huaytu farmer gave me a description of precise intercropping; rather, in very small fields used for subsistence production, half the cleared field unit will be planted in rice and the other half will be placed in maize, intercropped with yuca and perhaps beans.

Maize cycle

Field Preparation

When maize is planted in the second year, the first step of field preparation is to expose the roots of the prior year's crop with a shovel. This step was described as "like plowing" (como arada). The field is then raked with a special stick called an orquilla. Weeds and roots are then cut, piled, allowed to dry a day or two and then burned.

Planting

Planting can be done "in any month" but October is regarded as the best month to plant in order to achieve highest yields. Maize is also planted in July. The Cubano variety is grown as the only variety which has proven resistant to the plague of worms. The maguina sembrador may be used to drop seed into the wells placed 1 meter apart in rows, though some use it only to make holes in order to place exactly three seed kernels in each.

Weeding

Weeding is performed with shovels and the azadón hoe to turnover (vulcar) weed roots. Some Huaytu farmers of highland origin carefully mound (aporcar) each maize plant and dig dirt drainage ditches around the plants (surcus). Farmers of lowland origin do not as consciously mound maize, but will throw up some dirt around the maize plants in the course of digging out weeds (the chapurizado). Fumigation is practiced by some farmers. Pests include birds and worms which are said to be on the increase.

Harvest and Storage

Maize is picked by hand and stored in the husk on platforms (chapapa) or in small storage stacks 5 m square called chozas. A few ears of husked maize are selected to be hung from the rafters of kitchen beams to save for seed. Fresh corn is eaten from the cob, and also ground to prepare tamales with meat centers baked in the ovens.

Drying

Maize is stored and sold dry. Although there are drying platforms built of brick or stone in Huaytu—one in La Primera and two in the La Tercera including one which adjoins the mill—maize and rice are commonly dried laid out on sheets in front yards, or dried on commercial carchas or in maize dryers in Montero.

Commercialization and Consumption

The price of maize is also said to fluctuate within the year from \$b 69/quintal in the main harvest season to 100/quintal by October. Maize is sold in Montero or to balanced food mills. About 80% of the Huaytu farmers sell maize, and maize is prepared as mai tostado and by the Colla as muta. Maize is also ground into flour at the local mill for for \$b 3/arroba or by hand in a tacl. Maize flour is baked in bischotos and is used as an ingredient in a number of baked goods.

Yuca

Yuca is grown for home consumption and for pig feed. About a fifth of the Huaytu farmers growing yuca sell small quantities.

Yuca must be grown on high ground not subject to floods in any type of soil. Yuca is intercropped with maize in intermediate rows (para "calleforianle" en callejones de medio). Yuca seedlings are allowed to reach 6" in height before maize is planted. With this timing, maize and yuca grow evenly and neither plant shades the other. Yuca is weeded along with maize. After the maize is harvested, yuca continues to grow. The fields must be lightly weeded five or six times so that the yuca plants are visible.

Yuca is subject to three animal pests: the Peji—an agouti with talons which digs out the roots; the Tatú (a taloned anteater) and the Taitetú (collared peccary), which enters the fields at night to root-out yuca. Yuca plantings therefore are prime hunting grounds. An additional motive for keeping yuca weeded is so that friends can hunt there and keep an eye on one's fields and field storage. Yuca can be harvested after a growth of 9 months and for up to two years after the initial planting. Small quantities are pulled up by men or dug out if a woman or child is harvesting once or twice a week taking only enough for a few days' household consumption or pig fodder. Yuca is not dried or prepared in flours here: it is only eaten boiled. Boiled yuca is also

ground with rice flour to make a dough (mazaco) which is shaped around chittlings (chicharones de chancho) for one type of baked goods (horeneados). People named two varieties: black and yellow.

Peanuts

Most (77%) Huaytu farmers plant at least a tarea in mani for their household consumption. An estimated 27% also plant a field in mani as a cash crop. Mani is the only crop which resists weeds due to the planting design.

Peanuts are planted in barbecho after sequential crops of rice and maize "cuando es pobre la tierra y no muy abundante". (When the soil is poor and no longer very abundant.). Huaytu farmers explicitly recognize the limitation of their slash and burn system and it is because peanuts lack a market that so few farmers plant this third year crop.

Peanuts are sown on barbecho burned over in October. Three seeds are placed in each hold. Each plant and each row is about 18" apart. Peanut seedlings appear within seven days. At between 15-20 days into its growing cycle, peanuts are carefully weeded and mounds are built around each plant. Another light weeding is necessary about 30 days into the peanut growing cycle, but after that the plants cover the area with shade and no further weeding is necessary. Peanut fields are the only which "se ve verde y unito" (look all green).

Harvest is in February and again in April. Peanut plants must be pulled up one for one with a mazadón (a hoe-fork) and by hand, hunting for individual peanuts below the surface. The root bearing peanuts are placed in piles to await a shower which will wash off dirt: afterwards farmers and their families sit down and pull individual peanuts off the roots into bags. The only problem in peanut production then arises — peanuts must then be immediately dried in the sun for at least three days or else the peanuts begin to grow again. Peanuts are then shelled by hand: Huaytu farmers have heard of peanut shellers, but none exist in the colony. Peanuts in their skin (perilla) are stored in bags in the rafter platforms (chapappa alta) of kitchens or in a separate open-sided outbuilding called a pirgua or franero. In the case of peanut storage like rice the maladaptive Colla custom of storage inside airless adobe rooms can promote spoilage.

Peanuts are prepared as tabilla by toasting them in ovens; as chocolate de mani by toasting grinding and then boiling them with water into a thick drink; sopa de mani by boiling raw peanuts in water and as peanut brittle prepared with sugar.

Sugar Cane

Sugar Cane is the annual crop preferred by the more commercially oriented farmers for production on barbecho lands accessed by vehicle transportation. The land selected for sugar cane is on the flat sandy loam: sugar cane production begins after a field has been through several cycles for rice crop and fallow. After peanuts, sugar cane experiences the least problems with weeds.

Sugar Cane production requires participation in a group which collectively holds a quota to deliver cane at one of the three mills (eugenios) where Huaytu farmers have negotiated contracts: Guavira Unagro in Minerio and San Aurelio. The Asociacion de Caneros quota is at San Aurelio south of Santa Cruz. Payment levels in 1979 were \$800/ton: transportation cost \$190/ton. Cane is planted between July and September so that harvest can be phased over the safra period. Cane fields are burned so that less labor can be used for cutting and so trucks can "jump" the line in the average 15 hour wait to deliver.

Fruit and Tree Crops

An area of one-half to two hectares around houses on the lotos and in La Banda is dedicated to fruit tree cultivation, especially citrus: oranges, limes, mandarines, lemons and grapefruits. Oranges at \$b 1/each and limes are sold. Other fruit trees include mangos, tamarinds, avocados, papaya, urucú, achachairú, chirimoya, ocoró, guapurú, guayaba and guayabilla. Of these, only mangos are planted in groves.

Pineapples are cultivated at the borders of garden plots and protected plots seeded as pastures. Bananas and plantano of several varieties are grown: plantano verde, large de frito, Walele or Boracho, Morado and the guineo, which is the small dessert type. They are interspersed with other fruit trees and are also grown on barbecho plots, initially with maize.

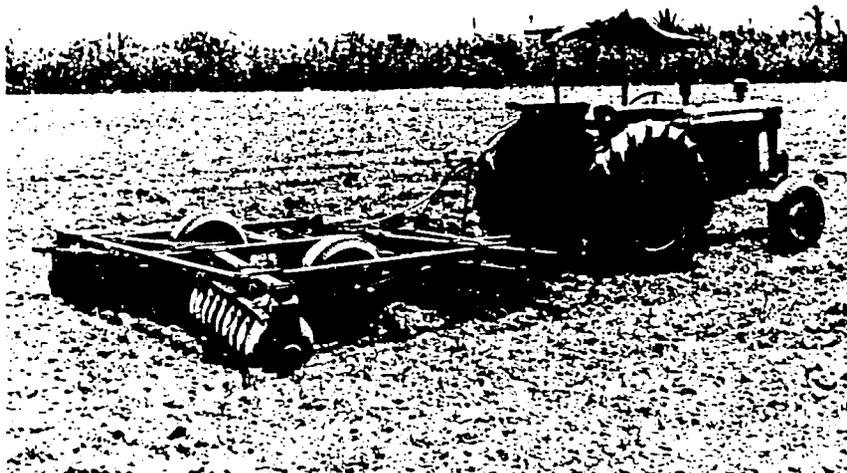
Cacao and coffee cultivation is limited to the Orientales, who grow for their household consumption only. The common problem of all fruit trees and other tree crops in Huaytu is that they take 4-5 years to bear fruit and then are infested with a growth ("la arana se tapa"-fungus or spider mite), dry out and bear fruit for only a few years.

Garden Crops

Small intensively cultivated garden plots of mixed vegetables are planted by most Huaytu householders at scattered locations on barbecho. In order of frequency the garden crops are tomatoes, lettuce, onions, beans (frejoles), potatoes, carrots, radish, squashes (hoco and zapallo) bell peppers, peas, turnips, sweet potato (camote), oregano and other spices, and celery. Gardening was promoted by the CEF agronomist resident in the mid 1960's and by recent Mennonite agricultural extension volunteers. Gardens may be prepared by burning but the essential field preparation involves turning the soil with hoes and shovels. Gardens are timed to produce a continuous harvest of "hortalizas" by planting in May and again in September.

Tomatoes have become an emphasis among garden crops because tomatoes can be sold among households and to the Montero market.

Several varieties of beans are intercropped with maize on garden plots—frejoles blancas, which are planted in September and harvested when the maize flowers; frejoles café, which produce in August and September, and the the ordinary bean (frejoles) which is planted in June and July for a November harvest and sale (1979 price \$b 375/quinta l).



Cooperativa Huaytu Ltda. field preparation with AZAR tractor



Demonstration: animal traction with horse(s) drawn plow arranged by CCM in Huaytu Primera

INNOVATIONS IN AGRICULTURE

An area of developed pasture



Domesticated Animals

Chickens are universal in Huaytu. Most households have 3-4 nesting hens and their broods and households with as many as 10 hens are usual. Chickens are kept to produce a regular supply of eggs for household consumption and for meat. One farmer in La Banda has developed a chicken ranch of sorts, channeling his production of rice and maize to chicken feed. Chickens, ducks, geese and an occasional turkey are kept in the cleared areas around homes. A limited amount of eggs and chickens are taken to Montero for sale.

Pigs and horses are kept by 3/4 of the households. Even the barbed wire fences which define the limit of each lote fail to deter rooting pigs from destroying gardens and round fruitstrees in the rainy season. Those farmers with more permanent tree crop plantation avoid keeping pigs or feed penned pigs with Yuca and table scraps.

Horses kept in fenced pasture area or hobbled with ropes around their legs are allowed to graze on the grassy slopes of the road. Horses are used for transport; 77% of the households keep at least one horse and horses can be rented for \$b 50/day. The local horses are small (14 hands) and carry a maximum of 200 lbs.

Cattle are kept by just over 2/3rds of the households. As a legacy of its history as a cattle ranching area, there are old areas of developed (destrumped and cultivated) pasture. Areas of natural pasture are restricted to the flood zone of the Rio Surutu. Conversion of Barbecho into pasture is attempted at scattered locations especially the old Barbecho s of La Tercera where the land has already been cycled through rice/maize/fallow and sugar cane. Emphasis is on dairy production. Though only three households sell milk commercially at \$b 3/liter, many more produce cheeses or cottage cheese and sell some of their production to neighbors.

About a third of the households and only those of highlanders are distinguished by raising sheep. The goal of sheep production is to produce wool for home weaving supplies. Pastures are deliberately over-grazed to reduce the maintenance costs.

Dogs are also universal and 4/5 of the households keep cats and half keep parrots.

Productive Strategies: Cooperative

Cooperativa la Chicheña

Between 1961 and 1964, the cooperative members cleared individual fields for rice in the monte alto of their initial tract of land, which lies between the road and the Surutú river north of Huaytu colony where the Quebradas El Yeso and Huaytu join the Surutú. Both the main road to Huaytu and an equally well developed side road which leads to the Surutu river border the property and feeder roads have been built

into the cultivation area. In 1965, when monte alto began to run low the cooperative purchased an additional 150 hectare tract across the road from their property from the final owner of the old estate Estacia Tacu. They burned its cacao plantation to plant rice.

Between 1966 and 1968 the cooperative planted in common 15-20 hectares in rice: in addition, each member planted a 3 hectare plot. The plan involved planting rice in the remaining monte-alto and in barbecho (regrowth), using each cleared field for two years then fallowing for four or five years. With the communal proceeds of the first year's harvest purchased a pickup truck in 1967. Rice yields fell the second year as they had exhausted the last of their monte alto. They sold the truck to purchase an additional 220 hectares in monte alto additional land on the west bank of the Surutú river in Paulillos, and returned to a system of individual plots.

In 1972, the cooperative made a decision to change to sugar. By 1972 all their land was in barbecho: rice yields had declined. The cooperative decided to change to sugar cane production and in 1973 purchased a truck to carry cane to the mill. Since that time, the cooperative has been planting an average of 76 hectares in cana: 6 hectares in common and 7 for each member. The truck was scrapped after an accident.

La Chicena is clearly facing the "barbecho crisis" (See Maxwell 1979). Last winter, they decided to fence part of their property to begin its conversion to pasture, but the pile of fenceposts burned in a sugar burning. They still have the barbed wire they also purchased. They continue to plant sugar cane, but yields are falling with crops as well. In November 1979 they are scheduled to have a meeting to decide what plan to adopt for their land: whether they will convert to pasture, attempt mechanized farming and a system of crop rotation, leave the land to fallow, or combine all of these solutions on the large tract.

Huaytu Ltda.

The scheme of production imposed by the five year agreement between Cooperative Huaytu Ltda. and AZAR/DESEC is to achieve one crop a year for five years on plowed fields. Each year the field is cleared (desmote con arruga) and with picotas (pick axes) by hand. Fields are not burned. The institution then provides a tractor to plow (arrar) and harrow (raspar) two or three times before planting. The scheme involves rotating an annual production as follows: soybeans, maize, soybeans, rice. Not all fields, though in the same cycle. Harvesting is also mechanically assisted. The cooperative members provided the land, their own labor and payment for the plowing, harrowing and harvesting; the institution acts as an intermediary to provide agricultural credits and a contract for the sale of the maize and soy to a balanced food mill.

Problems arose the first year with a splendid crop of weeds. Weeding is still performed by hand. The second year, the tractors arrived late,

both at planting and harvest. The fields planted in rice in December yielded only 1 - 3 fanegas/hectare. The soya, pulled up by hand and piled to await the arrival of the thresher rotted. One member reported that of the 10 hectares he had planted in soybeans, only 2 could be harvested. An estimated 175 quintales of soya was lost.

For the 1979-1980 growing season, the cooperative had cleared 70 hectares (desmote). The most adventurous member of the cooperative had committed 15 of his 30 hectare lote to be sown half in rice and half in maize.

The scheme may work out over the long run of the five year contract, but in the short run, the members of the cooperative are in debt. The sale of their yields has not allowed them to pay back the \$b 1000/hectare loans facilitated by DESEC. The loans were spent to cover the costs of the mechanized operations and other inputs encouraged by the program. such as fumigation with insecticides and improved seeds. Members are still positively oriented to the experiment with mechanized production and are pleased with the neat 1 - 2 hectare fields separated by a line of trees trees which the plowing and harrowing produce. They attribute the problems in production to the institution, particularly the late arrival of machinery in terms of the agricultural cycle requirements and frequent machinery breakdowns. They expressed interest in buying their own equipment, so as not to have to depend on AZAR/DESEC.

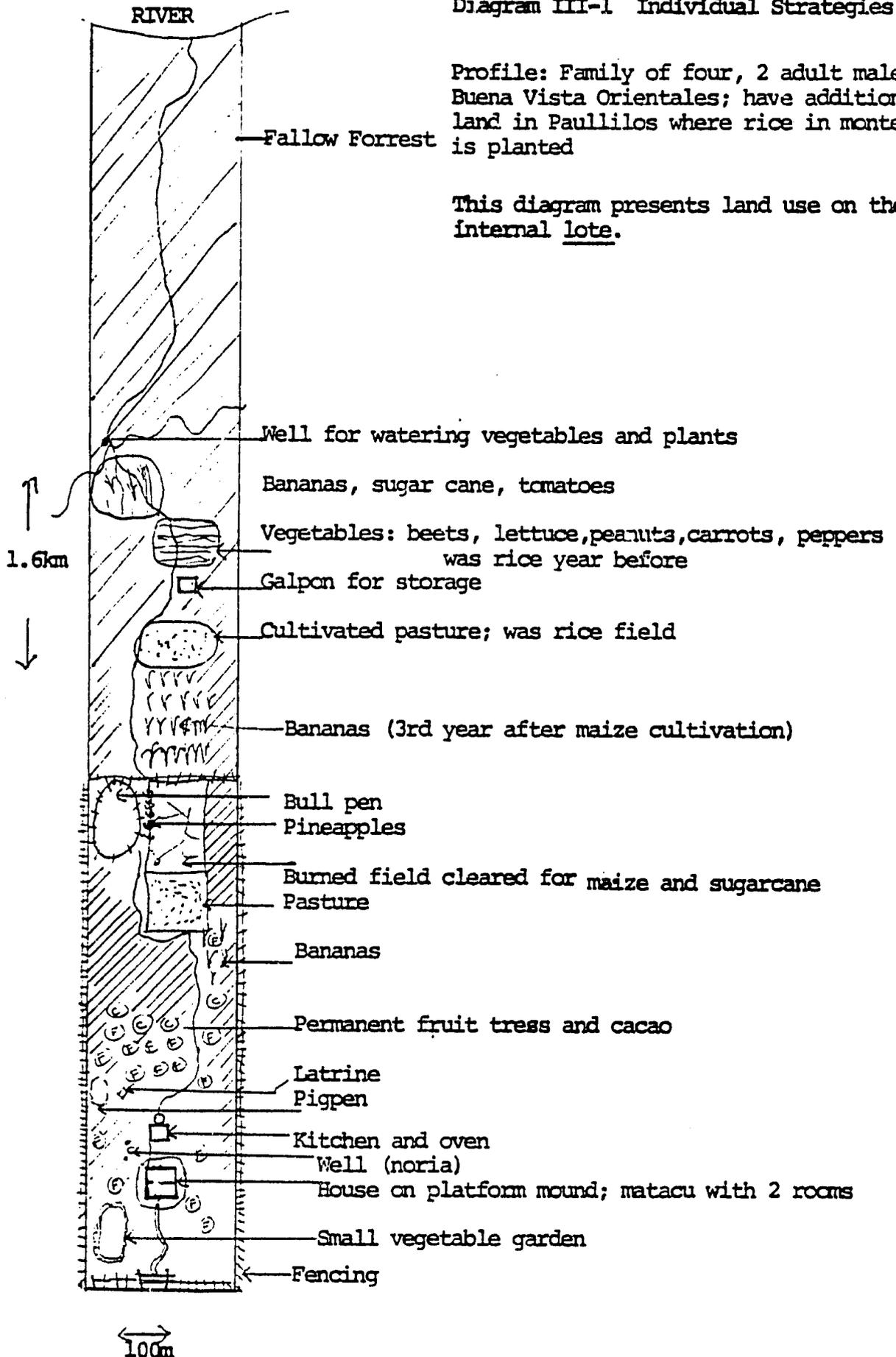
Productive Strategies: Individual

Individual production strategies are featured in the diagrams and charts which follow, (Diagrams III-1, III-2, and Chart III -3).

Diagram III-1 Individual Strategies

Profile: Family of four, 2 adult males Buena Vista Orientales; have additional land in Paullilos where rice in monte alto is planted

This diagram presents land use on their internal lote.



↑
1.6km
↓

↔
100m

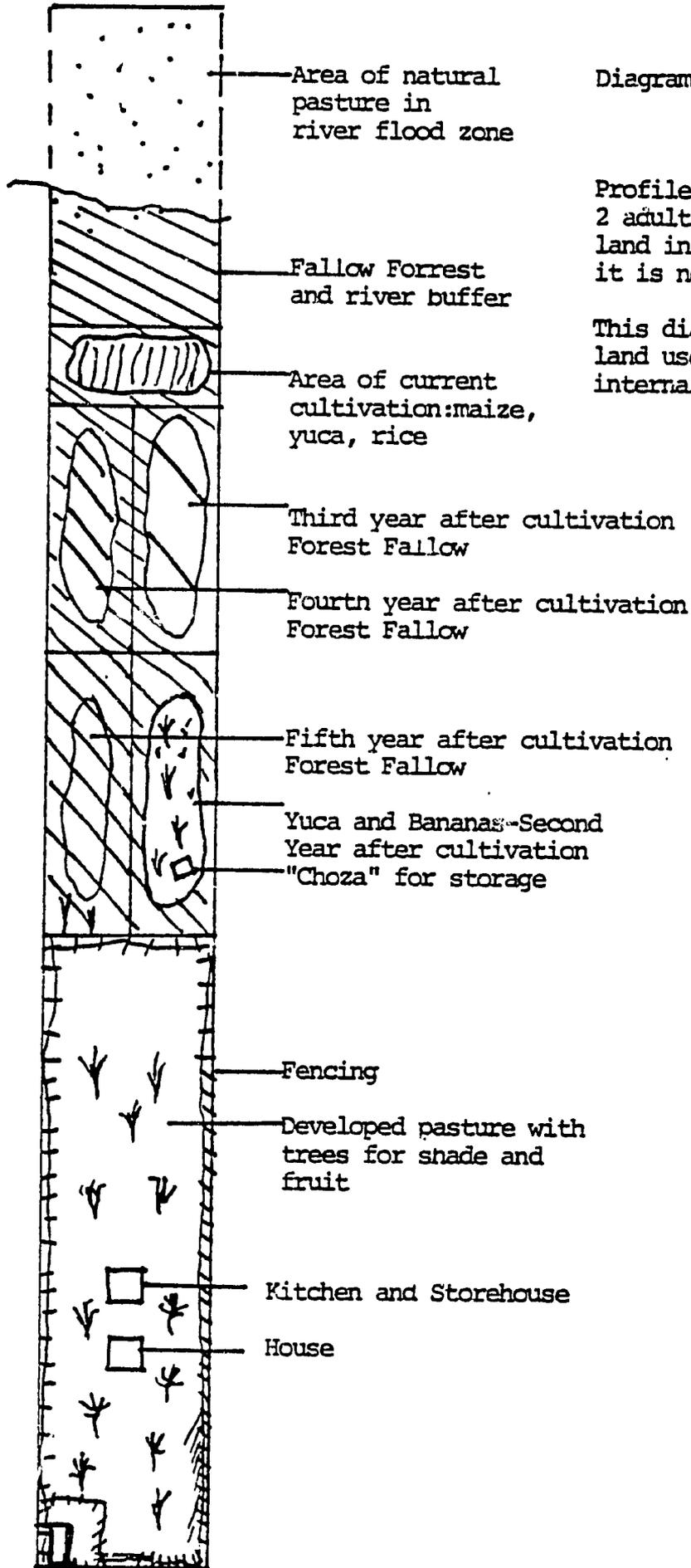


Diagram III-2 Individual Strategies

Profile: Family of six, 2 adult males,; have additional land in Santa Barbara but it is not used

This diagram presents their land use on the lote internal to Huaytu.

Area of natural pasture in river flood zone

Fallow Forrest and river buffer

Area of current cultivation:maize, yuca, rice

Third year after cultivation Forest Fallow

Fourth year after cultivation Forest Fallow

Fifth year after cultivation Forest Fallow

Yuca and Bananas-Second Year after cultivation "Choza" for storage

Fencing

Developed pasture with trees for shade and fruit

Kitchen and Storehouse

House

Fallow: Use # Years	Total Hec.	Cleared barbecho cultivation	Fallow Barbecho	Pastures Cultivated	Pastures Natural	Rice	Maize	Yuca	Sugar Cane CROPS	Fruit trees
5:2	46	7	30		6	4	1.25	1.5	.25	-
5:2	38	1.5	15.5	2		1	1	.5		2
2:1	30	7	21	1.5		3.5	3.5			1.5
5:2	28	1.5	20.5			1	1	1		
6:1	17	1	7.5		8	1	1			
5:1	22	3.5	16.5	1		1.5	1.5	.5		
4:1	20	3	8	2	7	1.5	1	.5		.5
5:1	30	5.5	26			7				
6:1	2.10	1.6				1.5	—1.5			.1

CHART III -

Individual Strategies: A selection from a larger sample noting importance of fallow

This chart illustrates some of the strategies of individual Huaytu farmers. Note the high ratio of total number of hectares in each unit in fallow barbecho, and the total number of hectares cultivated in the various crops.

Other Primary Sector Activities

The subsidiary cultivation areas used by Huaytu colonists were opened up by lumber roads. Lumbering activities are presently confined to the dry season when the Surutú can be forded by the madereo trucks. The trees sought are given in List III-1. Lumbering activities in the Serrania are legal, licensed and jealously coveted concessions in most cases, though lumberjacks also make private deals with the owners of large (1000 hectare+) areas @ \$b 100/tree. Although they are paid much more than this by the trunk or in the case of the more valuable woods by the cubic meter, the work of lumbering is the building of roads with a truck to pull roots and hoes. With tools no more sophisticated than this lumberjacks are currently building a road across the mountains which will eventually connect Huaytu by another route to the city of Santa Cruz.

The immediate colony's valuable lumber was consigned at the time the basic infrastructure was built; colonists never had the resource of valuable tropical hardwoods to finance their early years. There are only two lumbering operations based in Huaytu; most the 30+/day trucks which pass in the dry season are of outside operations.

Hunting is an important activity which supplements the diet with deer, several giant rodents and other mammals. A list of the animals in the area of Huaytu is given. Meat and some animal skins are sold.

Fishing is seasonal. A list of the common names of the area fish is given in List III-3.

Cottage Industries

Bricks and tiles are made and fired locally. The most active brickworks fires eight or nine times a year earning an annual average of \$b 15,000 from the strictly local sale of bricks. Brick and tile making in Huaytu was begun by a seasonal laborer who recognized a suitable clay deposit and convinced his patron to begin a works.

Straw mats are woven from palm in a style common in the Amazon. In Huaytu, house roofs are also woven in a style known as the Tacha Guaraya. Better than mere thatch, these woven roofs last up to fourteen years and begin to require repair after seven to nine years.

Preserves are the other major form of artesanal production. There is a traditional level, practiced by the Orientales which emphasizes fruit jells and candies and a modern level, taught by a recent home economics promoter.

LIST III- 4 (Huaytu, Santa Cruz)

TREES

<u>Local names</u>	<u>Latin</u>	<u>Uses</u>
Higueron		boxes for export items
Bibosi		"
Ochoó	<i>Hura crepitans</i> L.	"
Gabún		lamination
Aliso	<i>Alnus jorrullensis</i>	lamination
Yesquero	<i>Cariniana estrellensis</i>	construction planks
Cosorrío		window frames
Mara	<i>swietenia macrophylla</i>	furniture
Verdolago	<i>Terminalia amazonica</i>	construction
Tahibó	<i>Tabebuia</i> sp.	construction
Almendrillo	<i>Raralea oppositifolia</i> or <i>Terminalia</i> sp.	hardwood sold to Argentina for parquet (Yapacani area)
Cedro	<i>Cedrela odorata</i>	
Chuqui		red hardwood used for local fenceposts
Kurupartí (Kuruparo)		
Lengua de Vaca		used for fenceposts carbon and for brick firings
Pacay		used for firing bricks
Lengua de Vaca		
Guayavó		

LIST III - 3 (Huaytu, Santa Cruz)

FISH

<u>Local name</u>	<u>Species name/English</u>	<u>Distribution and Characteristics</u>
Sardina		a small, 5" fat fish in the river and the quebradas
S aballo		15" fish, lead colored with pink which digs in the mud during the day and comes to the surface at night (fine teeth) - river
Vagre	Catfish	fished from "pozos" (pools of standing water in the river and Quebradas), quebradas and river
Torrito		river, quebrada 8" (espinoza)
zurubi		24", found in the pozos (black and white striped fangs in open mouth)
Bocaybolsa		up to 18", in river (dark with white belly)
Benton		(like saballo dark brown tiene diente)
Carachenta		in still pozos of quebradas (tiene pugas) broad small 3"
Tachacá		bottom dweller in mud
Doradillo		yellow and orange, found in deep pozos in river and in the Yapacani

House Types

House types vary in Huaytu according to place of origin and economic status. The "matacu" (or motocu) is a simple palm thatched wattle and daub structure. There are several variations. The sides of palm leaf roofed buildings may be 1) split bamboo; 2) full tacuara bamboo cane pole; 3) tabique--a wall frame of waddled bamboo, saplings etc. filled with beaten mud--which simply encloses the area or which reaches the roof or 4) tapia de adobe: a kind of wattle and daub. A few odd structures combine the highland adobe wall element with thatch roofs of palm, though adobe walled buildings are more commonly roofed with tile or "tin".

Kitchens are generally thatch and pole or tabique. Only a few kitchens of highland colonists are adobe. A detached kitchen is the rule. Appended plates illustrate some of the house types.

In a survey of thirty two households, thatch roofs were most prevalent in the main building used for sleeping quarters, followed by tile and tin. Adobe was the most common wall construction; an equal number of main buildings were of wattle and daub type wall construction and of brick. About 12% were pole wall construction. All units surveyed had at least two buildings: sleeping quarters and a kitchen; 20% had additional outbuildings such as a garage, a storage deposito, a granja (barn with open sides), or storage galpon with a ladder leading to its elevated platform.*

Domestic Energy

Firewood is the primary fuel for cooking, followed by gas. Gas, delivered in tanks, is a practical alternative for the roadside households. Charcoal is incidentally produced in the ovens which are extremely common; it is used only during the colder months to place in ceramic pots to heat sleeping quarters.

Lighting is provided by kerosene or gasoline fueled pressure lamps, rarely by candles, and by the tin kerosene burning micheros. In Huaytu, even the wealthier families have micheros for use on muggy nights before rains: brighter lights simply attracts too many insects. Lighting is regarded as expensive: pressure lamps burn up to \$b 120 worth of fuel a month. Electricity is a desired alternative. The CRE (Rural Electric Cooperative) is presently building a line from Montero to Yapacani and has offered to string a line into Huaytu if a minimal number of subscribers join and a minimum initial fee (\$b20,000 was cited as the figure) is collected. Although everyone with whom possible electrification was discussed expressed enthusiasm, the organization of Huaytu cooperative subscribers--like so many other organizational efforts--has been invested in a single individual who has simply done nothing to pursue the opportunity.

The industrial uses of energy are limited to devices to hull, husk or mill grain, powered by gasoline motors or diesel fuel. Devices of this type based on electricity have an important potential for individual consumer/commercial farmer producers in Huaytu.

Trucks have been the most important major investment of Huaytu

colonists; because of the need to keep small local emergency supplies of gasoline, gasoline powered devices are preferred in pressure lamps and hand tools. For drying, the sun and ovens are used.

Water

About 20% of the Huaytu households have deep wells or norias; all the others obtain water from the streams (quebradas). Women with wells tend to wash small amounts of clothes every day; others wash in the ponds along the road or in the streams about once a week.

Personal use of water varies by place of origin. The Orientales begin each day by washing, and will pour buckets of water over their bodies after work. As Allyn Stearman noted in her evaluation of San Julian, the highlanders retain a resistance to bathing logical in the cold uplands but ill suited to the tropics. (1978).

Liquid intake is highly regularized in the diet. A variety of teas, coffee, milk, peanut drink, "frescos" from fruit juices or honey and milk are taken with every meal and are served at regular intervals during the day. Soft drinks and beer keep the little stores in business. Water is regarded more as an emergency liquid, as the processed home prepared drinks are definitely preferred.



Limed adobe with pillars and tile roof



Tabique (pressed mud waddle and daub) and matacu

HUAYTU HOUSE TYPES

Split bamboo walled house with matacu palm roof



Open sided kitchen with oven and palm roof



Meat drying in the sun (Huaytu)



Beehives in rafters of a "matacu"



The "noria" well to table water and typical storage tin can with calabasa gourd used for dipping

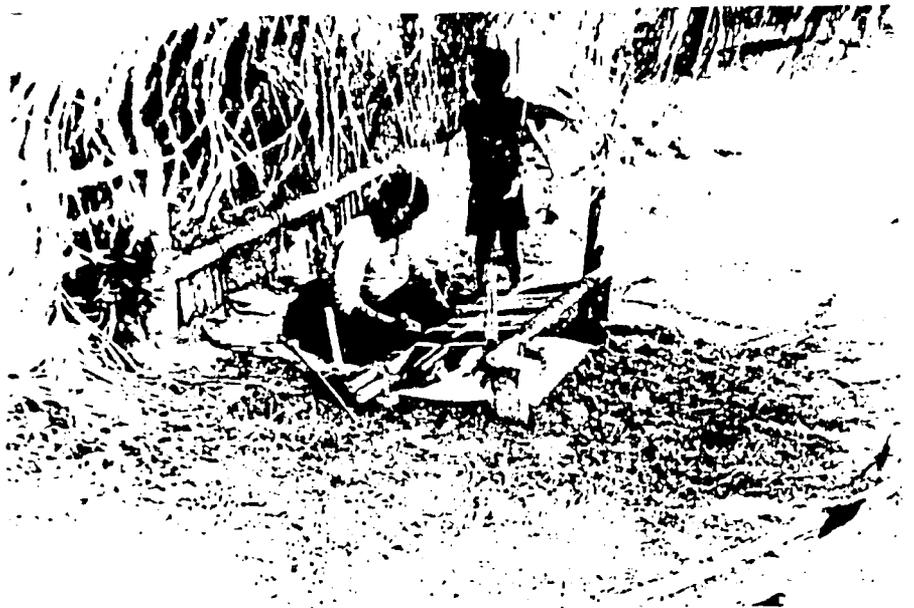
HUAYTU TECHNOLOGIES



Molding ceramic tiles



The Tacu for hand grinding



Highland colonist weaving in Huaytu

Health and Environment

Malaria, dysentery, cough and "weak lungs", skin infections and snake bites were reported by the nurse stationed at Huaytu as the most common ailments. Examinations of medical diagnoses for a two year period yielded the following in order of frequency: skin infections, respiratory diseases, malaria, dysenteries, "parasitosis," "mal de ojo" tuberculosis, pneumonia, enteritis, "weakness" or anemia, spontaneous abortions and "ataque viliar."

Malaria

Malaria is probably more common than the diagnoses reflect, in view of its varied symptomatology--not only the delirious fevers but pneumonic, dysenteric, cerebral and other forms simulating other diseases.

The most common anopheline vectors of malaria "prefer breeding sites exposed to sunlight" (UNESCO 1978:387) in pools of standing water. When Huaytu was built the road was elevated from the sandy loam mesa with local fill. Spaced at about 500 m. intervals are standing ponds where earth was dug to build the road. In building the road, the Army also built an anopheline habitat.

The colonists identify the higher altitude bosque virginal during all seasons of the year as the most mosquito-ridden area, though just before any rain Huaytu itself is unpleasant. Clearing activities in the high forest may expose some pools to create the *Anaphales darlingi* habitat; however, *A. cruzi* may be breeding in the tanks of bromeliads growing in the canopy forest (UNESCO 1978:387 citing Dean 1966).

Physiological tolerance to malaria (*Plasmodium brasilianum* or *simium*) varies among colonists. Native groups in endemic malarious regions have been observed to possess a relative immunity; acquired immunity as symptomless infection may develop as a result of repeated infections. Hypersensitiveness to toxins can however result in sudden death (Craig and Faust 1951:260,264). One long term Colla colonist stated he had experienced at least one incident of fever-chills every year for a quarter century but that he "cures himself" with a 3 day dose of chloroquine (Cloroquina; Camoquin). A long term Camba claimed he had never experienced the chills, though at age 56 he is simultaneously suffering the cerebral, pneumonic and gastro-intestinal symptoms. Nutrition and individual immune systems may be underlying variables: malaria is most feared by the Collas and has claimed many highland colonists' lives. The ages of colonists diagnosed for malaria during the first half of 1979 clustered in the 18-26 age range: it is probable that both the infant splenic malaria and chronic types which manifest unexpected symptoms escape local diagnosis.

Bora Bora as described by the colonists and some of the skin infections diagnosed at the clinic was tentatively identified as *Leishmaniasis cutaneomucosa*--a skin parasite transmitted by sandflies of the *Lutzomyia* and *Psychodopygus* genera and also by mosquitos according to CENETROP. *Leishmaniasis* is common in Santa

Cruz. The reservoir for these parasites is the forest rodent population. When the rodent habitat is cleared or their numbers are reduced by hunting, transmission to man increases. Like malaria, "bora bora" is associated by the colonists with the monte alto areas of La Banda and the Serrania. This accords with the observation that "the mature forest contains more species of biters than secondary forest" (UNESCO 1978:389).

Another disease which like Leishmaniasis increases when pioneer settler activities disturb tropical forest environments is the Mal de Chagas. Chagas disease is only beginning to be recognized in the Santa Cruz area as it is commonly manifested by heart attacks, the causes of which are not routinely identified. It is likely to be on the increase. "Reservoir hosts in sylvatic cycle include rodents, marsupials and edentates (UNESCO 1978:389); species of these orders are amply represented in the Huaytu vicinity. When these populations retreat in the face of hunting and land clearing, the triatomid bug (the vinchuca) adapts to human dwellings and human blood (:389). The bug live in the matacu palm thatch roofs and in the cracks of unsealed mud walls. Domestic animals such as cats, dogs and pigs can also become a reservoir population (Craig and Faust 1951:207).

The "mal de ojo" described by the colonists is tentatively identified as the ocular tropism of onchocerciasis, another skin parasite, though the symptoms accord with initial allergic reaction to vinchucas which bite the soft skin around the eye.

Intestinal parasites and the etiology of the dysenteries are rarely identified, though the Buena Vista clinic does perform stool examinations by referral. According to CENETROP surveys in Santa Cruz, 91% of the adults, 95% of the school age children and 85% of preschoolers are infected with intestinal parasites: 70% hookworm (Ancylostomidae), 69% *Ascaris lumbricoides*, 64% whipworm (*Trichurus trichura*), 16% a roundworm *Strongyloidea*, 2% the flagellate *Giardia lamblia* and 3% the amoeba which produces dysentery: *Entamoeba histolytica*.

The creeping eruption of hookworm was both observed and described in Huaytu. Its complicating effects on pregnancy may explain the number of spontaneous abortions. The *Ancylostoma braziliense* filariform may be transmitted by dogs or cats to humans, but it is of course contact with human fecal matter which transmits the disease among hosts. Hookworm must be attacked at the community level as human hosts are essential. The roundworm and whipworm are more problematical as these can live for long periods in warm moist soil.

Various habits in Huaytu promote these parasitic infections. Boiling water is uncommon. The reasons given are the preference for cool water and that the greatest need to drink arises when people are working in the fields away from the homestead. Water storage is unsanitary: in open tin cans. Water for a full days use (about 5 gallons per household per day) is draw from the springs or from wells in the morning. The storage method defeats the purpose of table water wells. Food is prepared several times a day: at noon and at night, food is cooked, but at intermediate meals (breakfast and a 4 pm snack) food is only reheated. Main dishes such as cooked rice sit out, usually exposed, less frequently in covered pots and rarely in refrigerators.

The squat latrine which is the most common type of Huaytu appears to be worse than no latrine as an environment for hookworm transmission.

It is notable that tuberculosis has been diagnosed in Huaytu--another community disease. The prevalence of respiratory illness and "bag lungs" however may mask both hookworm and malaria. The diagnosis of anemia or weakness should by no means be automatically attributed to the diet which includes a high intake of protein as eggs and meat in comparison to other Bolivian campesino diets. Rather, this is a side effect of the illness detailed above as well as secondary bacterial infections induced by the parasites. "Weakness," anemia and TB were treated alike at the sanitary post with shots of calcium.

During the period of observation in Huaytu, three people died. The medical post and the local health system was no more than a way station in the ardent search for medical care in critical cases. A baby burned; her family stopped at the medical post, stopped at Buena Vista and finally, half a day later, the baby died in a Santa Cruz emergency room.

The medical post is unprofessionally attended and inadequately supplied, though \$b 20 per visit is charged. There were no malaria tablets in Huaytu during the observation period and the means to obtain them was a point of conflict. The post nurse claimed the transport of medical supplies was the responsibility of the nonfunctioning health committee; a sanitario auxillar in private practice claimed he was not licensed to dispense them; a vendor of vet supplies was seriously considering defying Sanidad regulations and obtaining a supply for the community.

Health practitioners in Huaytu also included two midwives and folk healers including the Chiquitanos. It is ironic that until a Brazilian pharmaceutical company was given a license to extract quinine from the area that the colonists of Huaytu could rely on a Chiquitano quinine tea as their malarial remedy.

The settlement pattern of Huaytu may be the most favorable element in the health environment. Although the structure of the line of houses along the road without a distinct nucleus may have inhibited the consolidation of the community, the separation of households by at least 100 meters also inhibits the transfer of many diseases, confining hookworm for example to the infected homestead. McDaniel (1972) studied the differences in the epidemiological and ethnographic patterns of the native versus the in-migrant highland settlers in a Peruvian colonization area. He found that the native population, which maintained a pattern of dispersed homestead sites, suffered from less parasitic infections than the highlanders, who clustered their houses.

APPROPRIATE TECHNOLOGY FOR HUAYTU

The colonists of Huaytu engage in a range of farm production strategies so different segments of the community express different classes of needs for agricultural problems. The more commercially oriented farmers cite the need for agricultural credit to pay harvest laborers as their most pressing need. These same farmers face the problem of soil exhaustion, the "barbecho crisis" as it was identified by Simon Maxwell (1979). Colonists involved in a more intensive use of their land specify the problem of the fruit tree blight.

Universally, the colonists are concerned with obtaining health care. The system of rural health delivery is weak, forcing even the poorest to seek care in Santa Cruz. The prospect of economic ruin for the family because of the expenses involved in the slow, tedious service available there means that Huaytu families without friends or relatives in Santa Cruz do not have this option.

The women of Huaytu are interested in developing skills to produce marketable goods. One specific plan exists to use the capital fund of the Club de Madres to begin making preserves and candies for sale. The plan is sound: fruits are in season all year long (See Chart on Agricultural Cycle); the colony produces chocolate, peanuts and sugar for which hand mills exist locally; there is a market in the highland urban centers.

Huaytu has been the subject of several change oriented agencies of agricultural extension, as have the other Santa Cruz national colonies. At present, different groups advocate different kinds of agricultural technologies all aimed at the intensification or the acceleration of agriculture.

Boserup (1965) remains the leading model of intensification of a swidden system in a tropical forest habitat; the model of Greenland (1974) is also relevant. Boserup identifies the following stages:

- Forest-fallow cultivation
- Bush-fallow cultivation
- Short-fallow cultivation
- Annual cropping

Greenland identifies four phases, from "simple shifting cultivation" in which both dwellings and the cultivation area shift together (I), through II- cultivated areas shift more frequently than dwellings and complex field types may occur, III recurrent cultivation with continuously cultivated plots which is always complex with several field types and finally IV continuous cultivation alternated with husbandry. (As cited in UNESCO 1978).

The people of Huaytu are involved in all these types. In the subsidiary areas (See description above) there are former Huaytu residents who have moved dwellings and fields together into the high forest opened by lumbering roads. The majority of the colonists are involved in bush-fallow cultivation (Boserup) in Greenland's Phase III. What varies marketed is the length of the bush fallow.

Boserup identifies the stage of short-fallow as the point linked to the use of the plow. As an arbitrary division, those farmers who leave a field for as long as eight years to fallow in forest regrowth can be identified as bush fallow cultivators, while the many who have narrowed the fallow to less time—the prevalent 1:4 ratio—can be identified as short-fallow cultivators in a technological position to be receptive to plow agriculture.

The important point should be made that "increase in intensity is paid for by a reduction in work productivity as long as mechanization and fertilizers have not been introduced; people forced to obtain their subsistence from a smaller area must work harder" (UNESCO 1978:422) The restricted land base of the internal colony has produced this situation, leading in part to the need for labor external to the colony. However, it should also be noted that "intensification occurs only under demographic pressure" (ibid.) The subsidiary areas of cultivation in the Huaytu area offer the least labor intense form of cultivation: chaqueado en monte alto. As long as these areas exist, shifting cultivation will be preferred by the colonists.

In terms of the short-fallow practiced within the colony, a model can be sketched concerning intensification as practiced or proposed:

Use for 2 years: Maize Year 1
 Yuca Year 2
 (Bananas Year 2 +)

Fallow 12 years

Use 2 years (Rice or Maize Year I)

Fallow 8 years

Reduce ratio of use and fallow: 1:4, 1:3

Need for fertilization

1) Plowed permanent field cultivation in
 crop relay

In demonstration

2) Permanent plowed field double-crop and in
 crop relay

In demonstration

Reduction in fallow —————> Exhaustion ———> Pasture

Use for several years ———> Cultivated pasture

Those who advocate the cultivation of pastures as an alternative are proposing the "end game" of tropical forest intensification. In other areas, such as the llanos of Colombia, after twenty-five years of colonization, pasture of poor quality has resulted; similarly, in broad areas of Santa Cruz, low quality pastures are the dominant land use.

"Cattle have never supported appreciable human population densities. In fact the reverse occurs as cattle are used to fill empty areas. The conversion to permanent grasslands on scrub savanna provides the greatest threat to the survival of tropical moist forests...Clearing the forest reflects population pressure elsewhere, not locally. The failure to establish either a stable short fallow or permanent cultivation and the availability of new forests reflects this lack of local population pressure.' Abandoned swiddens become available to cattlemen at low cost who maintain the vegetation as a grassland. This shifting cultivation is replaced by an even more extensive form of land use — cattle grazing...Pasture is poor...Cattle quality and quantity are low. The beef and milk produced are too expensive for most people, but there is a market, and the demand for even low quality grazing land is great.

Thus while shifting cultivation is the instrument of forest destruction in frontier regions, it is cattle ranching which impedes the forest recovery." (UNESCO 1978:477)

The long fallow practiced by many colonists of at least twelve years is a rest period sufficient to restore the structure of the forest. Any reduction in this fallow below about ten years, produces dramatic changes in yields (Cf. Nye and Greenland). The notion of mulching and use of fertilizers, therefore, is the most applicable and appropriate technology to introduce to the majority of the campesinos. As Devevan has noted,

"natural fertility may be increased by mulches, composts, manures, ash and manufactured fertilizers. Soil structure can be improved by hoeing, mounding

and ridging, ultimately by terracing."

(Denevan 1975)

In terms of improving the farmers' income, any improvements of rice production would benefit the greatest number of campesinos, not only in Huaytu, but in other colonization areas of Bolivia. It is important therefore to discuss the various interventions of appropriate technology for rice.

Rice Devices

Various devices exist which could profitably be introduced into the various stages of rice production.

At the stage of monte alto clearing, motor saws and small motor weeders such as the U.S. commercial product, "Weeder Eater", are likely candidates. Changes can be suggested in field preparation technology and timing away from the early, windy seasonal burnings in which the precious humus content of the sandy loam is burned and ash is burned off, precipitating the exhaustion of the barbechos toward tilling in ash and vegetation as compost could be made. Animal traction is not a clear, universal alternative for this change, however. On the flatter extensive barbechos of the cooperatives' rice production areas, tractors are already the preferred alternative, owned or rented and rotated for members' use by the cooperatives. On the smaller (1/2 hectare to 8 hectare) barbecho of the internal colony lomas, animal traction may be an alternative as these lands, developed in rotation in some cases for twenty-four years, have been freed of prominent stumps. On the new monte alto chacos, however, animal traction is as unlikely an option as tractors. Some farmers with new chacos near a road used trucks to pull the larger stumps, but the remote chacos do not have this option. The new chacos—and some of the installed barbechos sembraderos internal to the colony—are in very hilly areas. Huaytu itself is situated on a plateau. East of the colony, the topography is broken by foothills and streambeds; west of the colony, the land drops sharply to the Surutu River. Just past the uncultivable flood zone of the west bank, the topography is broken by the foothills of a cordillera.

At the stage of planting, the existing maguinas sembradoras already represent a labor-saving device introduced about a decade ago and universally accepted and used. Those who do not own planting machines try to arrange to borrow one. Promotion of their fulltime artisan production in Bolivia would be the most important AT aid — perhaps including credits — so that artisan could even out production over the year and stockpile for the strictly seasonal sales.

At the stage of weeding, motor-powered hand weeders are a potential labor-saving device. In fields planted in distinct rows (versus the turpido crop-spacing), cultivators may be the most attractive element in an animal traction tool kit. Cultivators are the only item in the inventory of animal traction equipment offered by the CCM which Huaytu farmers have purchased on their own initiative. In the Dutch COOPERHOLTA project at Tarapoto, Peru, where animal traction AT introduction and demonstration is more mature, cultivators have been purchased by farmers. The COOPERHOLTA AT specialist, Ben Mensink, took this cue to gear his demonstrations of animal traction to the cultivator element. He carries his horses and rigs on a truck to demonstrate that technical approach to weeding. It is important to note that accessing fields is the most indicated innovation, both by the improvement of feeder road infrastructure and by bridging the Surutú. Simple solutions include increasing the number of horses available to ride to outlying fields and aerial pulley bridges across major rivers such as the Surutú.

At the stage of harvest, a number of complications arise. The hand harvesters of Huaytu are limited to certain seed varieties and hampered by a prohibitively priced manual labor cost. Yet this hand harvesting has some advantages. First, it sloughs the necessity of weeding. Hand harvesting rescues the rice from the high weeds. The weeds themselves also protect, to a certain degree, the rice head from falling to the ground. By stooping, a hand can find the head of rice of those rice plants which have been leveled by a sur wind or which have collapsed from excessive moisture.

Two outside agencies working on the problem of rice harvests are considering alternative models. The resident Mennonite agronomist is entertaining the idea of experimenting with animal traction to cut the whole field and then to thresh the rice in the field. CIAT, the Centro de Investigación de Agricultura Tropical, a joint venture of MACA, CORECRUZ and the British mission, has been actively experimenting with the combination of introducing a hand scythe or sickle (hoz) and a field trasher (trilladoro). Several models which co-vary in a continuum of portability to field sites, fanegas threshed per hour and price have been used. Their alternatives as presented in the recent Agricultural and Forestry Fair of Santa Cruz include the following:

1. A combination of a hoz and a trilladora a golpe developed by CIAT Columbia for less than \$b 1,500, which allows for the harvest (segar) and threshing (triller) of one to five fanegas a day. This model can be carried by two men to the field site;
2. A combination of a hoz and a pedel-design trilladora developed by CIAT from an Asian design, which threshes three fanegas a day. Two men can also carry this thresher to the field site. It required an additional step of wind winnowing, which was rejected by farmers. In field trials, the petal-designed thresher was a failure; too much chaff and extraneous material was produced; and
3. A hoz and either a small mechanical thresher (Despicadora Mecanica Pequena), manufactured in Japan and selling for less than \$b 30,000 which threshes five to ten fanegas an hour, or a larger model manufactured in Brazil selling for \$b 80,000 and threshing ten to twenty fanegas an hour. The disadvantage of both of these threshers is that they must be transported to the field by truck—ruling out their use in unaccessed fields.

CIAT is now considering importing an intermediate thresher, the patent of which is in the public domain in Britain, for field trial next year.

CIAT is concerned with on-site threshing to enable the introduction of the varieties of rice which they now recommend after experimental planting. These varieties can be stored in sacks after the unhulled heads are threshed from the stalk.

These solutions seem less than socially feasible. One reason is the existing dynamics of moving the rice to the thresher versus moving the thresher to the rice. (Personal Communication: Simon Maxwell, CIAT.) Unhulled rice on the head stalk can be stored for later thrashing and hulling in crude storage sheds (the open-sided galpones). Rice threshed at harvest would either have to be sold at the lowest annual price or would require a more sophisticated infrastructure of temperature and moisture-controlled silos to command higher prices.

Another proposed solution is to switch from cutting only the head of the rice to cutting the whole plant at the base, whether with scythes, sickles or animal traction devices. This method is used in the Japanese colonies, and was demonstrated in Huaytu for several years by a farmer from the Japanese colony who married a Huaytu woman. According to Huaytu farmers who worked with or observed the large operation he mounted in La Banda, the operation was costly, inappropriate to their scale of production, and possible only because the Japanese was able to borrow "capital" from his colony's credit fund. The costs included 1) renting the thresher and the truck to carry it to the field; 2) construction of many large galpones for temporary storage of the rice plants; 3) a large stock of bags to carry the threshed rice, financially feasible in a large operation each year (8-10 hectares) which in turn, drove up the 4) cost of labor. After four years of this style production, the Japanese colonist and his wife made enough money to set up a store in Santa Cruz—abandoning the land to fallow.

The CCM proposal should be evaluated in the context of doublecropping—if animal-powered threshing and cutting were performed in the field, after the harvest operation, the animal rigs could be used to plow in the roots to prepare for the next crop. Timing and storage are critical constraints. In the smaller, more intense (and less commercial) operations, another crop (maize and yuca or bananas) is planted either within two months of the rice harvest or else nearly six months later. The variable is the deposition of the rice crop—if it is stored unthreshed, the farmer can move quickly into another crop. If it is further processed, the preparation of rice for sale requires at least a month, and the dry season must be weathered before replanting.

The greatest benefit to the greatest number of rice farmers would be the introduction of available, low interest credits delivered on time so that the rice farmer would own his crop after harvest. The upgrading of the harvest procedure with mechanical harvesting or threshing has a more limited applicability and this upgrading can only be financed if the rice farmers' income from rice production can be improved by credits.

It is important to note that where harvest techniques upgrading by mechanization is most applicable is in the extensive, flatter areas which in Huaytu are accessed by roads. Here, too, the problem of gradual barbecho soil exhaustion on the field, together with the stubble and roots harrowed into the soil, could be proposed for experimental demonstration.

After the need to own their rice after harvest, a need for devices to dry and hull rice is most acute. Rice farmers who are able to dry and hull their rice before sale are at an obvious economic advantage—estimating from 1979 prices, across varieties and quality—by \$b 320/fanega over those who sell their crop in the field and by \$b 155/fanega over those who sell their rice en chala.

Rather than purchase rice for milling at its single industrial fifteen-year-old peleadora in Buena Vista, FENCA would be serving its cooperative members better by offering producers the opportunity to hull rice there at a lower-than-commercial service fee. Among the thirty-one other mills in the Santa Cruz area, only a few will hull for a fee; molinas prefer to purchase rice, wet from the recent harvesting or dry at different prices, perform the necessary drying and hulling, and then sell dry, harvested rice to wholesalers, obviously at a profit. It is only the rice dried on hides or on canchas rented for a fee and hulled for a service fee at the small localized peleadoras which producers are able to sell at the highest stage of processing.

The nature of rice dryers which could be introduced must be studied in terms of habits, climate and energy availability in each area. In Huaytu, rice is dried during the sunny, less windy, periods. Small quantities are removed from storage en chala for hulling until the rains begin. Dried rice is taken in bags on horseback or on one's back to the single weekend-operating despicadora. At roadside locations, natural gas is available to Huaytu householders as it is to anyone in Santa Cruz; firewood is the most typical fuel. Solar-powered driers would have to be very small. There are actually few unshaded areas close to the houses and open spaces such as pastures and cropped rice fields are impractical.

The diffusion of community-based, if not cooperatively-owned, threshers to remove the rice from the head and more hullers also would be welcomed. The owners of the small hullers seem to experience a syndrome of burning out or otherwise taxing their machines into disrepair by an initial crush of customers in an effort to make a quick return on their substantial investment. Interpersonal problems also arise with customers, leading millers to withdraw their services from the community's public.

Rotation of Other Crops

Soya

The rotation of rice and soya on the same barbecho has been experimentally introduced by AZAR and CCM. The current president of FENCA is interested in promoting the rotation of rice with soya. As a legume which returns nutrients to the soil, this crop may extend the utility of the barbecho. The soya market is, however, immature in Boliviz.

Cacao

When Cooperative La Chicaña purchased its 150 hectare Estacia Tacu tract, the members burned the cacao plantation installed there. While these trees had been planted several decades ago when cacao was the major crop of that particular hacienda and may not have been healthy, the economic rationality of burning a crop worth (1978) \$b 400/arroba for one worth (September 1979) \$b 80 in its most processed state, is weak. Rehabilitation of the cacao plantation would have probably cost less than clearing the trees like any other nuisance vegetation in the way of rice. Significantly, only the long-term and Orientales/camba Huaytu neighbors were shocked by this decision. The Cooperative members who made the decision, predominantly born in the highlands, did not even recognize the trees as cacao. The installation of permanent tree crops in old barbechos is an important alternative. Problems in the generalization of this solution are discussed in the section on fruit trees.

Traditional rotation

The present use of barbecho rice fields in the second or third year for maize (3-4 croppings) and yuca (harvested a year later) must be recognized as a important subsistence strategy, particularly for rice cultivators located outside of the accessed areas. The rotation of rice barbechos into temporary pasture for a small number of cows in the internal colony lote areas is practiced by a minority of the farmers. It should be stressed that the broad pasture areas apparent in the colony are not new; these areas were developed and maintained under the estate system a quarter of a century ago. Pasture installed on barbechos is, in Huaytu, regarded as a temporary use alternative to abandoning barbechos after three to four years for as long a time. It is not conceived as a permanent new land use allocation, especially on the limited land base of the lotes. Outlying chaco rice

producers are simply years away from facing the problem of soil depletion; if the usufruct owners of the Herman Busch cooperative each hold 50 or more hectares, and overcoming the problems of access, farm commercially the ideal eight to ten hectares in rice, or more realistically, maximum three hectare plots, for three to four years before they return to clear the second growth on the first plot.

Research priorities:

Firebreaks

The swidden system will persist for some time to come. Experiments with non-selective chemical total weed killers to produce adequate fire-breaks may solve the problem of fire clearing in the densely settled and cultivated areas: the inadvertent destruction of neighbors' buildings and plantations.

Fruit trees

The variety of fruit trees tended in Huaytu suggests an important mode of agricultural intensification which is compatible with husbandry and gardening. If however the problem of fruit tree cultivation can be identified with the spider mite (*Oligonychus milleri*/ Acariiformes-Tetranychidae), there is no easy solution to propose. Research would be necessary, especially in the appropriate technology of biological pest control through the use of natural enemies. The variety of species and field situations where fruit trees are grown would offer a natural laboratory for research of this type.

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