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July 31, 1972

Osa Research Proposal:

**AN ESTIMATE OF THE CARRYING CAPACITY OF THE OSA PENINSULA FOR
HUMAN POPULATIONS SUPPORTED ON A SHIFTING AGRICULTURE TECHNOLOGY**

I.) INTRODUCTION:

The quantification of such age-old ecological concepts as carrying capacity for human populations is both of theoretical interest and essential to the eventual bridging of the gap between ecological theories and sound demographic and resource management policies.

The present study will be done by interviewing and observing squatter populations on the Pacific coast of the Osa Peninsula in Southwestern Costa Rica. This is an excellent system for conducting such a study as it is virtually closed: the minimal exchanges with the outside will be relatively easily monitored as all exchange is through a single barge service connecting the Osa Peninsula with the Golfito area.

II.) GOALS OF THE PROJECT:

The primary goal of the study will be to estimate the number of people which can be supported with the present shifting agriculture technology without importing energy from outside of the system.

Although the carrying capacity will remain the central thrust of the study, the first few families interviewed will be asked to provide some demographic information as well. If the collection of the demographic data does not prove to be overly time consuming, then it will be continued throughout the study. In addition to life table-type data of age-specific natalities, age-specific mortalities, etc., immigration and emigration information would also be gathered.

With a population projection for the area in hand, predictions could be made of future land clearing and general impact on the environment, and of course, when the all-important carrying capacity will be reached.

It should be noted that the demographic aspect of the study will be regarded as of secondary importance to the carrying capacity since: I.) the sample size will be far too small to make accurate projections, especially assuming huge variances in age-specific mortalities, etc. such as those uncovered in this year's O.T.S. "campesino field problems." Also, it should be pointed out that the Osa area appears bound to "fill up" quickly, and the ecologically significant question is not whether this process will take 5 years or 10 years, but how many people the land can support. The major emphasis of the study will therefore be on determining the carrying capacity.

III.) CARRYING CAPACITY CALCULATIONS:

The carrying capacity of the studied area for humans using the present agricultural systems can be approximated as follows:

assumptions:

1.) The proportions of family units of the various size classes will remain constant,

2.) As the quality of new land being brought under cultivation declines, the population will switch its agricultural practices in such a way as to preserve the same proportions of the various agricultural systems as are presently used on land of each quality category.

The calculation of the carrying capacity must take into account the amount of land of a given quality which must be kept under cultivation ~~at any one time~~ at any one time to support a given family unit size (or for theoretical purposes, one person). There must be included, in addition to this short-term unit of land area, the number of such unit areas through which a family must move its farm before the first plot has recovered sufficiently to be re-used.

These two notions can be combined as follows:

$$\text{Hectares/person at carrying capacity} = \left(\begin{array}{l} \text{Hectares of} \\ \text{land quality } Q \\ \text{\& Agricultural} \\ \text{system } S \text{ needed} \\ \text{to support 1 person} \\ \text{on a short term basis} \\ \text{(the size of a "unit} \\ \text{area")} \end{array} \right) \left(\begin{array}{l} \text{No. of Unit Areas} \\ \text{needed for a long-} \\ \text{term equilibrium} \\ \text{migration cycle} \end{array} \right) \quad \text{Eq 1}$$

For the terms in this equation one can substitute the following more measurable quantities:

$$\text{Hectares/person at carrying capacity} = \left(\frac{\text{Ave. consumption/person/year}}{\text{yield of land of quality } Q \text{ under agri. system } S / \text{year}} \right) \left(\frac{\text{No. years required for abandoned land to recover}}{\text{No. of years a plot can be farmed before abandoning}} \right) \quad \text{Eq 2}$$

Perhaps the addition of one to the last term of equation 2 requires some explanation. Imagining the following diagram of a shifting agriculture system in which each circle represents a plot of land which must be cultivated at any one time to support one person, i.e. a "unit area".

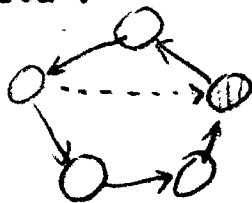


Fig. 1

If each plot in fig. 1 is farmed for a period of one year, and four years are required for fallowing before re-use, then five such plots are required, one of which will be being farmed and the other four in various stages of recovery. Similarly, if each plot is farmed 2 years, then three plots are required, or, as in equation 2,

$$\text{no. unit areas} = \frac{\text{recovery time}}{\text{farmed time}} + 1$$

Equation 2 must be expanded to encompass all agricultural systems in use and all land quality categories:

Eq. 3

$$\begin{aligned} \text{Carrying capacity} &= \sum_{\text{all agricultural systems}} \sum_{\text{all land qualities}} \left(\frac{\text{persons/Hect.}}{\text{the inverse of eq. 2}} \right) \left(\text{Proportion of the presently farmed land of Quality Q being farmed with syst. S} \right) \\ \text{in no. of people supportable on studied area} & \end{aligned}$$

total hectares of qual. A potentially available

This carrying capacity can then be expressed in terms of persons per hectare and kilograms of human biomass per hectare. These additional formulations are more readily compared with data from similar studies on other cultures.

IV.) FURTHER REFINEMENT OF THE CARRYING CAPACITY ESTIMATE:

Soil chemistry and physical data are needed as a check on the estimate of the recovery time needed between periods of farming. I suspect that the squatter population on the Ysa has been small enough so far so that re-use of abandoned land has not yet been necessary. However, if the carrying capacity is reached, re-use will obviously be a necessity.

nutrient

In addition to the depletion rates as a prediction of how much succession must take place before abandoned land becomes re-usable. Knowledge of the weed species may be critical. In many shifting agriculture

systems it is the increasing hassle of fighting weeds and insect populations that forces the migrant to move on, not the depletion of soil nutrients. The importance of insect and weed problems will not be measured empirically by quantifying leaf damage etc., but will be assessed by asking the farmer for his own evaluation. It is the problem as perceived by the farmer, not the "true" biological limitation on his production which is really relevant to predicting when he will decide to move next.

Sociological information may lead to a revision of some of the assumptions underlying the carrying capacity computations. The preliminary assumption that as population pressure mounts and the more desirable quality categories begin to dwindle, the population will switch its techniques in just such a way as to have the same proportion of the then existing supply of each land quality category cultivated by each of the various systems as exists under the present situation. Indications of flexibility may appear as correlations between the length of residency of an immigrant and the actual deterioration of his fields, the total area of cleared fields, the "ecological precautions" taken to preserve his land, his expectations for the future (including migration), and the amount of intra-community cooperation and specialization, and the diversity of crops on his land (which can be measured with the same set of formulas used in species diversity work for "H", evenness, etc.

IV.) INFORMATION TO BE COLLECTED:

A.) FARMING PRACTICES:

(asterisk * indicate prime importance)

- *Age of fields
- *Crop history: area & yields of each crop; rotation, mixed planting
- *Yield in first year
- *Yield in second year, third year, etc.
- *How long a piece of land is farmed
- *Fallowing
- *How decision to abandon land is made (weeds, insects, soil)
- *How often is weeding done
 - Who does the weeding (children?)
 - What happens if it is left unweeded
 - How long can it be left unweeded
 - How is decision made to weed (how much is he willing to weed)
- *How bad are weeds the first year, second year, etc.
- * " " " insects " " " " "
- * " " " other diseases " " " " "
- *fertilization
- *composting
- *erosion control
- *pest control practices
 - seed source
 - amount of seed sown
 - storage practices
- *Physical data on fields: size, slope, exposure, soil chemistry, porosity, particle size, color, depth . . .
- *What stage of secondary succession must be reached before abandoned land is re-useable
 - How do they choose their land when they arrive (salable trees?, water, no floods, seclusion, relatives, patrols?)
- Do they like their land
- Time between burning and cutting
- How many burnings

Do they pile wood in center of field before burning
 Time of year of burning
 Time of year of cutting
 Time of year of planting
 Time between ~~planting~~ burning & planting
 Time of harvests

B.) DEMOGRAPHIC DATA:

*Number of households of each size class
 *number of persons per household (correlate with length of time plot is farmed, etc.)

Ages

Sexes

relationships

Age at marriage & first reproduction

Age-specific birth rate,

ages at death (age-specific mortality)

ideal family size

education

income

*weights of people

immigration & emmigration

place of deaths (location-specific mortality)

causes of deaths

C.) SOCIOLOGICAL DATA:

Level of cooperation (intra-community trade ; specialization & who helps?)

*Past history (previously rice cultivators, corn, cattle, etc.)

*Plans for future land use

D.) ENERGY FLOW & CARRYING CAPACITY:

*Percent of diet from farm, forest, rivers, imports

How much useable energy from each of these sources (calories, protein)

*Diet- consumption/week of each food item

*marketing - quantities & prices

*Minimum amount of land to support family of each size class

*How much land do they intend to clear (why - use, sale?)

*what comes in on the barge, & what goes out

*Migration within area

Rate of land clearing

*Total amount of land cleared (from aerial photos)

*Total amount of land of each quality existing (from Wright?)

V.) SCHEDULE:

Date	activity
(Aug)	
5	arrival
6	orientation/or: meet Oscar Brielly, others
7	reconiter squatter areas in hills behind Rincon
8	Walk to Pacific Ocean
9	
10	
11	Collect data of shifting agriculture of Osa squatters
12	
13	
14	
15	Begin to dry soil samples
16	Return to Rincon STS field sta.
17	
18	
19	
20	Return to Pacific coast for additional data (without soil samples) possibly with helpers
21	
22	Departure

VI.) EQUIPMENT:

Tape recorder (1)

Food for backpacking

Trinkets (medicine, boullion cubes, etc.)

Food for backpacking

Slope measuring device

Compass

Distance measuring device ("Distomaster"?) if available

Graph paper

Aerial photos

Map

Soil sampler

Portable scales (4) (spring balances) one sensitive to 50 grams

one 250g- 12kg.

two for up to 50 kgs (or 1 to 10
100kgs)

Measuring tape (40 meter)

Polaroid camera

Polaroid film (10 rolls)

AN ESTIMATE OF THE CARRYING CAPACITY OF THE OSA PENINSULA FOR HUMAN POPULATIONS
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I.) ABSTRACT

An estimate was attempted of the carrying capacity of a 657 square kilometer section of the Osa Peninsula for Human populations supported with a modified form of shifting agriculture combined with some cash cropping of cattle and pigs. ~~Interventive~~ Estimates were made both based on per capita annual consumption and per hectare annual yield data from campesino interviews and based on cultivated land per capita figures from a 1963 Osa Productos Forestales lugber company survey. Fallowing times and farming times ~~from~~ for two land quality classes were incorporated into the estimates. Two scenarios were constructed based on different assumptions about cropping patterns, and estimates were made for each using both calculating techniques. Estimates of the number of persons theoretically supportable ranged from 13293 to 53528, or 20.4 to 82 persons per square kilometer. Assumptions made in the computation make such estimates useful strictly as maximum, theoretical, values.

II.) THE EXECUTION OF THE PROJECT: ON FOLLOWING THE PROPOSAL:

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A.) INFORMATION COLLECTED

The information outlined in the project proposal was collected as planned, with a few changes brought on by the exigencies of the field. As was hinted in the proposal, the demographic information for a population projection was dropped from the list for lack of time -- the amount of more strictly carrying capacity-related information was soon mushrooming out of all reasonable proportions as it was.

Information was collected by interviews with farmers and observations of their fields both in the vicinity of the airport at Rincon and in the Sirena area on the Pacific side of the Peninsula. This required a five-day trek taken from August 10-August 14, 1972, during which time I stayed with three families of campesinos in addition to interviewing the owner of a small pulperia at the mouth of the Rio Claro. The exact map coordinates of each family's holdings are given in the Soil Sample Master List in Table VI. The results of chemical analyses of the soils themselves are not yet available.

In addition to the data gathered by me personally, I was blessed with a magnificent windfall. ~~Osca~~ Oscar Breally, formerly ~~the~~ ~~engineer~~ ~~for~~ ~~the~~ ~~Osa~~ ~~Productos~~ ~~Forestales~~ ~~Company~~ ~~which~~ ~~is~~ ~~now~~ ~~an~~ ~~independent~~ ~~consulting~~ ~~engineer~~ permitted me to take and copy from the Compañia's vaults, ~~the~~ ~~the~~ a 1963 squatter survey giving information on 143 families of squatters. He also was the very epitome of cooperation in giving freely of his time, allowing me to use his maps, aerial photos, and the like.

B.) DISCREPANCIES BETWEEN WHAT PEOPLE SAY AND DO

The difficulty of deciding which of two conflicting statements to accept, or of knowing what to assume when informants say they are doing one thing but are observed doing something else, is made no less frustrating by its lack of surprise. In many cases informants simply could not remember how many years a given field had been farmed, or what the production was in a particular year, but gave an answer nevertheless in their desire to please. Such answers on a number of occasions could change radically when the question was repeated a few hours later.

In other cases local myths about the production of the land for a particular crop overrode obvious evidence to the contrary. Everyone in the Sirena area believed that 10 pigs could be supported on a hectare of bananas, but further questioning revealed that there is a banana disease in the area which caused the bananas to fall off early, and the actual number of pigs present ranged from 0.995 to 3.33 pigs per hectare. Likewise everyone, including even peons on cattle ranches, knew that the land produces 3000 lbs. of rice per hectare regardless of the age of a field. On closer questioning about specific years, the yields are often much less.

The difference between land areas as quoted by farmers and those actually measured was often astounding. A separate note on land areas is included as Appendix II.

Often items are omitted from lists of what is eaten or grown, and will only be mentioned when the interviewer knows to ask about a specific item by name. Once, for example, I was pleasantly surprised to be served a meal that included cheese and turtle eggs on return to a family that had failed to mention these items the previous day.

On one occasion I suspect I was lied to deliberately. One informant stated that he had no cows and no pigs, but did have only 6 calves in hopes of starting a small herd. The next morning I counted 20 cows, ~~and~~ 1 calf, and 6 pigs as I was leaving his farm. My coming was at a time when the squatters were understandably worried about their future under a new land owner. My efforts to dispell the natural assumption that I was a representative of the new owner may not ~~have~~ always have been believed.

The amount of cooperation among farmers was particularly hard to assess. On several occasions people were observed doing things to help neighbors such as carrying bags of sugar in exchange for an unspecified "favor," or receiving a small bag of rice as a "gift" from a friend. When questioned about such exchanges the answer was invariably that this was a freak occurrence that almost never happens.

Such discrepancies litter the path to a valid estimate of the carrying capacity, and the amount by which they detract from the value of the final estimate is as hard to assess as the statements of the campesinos themselves.

III.) AGRICULTURAL SYSTEMS IN USE ON THE OSAN

A.) THE STUDIED AREA

The area studied was chosen not to include the large cattle ranching operations on the Southern end of the Peninsula such as the huge Rio Oro Finca. Also minimized is the large Company rice growing operation at Playa Blanca, which is now slated to be converted to cattle after this year's harvest. The area studied consisted of 65672 hectares, or about 256 square miles of land, most of which belongs to the Spanish Main Corp., the principal interest in which is owned by Captain Donald Allen of San Antonio, Texas.

The area was divided into four sub areas: Rincon, Playa Blanca, Sirena, and Bahia Drake. The exact description of the boundaries of each region are given in Appendix I. The areas of the regions, and the areas represented by hills and by bottomland in each, are given in Table XII: "Amounts of Land Available in Each Land quality Category."

B.) CASH CROPPING

The situation envisioned in the proposal was one of shifting agriculturalists farming in one patch of the forest for a few years until the land wears out or the ~~woods~~ ^{weeds} assert their claim to the land, and then picking up the entire household to

out down a new patch of jungle somewhere else. After some minimum amount of time spent in other parts of a migration cycle, these theoretical people would return to their original theoretical patch to start anew. ~~xxx~~ As it is, this description is only partly true. The campesinos do not regularly move their entire household from place to place, but do occasionally leave land fallow for future use around a fixed homesite. Often, instead of abandoning land which is no longer suitable for farming; they convert the land either to bananas or pasture. Bananas do not require the maintenance work of a corn ~~ar~~, rice, or bean field, and can be fed to pigs for sale at a tidy profit.

If converted to pasture, it is then burned yearly to keep out woody growth. It is said that pastures can be maintained in this way indefinitely, although some have been observed to be abandoned, one of which had lasted as a pasture only 8 years. The Sirena campesinos saw no limit to the expansion of their farms, and envisioned themselves clearing 5-10 hectares a year until they died and then their sons and grandsons carrying on after them. "Look at Sr. Comenzo over there," said one man, "He is 60 years old and has 500 hectares of pasture cleared."

Most of the interviewed campesinos farmed only one year on a given plot of land before converting it to pasture. Once planted in pasture land cannot be reused for agriculture without a tractor. In some cases some of the cleared land is planted directly as pasture without farming it first. Where all land was first farmed before being converted to pasture, it may be that new pasture was being generated because the land was needed for farming and it was expedient to keep it as pasture in hopes of later acquiring a herd of cattle to exploit it. All campesinos interviewed that had any pasture complained of not having enough cows to put on ~~xxx~~ what they had, and said they were trying to increase their herds. The appearance of the pastures, which may have been deceptive in their wet-season best, was one of being anything but overgrazed. Shoulder-high clumps of what was described as good grazing grass were not uncommon. Informants claimed variously from 1-4 cows could be stocked per hectare, and that it takes 4 years for a cow to grow to a salable size of about 500 lbs. At \$200/100 lbs, this ~~xxxx~~ is a ^{gross} cash yield of up to \$1000/hectare/year. One farm, however, was actually producing for sale only 15 cows on 96 hectares of pasture, or \$156 per hectare per year.

Pigs are the other major cash crop. Bananas for pigs often appear to be one of the first things planted when a new family moves in, but after a point of about 15 hectares is reached, the farmer usually switches to cattle for further cash crop planting. Pigs are a hassle to raise, since they require a certain amount of work in feeding and the like. They also can cause havoc on the other operations on a farm if not confined by fences or other barriers. One family had lost almost all of one year's rice crop when pigs had found their way into the rice field. Another family had sworn off pigs outright as a commercial enterprise. Despite grandiose claims of the potential yield of pigs per hectare of bananas, farmers interviewed had an average of 2.16 pigs/hectare of bananas. Pigs grow to 100 lbs in 1 year and sell at \$200/100 lbs. This gives a cash yield of \$432/hectare of bananas.

Individual families seem to choose a specialty, usually either pigs or cattle, as is shown in a family-wise tabulation in Table XI-A. Regional differences in the proportions of families choosing each specialty are shown in Table XI-B. Here a "specialty" is taken to mean having more than 40% of one's cultivated land devoted to 1 crop.

In addition to pigs and cattle, small amounts of cacao and rice are also sold as cash crops.

C.) EXCHANGE WITH THE OUTSIDE:

The Sirena area where I did most of my interviewing is dependent for most of

its exchange with the outside on a launch which comes irregularly from Puntareñas at intervals varying from 1-3 months, stopping both at Drake and at Salsipuedes Point. Pigs and some rice and cacao are sold to the launch -- the day before I arrived at the coast \$ 42 pigs had been sold to the lancha at Salsipuedes.

Cattle are not sold to the lancha but are driven overland to Puerto Jimenez, from whence they are shipped to Golfito. There seems to be a fair amount of contact with Golfito despite its distance; two of the families interviewed had sons in Golfito on errands. Most of the clothing worn in the area comes from Golfito.

There is now a small pulparia at the mouth of the Rio Claro which is in its second year of operation. It buys all its stock from the Rio Oro Finca, and brings it along the beach by horse. I made a complete listing of the quantities and prices of items sold at this pulparia, but do not include it here out of pity for the hard-working O.F.S. secretaries.

Bahia Drake also is said to have a small pulparia. Rincon and Playa Blanca have much more exchange with the outside due to their proximity to Golfito and the presence of the Compañía's ~~primary~~ headquarters.

Exchange with the outside can be expected to increase as increased population makes commercial enterprises more lucrative. This expected increase in exchange has not been compensated for in the carrying capacity estimates.

D.) LAND CLEARING

The amount of land cleared per year can be figured from the length of residency and total amount of land cleared figures in Table VIII-A. A family-wise tabulation of yearly percapita land clearing has been prepared from this and included as Table X.

Felling is said to usually be done in January, burning in March, and planting in April. One plot was observed, however, which had been recently cut at the time of my August 10 visit. Neighboring farmers said cutting at this time of year was not good; indeed it makes intuitive sense to cut and burn in the dry season. The trunks of the trees are burned where they fall rather than being piled in the center of the field. Some ~~hazarding~~ farmers burn twice and others only once.

Clearing new land every year is accepted by the farmers as a virtual necessity. This makes it impossible for farmers to survive when prevented from clearing more land unless they have worked out a suitable system of fallowing and hold control over the "abandoned" fallow land. The squatters in the past who have been forced off their holdings by being prevented from clearing more land afford a useful preview of the problems that will arise if the carrying capacity is reached or exceeded and new uncleared land ~~is~~ simply does not exist. ~~Costa Rican law granting title to squatters who have farmed land for one year prevented the squatters from being thrown off outright and provides a unique opportunity for the ecology of the agricultural system to simulate carrying capacity conditions. One family tried to farm 3 years in the same place, another claimed to have done it up to 5-years. The first family then usually cleared an additional plot far out in the forest and commuted between its two sites for two years. They then left their holdings to work as peons far on the Rio Oro Finca for four years before returning to their original plot to clear the second growth and start ~~again~~ again. Some experience has therefore been gained by the farmers of the area in re-using fallowed land and in testing the limits of production of a single piece of ground.~~

as required in Equation 2 of the proposal is presented in Table II. The income and expenditure information for use of cash as if it were a crop like any other is also given in Table II, ~~and is summarized in Table III-A.~~ The production information is then broken down for fields of various ages in Table IV, and the consumption data is converted to annual consumption per capita of each foodstuff in Table V. Once the data is in this state it is ready for use in making the carrying capacity estimate.

Because of the discrepancies between answers given by informants on their income and expenditures, it was decided to use only the values for expenditure as these are less likely to be inflated by pride. The discrepancies between what was said to be possible and what ~~was actually done~~ was said to have been actually done with regard to fallowing times, number of years in production, and yields were all resolved by using only figures reported for actual yields and ^{cropping} history, not the claimed potential of the region's land.

Values for the terms of Equation 2 are given in Table XIV-A: "Carrying Capacity from Consumption/ Production Information." Consumption-yield information gives a value of 5.02 hectares of hillside land necessary to support one person, and 2.50 hectares of bottomland to support one person on a long-term basis. These give a total value of 22760 persons supportable in the studied area, or about 35 persons/square kilometer of the total area.

This makes the assumption that beans can be grown in the lowlands at the same production as in the highlands, even though it is known that beans generally do best on hillsides and that in the Sirena area at least it was impossible to grow beans in the lowlands due to an insect problem called a "bacilla" which has become intolerable in the last few years. Farmers in the lowlands in Sirena now buy beans from other farmers farther up in the hills.

This my information permits me to use different production values for rice and corn for hillside and bottomland, but no such land quality breakdown is possible for cattle and bananas without more information. It is therefore assumed that the ratio of cattle to bananas will remain the same as it was in that portion of the land which was devoted to cash cropping at the time of the 1963 survey.

There is some reason to believe that the proportions of land in cattle and bananas will change as population pressure mounts. One would expect bananas to do better on bottomland and cattle to be the least adversely affected by being relegated to the hillsides. However, as can be seen from the land use information in Table III and the land quality information in Table XIII, the region with the greatest proportion of hills -- Brake -- also has the least proportion of pasture.

An important fraction of the population's food supply, especially the supply of meat, comes from hunting and gathering in the forest. Were the forest to be decimated by a population size to the theoretical carrying capacity populations of this study, this food would have to be substituted for either by growing the additional food on the farms or by growing cash crops so that it could be purchased from outside. In other words, this is one more way in which the figures ^{of the car. c} calculated here are expected to err on the high side.

B.) CARRYING CAPACITY FROM PRESENT LAND USE INFORMATION

The data from the lumber company survey makes possible approaching a carrying capacity estimate from a number of different directions. The first term in Equation I of the proposal, the number of hectares needed to support one person, can be ~~estimated directly~~ approximated directly from present land and population

IV.) POPULATION OF THE STUDIED AREA

The most complete information available on the population of the area is that contained in the 1963 Osa Productos Forestales survey of "Reporte de las Fincas Ocupadas por Postedores in Precario o Invasadas por Parásitos," which is presented as Table VIII-A. The notes of Oscar Breilly on a ~~survey~~ less complete survey of the Bahia Drake area made in Feb. 1972 also contain valuable information on population as well as amounts of land cleared. These notes are included as Table VIII. I also uncovered the names of an additional 17 families on my trek to Sirena, and include them as Table VIII-B. In addition to these, there are estimates of up to 50 "oreros" -- wandering gold prospectors who spend 200-300 grams of gold dust last year when they didn't have money to make purchases in cash at the Rio Claro pulparia.

The sales at the pulparia indicate rapid population growth, possibly coupled with increased prosperity. Cipriano Valdez, owner of the pulparia at Rio Claro, says sales of most items have doubled since last year.

The number of new families arriving per year can be calculated from the information in the 1963 survey in Table VIII-A.

The original data sheets from the 1963 survey on file in the Compañía office in Rincon give names and ages for all family members in some but not all cases. This has not been copied in Table VIII-A, however. If a population projection is ever attempted, this information could be found in Rincon to supplement field observations.

Rumors of another upcoming survey, including both aerial observations in a Spanish Main Company plane and field interviews similar to the 1963 survey, open exciting possibilities for future population and carrying capacity studies.

Using the average family size information for those families in the 1963 survey for which the full family was listed, an estimate of the population at that time can be made by multiplying this figure by the total number of households listed. A region-wise breakdown of this kind of estimate is given as a part of Table XII, with a total population estimate of 910 people living in the studied area in 1963.

V.) ON MAKING THE CARRYING CAPACITY ESTIMATE

A.) USING CONSUMPTION-YIELD INFORMATION:

The presence of cash cropping complicates the calculation of a figure for the carrying capacity. This will be handled as well as possible by constructing a number of hypothetical scenarios making various assumptions about how cash cropping would be balanced with production of staples as envisioned in the original proposal.

The original formulas proposed for the purely subsistence system can be modified to deal with cash cropping as well. One makes the assumption that the average per-capita annual cash expenditure is a minimum below which people cannot be expected to live. It can then be calculated how much land is required to supply this income both with pigs and cattle, and then making an additional assumption that the proportions of bananas and pasture will not change as population pressure mounts and more marginal land is brought into production, the estimates can be made.

This last assumption is somewhat more emasculating than the one proposed in the original proposal that the proportions of each crop would not change within each land quality category. This more limiting assumption of no switching of proportions in the system as a whole, in this first scenario, is necessary due to my inability to get max land use data broken down by land quality category. Hopefully the potency of the carrying capacity estimate will not be totally lost to this partial castration.

The consumption information needed for calculating the size of a "unit area"

information for the area. The lack of data broken down by land quality again probably makes the estimates based on this technique err on the high side since the poorer quality land which has not yet been pressed into production would be expected to support less people per hectare. Estimates from this method are presented in Table XIV-B. Here a prediction is made that ~~ix~~ 1.911 hectares of hillside or 1.810 hectares of bottomland would be needed to support one person on a long-term ~~maxim~~ equilibrium basis. This would give a figure for the population supportable on the studied area of 33500, or 51 persons per square kilometer averaged over the entire area.

C) THE NO-BEANS-IN-THE-LOWLANDS SCENARIO

Since it was observed that no beans could be grown in the Sirena lowlands due to insects, an additional scenario in which only rice and corn of the staples are grown in the bottomland, and the hillsides are used entirely for beans until the maximum population of the bottomlands has been satisfied, and then ~~the~~ what remains of the hillside area is cultivated in the expected proportions ~~as~~ to support its own population until it too is exhausted.

The figures for this scenario are given in Table XIV-C., using both the consumption-yield technique and the present land use technique to make the estimates. The total figures are 13293 persons or 20.4 per square kilometer averaged over the total land area for consumption-yield, and 53528 persons or 82 / square kilometer from present landuse.

D.) CHECKS ON THE VALUES USED IN EQUATION-TWO CALCULATIONS

1.) ON THE NUMBER OF PLOTS :

One can check the number of plots value derived from Equation 2 with the "abandoned land" figures from the 1963 survey. One would predict the hillside to have a proportion of 0.75 of the land ever cleared falling into the "abandoned" category and a similar proportion of 0.40 "abandoned" in the bottom land. This is from using the values of 4 plots needed for the hillside and 2.5 plots for the bottomland.

The average figures as seen in the "Cleared but Abandoned Land" section of Table XII ~~fall~~ range from 0.481 at Playa Blanca to 0.658 at Rincon, with a Peninsula-wide weighted average of 0.518.

2.) ON THE SIZE OF A "UNIT AREA"

a.) CHECK BY COMPARISON WITH CONSUMPTION-YIELD INFORMATION AND PRESENT LAND USE DATA

The short-term land requirement figures from present land use can be checked by comparison with what one would predict from consumption-yield data. One would expect the amount of land needed on a short-term basis to supply staples and cash crops to be approximately equal to the per-capita amount of land now occupied in Table XII. Such occupied land values range from 0.722 in Rincon to ~~3~~ 2.365 in Drake, with a peninsula-wide weighted average value of 1.21 hectares per capita. This is to be compared with 2.16 hectares per capita for hillside and 1.59 hectares/capita for bottomland needed ~~text~~ as calculated in Table XIV-A from consumption and yield data. The low occupied land/capita value for Rincon may be explainable by the large outside income to many families through employment with the lumber company. If one assumes that virtually all land in production of staple crops at present is bottomland, then the peninsula wide value is 24% lower than would be predicted. This can partly be explained by Rincon. It may also be partly explainable by the assumption that the present amount of cash cropping is the minimum needed— people may have been getting along on less cash in 1963.

b.0 CHECK FROM PER CAPITA YEARLY LAND CLEARING AND LAND FALLOWING DATA:

The data on hectares cleared and hectares/^{of} abandoned land might both be useable to arrive at an estimate of the size of a "unit area." Plots of both the hectares cleared/capita/year of occupancy versus the number of years occupied, and of the number of hectares of abandoned land/capita/year of occupancy versus the number of years of occupancy could be expected to taper off asymptotically to a level approximating the size of a "unit area." Table X gives a family-wise tabulation of yearly per-capita land clearing, and land abandoned/capita/year could be derived from the untreated survey data in Table VIII-A. So far this has not been done for lack of time, but it could provide a useful additional check on the size of a "unit Area" value used in the Equation 2 computations.

VI.) CONCLUSIONS

A summary of the carrying capacity estimates is given below:

SCENARIO	ESTIMATION TECHNIQUE	TOTAL POP. SUPPORTABLE	PERSONS PER SQ. KILOMETER
All crops, including beans, are grown in all places in proportion to the needs to continue present consumption. Cattle:pig ratio remains constant.	Consumption-yield	22760	35
	Present land use	33500	51
Beans grown only in hilly areas, exchanged with lowlands for other crops including cash.	consumption-yield	13293	20.4
	present land use	53528	82

It should be noted in closing that the "carrying capacity" is not a number which carries any particular magic from a viewpoint less removed from day-to-day existence as a campesino on the Osa. No bells would ring or voices come hammer booming from the sky as the baby is born that puts the population "over the line."

The plans of the Allen family for developing the area make the potential carrying capacity as a more-or-less self-sufficient agricultural system a thing of even more rarefied theoretical interest. The allens are presently developing their Osa property to be sold as house lots in a retirement haven for Northamericans. The property is planned to support a hotel, riding stables, a golf course, yacht club and marina, watersports lagoon, and miles of double-laned paved road. The carrying capacity can therefore never be reached in the terms envisioned in this study, and the predictions made remain safely unverifiable. They would become valuable only for comparison with results from other workers in other places. It is hoped, however, that at least the methods employed in making these estimates will have applicability elsewhere.

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The no-beans-in-the-lowlands scenario

APPENDIX I : LOCATION DEFINITIONS OF REGIONS IN THE STUDIED AREA

A.) DRAKE: "Drake" was taken to be the area bounded on the North by the Allen property boundary, on the East by the Pacific Ocean, on the South by a straight line connecting Llorona Point and the junction of the ridge dividing the Riyito, Drake, and Dos Brazos river drainages, and on the West by a straight line connecting this point with point at which the Allen property boundary crosses the ridge of the Chocuco Hills.

B.) SIRENA: "Sirena" was taken to be the area bounded on the North by the Llorona Point - Drake, Riyito, Dos Brazos watershed triple divide point line, on the East by the line of the watershed division dividing the rivers flowing into the Pacific from those flowing into the Golfo Dulce, on the West by the Pacific Ocean, and on the South by an arbitrary line drawn to connect Salsipuedes Point on the Pacific side with the mouth of the Conte River on the Golfo Dulce side.

C.) PLAYA BLANCA: "Playa Blanca" was defined as the area bounded on the North by the Rincon River from its mouth at the Golfo Dulce to its junction with the Dos Brazos, then by the ridge separating the Dos Brazos and Rincon watersheds to the point where the Rincon and Sirena River drainages meet. From here the Playa Blanca area is bounded on the West by the ridge separating the Sirena and Rincon River drainages until ~~xxxx~~ this line is intersected by the Salsipuedes Point - Conte River mouth line described for the Southern boundary of the Sirena area. This line forms the Southern boundary of the Playa Blanca area, and the Golfo Dulce forms the Eastern boundary.

D.) RINCON: The region defined as "Rincon" is bounded on the North by the Allen property boundary, on the East and South by the boundaries described for Drake, Sirena, and Playa Blanca, and on the East by the Golfo Dulce.

APPENDIX II : A NOTE ON LAND AREAS

The validity of the carrying capacity estimate depends on the accuracy of figures for land areas, yields, and consumption data supplied by the farmers when interviewed by the author. Of these, the accuracy of the statements regarding land areas are the easiest to check. The discrepancies regarding land areas vary widely, and therefore cannot easily be corrected for with any kind of constant correction factor. The areas as reported by the farmers invariably show a tendency to be overestimated, and it can only be hoped that the suspected similar exaggeration of the total productions of the fields would help counter the bias in the per-hectare yield values used in the final estimate. The tenuous nature of these figures should not be forgotten in assessing the reliability of the estimate.

The several cases where independent figures are available for comparison with the farmer's own claims show varying magnitudes of discrepancy. As can be seen in Table I, for example, Belfort Brenas Mora claims to have 18.0 hectares of land, but measurement by pacing and rangefinder measurement gave an approximate total area of only 12.5 hectares, a difference of 44%.

One other set of fields measured using a rangefinder were the maize and rice fields of Francisco Morenco. These were estimated to be very approximately 3.4 hectares in area, as opposed to Francisco Morenco's own statements of areas ranging from 3 hectares to 6 hectares.

The claims of areas cleared by the farmers at times in the past can also occasionally be checked against other evidence. Francisco Morenco claimed to have cleared land at a rate of 5 hectares/year from 1954 - 1967, and at a rate of 10 hectares/year since 1968. This would give a total of 120 hectares cleared to date, 20% higher than the 100 hectares he claims to have cleared so far. If one accepts the 5 hectares/year earlier rate, then he should have had 50 hectares cleared at the time of the 1963 survey, a 35.2% discrepancy from the 37 hectares shown in the survey data in Table VIII-A. If the present 10 hectares/year rate is accepted, and the remaining 50 hectares to be accounted for are assumed to have been cleared at a constant rate from 1954 to 1967, Morenco would then have had 38.5 hectares cleared in 1963, only 4.06% different from the Company survey's value of 37 hectares.

The Company survey data in Table VIII-A checked against the claims of Anastacio Silba in Table III-E show a 33.3% discrepancy between the 30 hectares claimed for 1963 and the 22.5 hectares reported in the survey.

Measurements made on inch-to-the-mile scale aerial photos taken by the U.S.A.F. in early 1961 presented in Table IX show Anastacio Silba's holdings to be approximately 14.68 hectares, while by his own claimed land clearing history in Table III-E he had cleared 17 hectares through 1960, a difference of 15.7%.

It is important to note that in all cases where an independent check is available, the farmer's own statement of land areas proves to be an overestimate. Since only land area values as reported by the farmers themselves have been used in calculating per-hectare yields, the probable bias from this should be fully realized.

TABLE I : PRODUCTION HISTORY AND AREAS OF FIELDS OF BELFORD BRENAS MORA :

FIELD	AREA IN MANZANAS CLAIMED BY BELFORT	AREA IN HECTARES CLAIMED BY BELFORT	AREA IN HECTARES AS MEASURED BY AUTHOR
A	1	0.75	0.16
B	1	0.75	} 4.50 5.44
C	5	3.75	
C'	4	3.00	0.925
D	9	6.75	3.00
E	4	3.00	3.00
totals	24	18.00	12.5

FIELD	YEAR	CROP NO.	CROP	YIELD (LBS)	YIELD (KGS/HECT)
B	1968	1	rice	1200	727.3
		2	maize	500	303.0
B+C+C'	1969	3 for B 1 for C&C' (1.33 ave)	rice	10000	606.1
		4 for B 2 for C&C' (2.33ave)	maize	6000	363.6
	1970-71		fallow		
B+C	1972	ave 3.33	rice	3000	303.0
		ave 4.33	maize	2500	252.5
D	1970	1	rice	3000	303.0
		2	maize	2500	252.5
E	1971	1	rice	3000	202.0
		2	maize	1500	227.3

TABLE II (A-1) : YEARLY CONSUMPTION OF BELFORT BRENAS MORA:

ITEM CONSUMED	1971-2 LBS CONSUMED	1969-70 LBS CONSUMED	1972 PRICE (\$ /LB)	1971-2 EXPENDITURE	1969-70 EXPENDITURE
Beans (560/bought, 50 grown in '72)	610	505	1.50	910	760
Shortening (Manteca)	204	169	2.30	467	385
Coffee	102	85	2.50	255	212
Sugar	916	760	0.75	685	570
Eggs (N.B.: suspected exaggeration):	(3395 eggs)	(1696 eggs)			
Rice	1460	1210			
Maize (not incl. 291 lbs/yr fed chickens)	910	760			
Chickens (36"little"chickens)	79	--			
Meat (very approximate)	360	350			
Fish (very approximate)	10	10			
Bananas (9 stems)	450	374			
Oranges	140	116			
Parafionas	38	31			
Yucca (very approx.)	50	50			
author's estimates:					
Matches				20	20
Soap @ 7.5 bars/person @ \$ 2.00/bar				105	90
Salt @ 25 lbs/person				140	120
Clothing				525	425
			TOTALS	\$ 3107	\$2582
			NON-STAPLES	\$ 2197	\$1822

TABLE II (A-2) : YEARLY INCOME OF BELFORT BRENAS MORA

(14)

YEAR	ITEM	AREA CULT. (HECTS)	production (lbs)	no. PERSONS	LBS. EATEN	LBS. SOLD	INCOME (COLONES)		
1968	rice	0.75	1200	5	1210	0	0		
	maize	0.75	500		760	0	0		
	Labor		2 men					5400	
							TOTAL:	5400	
1969	rice	7.50	10000	5	1210	8190	4914	(?)also said sold none in 1969	
						600			
						(to sons)		720	
	maize	7.50	6000		760	4640	928		
				(family)					
					600		240		
					(to sons)				
	Labor		2 men				5400		
							TOTAL::	12202	
1970	rice	6.75	3000	5	1210	1190	714		
	maize	6.75	2000		760		290		
					(family)	1451			
						291	600	240	
						(chickens)	(to sons)		
	eggs		3625 eggs		3395 eggs	230eggs	77		
	labor		2 men				5400		
							TOTAL:	2755	
1971	rice	3.00	3000	6	1460	940	564	NB: also once said he sold 1000 lbs.	
						600		360	
						(to sons)			
	maize	3.00	1500		910		0	0	NB: also once said he sold 500 lbs.
					(family)				
				291					
				(chickens)					
	Eggs		3625eggs		3395 eggs	230 eggs	77		
	pigs		2 pigs			2pigs	265		
	labor		2 men				5400		
							TOTAL:	6906	
1972	rice	4.5	3000	7	1460	940	564	N.B. admits to itemized food expenditures of only ₡ 231 for 1971-72, and ₡ 1927/yr for 1968-70.	
						600			360
						(to sons)			
	maize	4.5	2500		910		140		
					(fam.)	600	240		
				291					
				(chick.)	(sons)				
	eggs		3625 eggs		3395 eg.	230eg.	77		
	labor		2 men				5400		
							TOTAL:	6761	

TABLE II (B-1): YEARLY CONSUMPTION OF ANASTACIO SILBA:

YEAR	ITEM	QUANTITY CONSUMED	SOURCE	EXPENDITURE (¢)
1972	rice	1200 lbs	farm	
	maize	1090 lbs- family 1820 lbs- chickens	farm	
	beans	240 lbs	bought from neighbors @ ¢ 1.00/lb	240
	bananas	5500 bananas	farm	
	meat	840 ^{lbs} /peccary	hunting	
		?	farm	
	turtle eggs	20 (guess)	gathered on beach	
	coffee	156 lbs	pulparia @ ¢ 4.25/lb	663
	sugar	1095 lbs	pulp. @ ¢ 1.10/lb	1205
	milk	0		
	cheese	90 (est.)	farm	
	eggs	3510 eggs (est)	farm	
	chickens	25 chickens	farm	
	shortening (manteca)	390lbs	? (probably farm)	
	salt	158 lbs	pulp. @ ¢ 0.80/lb	126
	Cacao	52 lbs	farm	
	Peones salaries;	2 in Dec. for clearing land 15 days, (est.)		240 (est)
	herbicide	2 bottles	@7.00/bottle	14
	soap	158 bars	pulp @ ¢ 2.00/bar	316
	Kerosene	52 bottles	pulp. @ ¢ 1.25/bottle	65
	fish	145 lbs	ocean	
	Corambolo	60 fruits	forest	
	(a fruit)			
	also	mangoes, oranges, manzanas de agua		
	matches	104 packages	pulp @ 0.25/pack.	26
	onions	26 lbs	pulp @ ¢ 2.50/lb.	65
	clothing		@ ¢ 75/person (est)	900
			TOTAL	3860
			NON-STAPLE	2620
			WITHOUT PEONES:	2380

TABLE II (B-2) : YEARLY INCOME OF ANASTACIO SILBA :

YEAR	ITEM	HECTS.	PRODUCTION	LBS EATEN	LBS SOLD	PRICE	INCOME
1972	rice	5	16000 (also reported (also rptd. 10000) 3000)	1200 3000)	4800 5000)	₱ 0.60 lb	₱ 2880
	maize	2	3000 (also rptd 4000)	2910 2000)	1500 5000)	₱ 0.25 lb	₱ 375
	pigs		reported: 0 pigs observed: 6 pigs				
	cattle	15 pasture (also rptd 22 hecets)	Reptd: 6 calves observed: 20 cows incl 1 calf				
	cacao	6 (also rptd 3)			1500	₱ 1.00 lb	₱ 1500
						TOTAL: ₱	4755

TABLE II (C-1) : YEARLY CONSUMPTION OF MARGARITO GUITTEREZ

YEAR	ITEM	QUANTITY CONSUMED	SOURCE	EXPENDITURE	
1972	rice	1000 lbs (accordint to daughter:365lbs)	farm (according to son; buy from neighbors: daughter farm	₱ 365	
	beans	183 lbs			
	maize	270 lbs (family) 300 lbs (chickens)	farm		
	meat	365 lbs	forest		
	eggs	600 eggs	farm		
	yucca	300 lbs	farm		
	bananas	1460 bananas	farm		
	sugañ	182.5 lbs	Pulparia @ ₱ 1.10/lb	₱ 200	
	rice seed	15 lbs	pulp. @ ₱ 1.00/lb	₱ 15	
	maize seed	50 lbs	pulp. @ ₱ 0.30/lb	₱ 15	
	bean seed	30 lbs	farm (?)		
	coffee	60.8 lbs	pulp. @ ₱ 4.25/lb	₱ 256	
	fish	80.3 lbs (approx)	ocean		
	chickens	11 lbs (5chickens)	farm		
	soap			₱ 100	
	matches			₱ 20	
	salt			₱ 42	
	clothing	approx @ ₱75/person		₱ 225	
				TOTAL	₱ 1238
				NON STAFLE:	₱ 782

TABLE II (C-2) : YEARLY INCOME OF MARGARITO GUITTEREZ ::

YEAR	ITEM	HECTS.	PRODUCTION	LBS. EATEN	LBS. SOLD	PRICE	INCOME
1971	rice	0.5	500	1000			
	maize	2.0 (?)	1000 (?)	800			
	beans	2.0 (?)	200 (?)				
	pigs	12 bananas			20 pigs (2000 lbs)	¢200/ quintal	¢ 4000
	chickens		10 chickens		10 chick.	¢5-10	¢ 75
	cattle				0		
TOTAL:							¢ 4075
1972	rice	1.0	2000(?)	1000	1000(?)	¢1.00 / ^{lb}	¢ 1000
(NB: production questioned since son observed arriving with a "gift" of rice)							
	maize	2.0	1000	270 (fam.) 300 (chick.)	0		
	beans	0.5	300	183 (eaten) 30 (seed)	87	¢ 1.10/lb	¢ 105
	pigs	15 bananas	15 pigs		10 pigs (1000 lbs)	¢200/ quint.	¢ 2000
	chickens		20 chickens	5 chick. (11lbs)	0		
	cattle				0		
TOTAL:							¢ 3105

TABLE II (D-1) : YEARLY CONSUMPTION OF FRANCISCO MORENCO:

YEAR	ITEM	QUANTITY CONSUMED	SOURCE	EXPENDITURE (COLONES)
1972	salaries to peons	3 peons all yr. @ \$ 8.00/day		11350
	rice	5 additional for 15 day clearing		
	rice	4380 lbs	farm	
	maize	365 lbs (family)		
		1820 lbs (chic. & pigs)	farm	
	beans	2555 lbs	buy from neighbors @1.20/lb approx.	3050
	bananas	7300 bananas	farm	
	chickens	only on special occasions	farm	
	milk	730 litres	farm	
	cheese	540 lbs	farm	
	sour cream	135 lbs	farm	
	coconut	some for children		
	shortening(manteca)	364 lbs approx. (52 gallons)	farm	
	sugar	910 lbs according to senora; 1200 lbs according to señor.	pulp. @ \$1.10/lb	1440 (sr.)
	coffee	78 lbs (Sra.) (82 lbs, Sr.)		347
	eggs	1485 eggs	farm	
	meat from hunting	little (last time 3 mos ago)	forest	
	meat from farm	240 lbs pork (6 pigs)	farm	
	yucca	none		
	wheat flour	96 lbs	pulp. @ \$ 1.10 / lb	105
	oranges			
	salt	400 lbs	pulp. @ 0.80/lb	320
	onions	21 lbs	pulp. @ \$ 2.50/lb	53 (est.)
	soap	75 bars	pulp @ \$ 2.00/bar	150
	matches	3 large packs.	pulp @ \$.10/largpk.	30
	liquor	claimed: none observed: 6 bottles		
	oats	little	pulp. @ \$ 4.25/can	8.50(est.)
	clothing	@ \$ 75 / pers. est.		525

TOTAL: 17378

NON STAPLES: 14328

WITHOUT PEONES :: 2978

TABLE II (D-2) : YEARLY INCOME OF FRANCISCO MORENCO:

YEAR	ITEM	HECTARES	PRODUCTION	LBS EATEN	LBS SOLD	PRICE	INCOME(%)
1972	rice	2.0	9600-14200 (Use:11200 ave)	4380	5000	Q1.20 1b	6000
	maize	reported 1 hect one time & 2-3 another time	4800	1820 (chickens & pigs) 365 (family)	(according to Rodolfo) 0		
	pigs	13-13 hecets 40-50 pigs	bananas	6 pigs (240lbs)	50 pigs (5000lbs)	Q2.00 1b	10000
	cattle	94 hecets 65 meat cows 8 milk cows	pasture	0	(according to Rodolfo) 15 cows (6000lbs)	Q2.00 1b	12000
TOTAL							28000 (BY Rodolfo's estimate)
							18000 (by Francisco's estimate)

TABLE III-A : LAND USE AND INCOMES OF INTERVIEWED CAMPESINOS

(Note: values are as told by informants for 1972)

FAMILY	NO. PEOPLE	HUMAN BIOMASS (Kgs)	HECT. RICE	HECTS. MAIZE	HECTS. BEANS	TOTAL HECTS. TILLED	HECTS. BANANA	HECTS. PAST-URE	NO. PIGS	NO. COWS
Belfort Brenas Mora	7	359.1	2.25	2.25	very little	4.5	0.5	0	0	0
Margarito Guiterez	4	269.5	1.0	2.0	0.5	3.5	15.0	21 (approx)	15	0
Francisco Morenco	10	571.8	2 (N.B.: also claimed Rice&Maize 6 H.A.)	2-3	0	4.5	13-14	94	40-50	73
Anastacio Silba	12	545.5	5	2	0	7	1	15	6 (probably low figure)	20

FAMILY	CASH INCOME PER YEAR (COLONES)	CASH EXPENDITURE PER YEAR (COLONES)	PER CAPITA EXPENDITURE PER YEAR (COLONES)
Belfort Brenas Mora	₡ 7141	₡ 3107 (total) ₡ 2197 (non-staple)	₡ 444 (total) ₡ 314 (non-staple)
Margarito Guiterez	₡ 3105	₡ 1238 (non-staple) ₡ 782 (without peones or staples)	₡ 310 (non-staple) ₡ 196 (w/o peones or staples)
Francisco Morenco	₡ 28003	₡ 17378 (total) ₡ 14328 (non-staple) ₡ 2978 (w/o peones or staples)	₡ 1738 (total) ₡ 1433 (non-staple) ₡ 298 (w/o peones or staples)
Anastacio Silba	₡ 4755	₡ 3868 (total) ₡ 2620 (non-staple) ₡ 2480 (w/o peones or staples)	₡ 322 (total) ₡ 218 (non-staple) ₡ 207 (w/o peones or staples)

Note: exchange rate in 1972: U.S.\$1.00= ₡ 8.57

TABLE III-B : FARMING AND FALLOWING TIMES OF INTERVIEWED CAMPESINOS

FARMER	NO. CROPS PER YEAR	NO. YRS. PRESENTLY ACTUALLY USES 1 FIELD CONTINUOUSLY	NO. HECTS. NOW FALLOW WHICH WILL BE REUSED	MAXIMUM NO. YRS. HE HAS ACTUALLY USED 1 FIELD IN PAST	NO. YRS. HE SAYS LAND CAN BE USED CONTINUOUSLY	NO. YRS. HE HAS ACTUALLY FALLOW & REUSED IT	NO. YRS. HE SAYS LAND SHOULD BE LEFT FALLOW BEFORE RE-USE
Belfort Brenas Mora	2	1 (both hillside & bottomland)	9.75	2	Hill: 1 Bott: 2	2 & 3 (both cases bottomland)	2
Margarito Gutterez	1	1	0	1	5	never (converts all to bananas or pasture)	10
Francisco Morenco	2	1	0	5	--	3	--
Anastacio Silba	2	1	8	3 or 4 (under company ban from clearing more land)	1	reused after 2 yrs once; reused after 4-6 yrs once; fallow 2 yrs & may be used next yr.	Señor said 2 or 3 once & 3-4 once; Sra said 3-1 plot has been fallow 2 yrs & may be used next yr.

FARMER	NO. YRS. LAND LAND HAS ACTUALLY BEEN REUSED AFTER FALLOWING	NO. YRS HE SAYS LAND CAN BE RE-USED AFTER FALLOWING	MAXIMUM NO. OF TIMES HE HAS ACTUALLY USED 1 PLOT FOR AGRICULT.	MAXIMUM NO. OF TIMES HE SAYS HE CAN USE LAND FOR AGRICULTURE
Belfort Brenas Mora	1 (both hill & bottom)	Hill: 1 Bott: 2	2	4
Margarito Gutterez	never	5	1	--
Francisco Morenco	1	--	2	--
Anastacio Silba	1	1	2 (has converted to pasture and cacao after 2nd use)	--

TABLE III-C : FUTURE PLANS AND AGRICULTURAL PROBLEMS OF INTERVIEWED CAMPESINOS

FARMER	NO. YRS. EXPECTS TO REMAIN IN ONE PLACE	TOTAL NO. HECTS EVENTUALLY PLANS TO CLEAR	WEED PROBLEMS	INSECT PROBLEMS
Belfort Brenas Mora	15 yrs.	37.5 (amt. of land leased to him by company)	weeds 1 time/ ^{per crop} the 1st yr a field is used, 2 times per crop the 2nd yr.; weeds killed some of rice crop this yr, & 1 corner of 1 field was abandoned to weeds. Some of corn is totally hidden by viny weeds.	says he has no problem with insects.
Margarito Gutterez	indefinitely	indefinite wants more pasture but not more Bananas or staples	weed rice & maize once per crop (only plant on new land)	"no problem" -- bean insect not so bad as in lowlands (Moreno & Silba)
Francisco Moreno	indefinitely	indefinite wants more pasture	Has herbicide sprayer; pastures burned yearly to keep out weeds; 6 hecst pasture have been lost to weeds.	Insects make cultivation of beans impossible - Tried to save beans with insecticide once, but was not worth it
Anastacio Silba	indefinitely	indefinite - if no more problems with company; wants both more pasture & more rice & maize. Has no intention of raising pigs.	Weeds make it best to farm only 1 yr (2 crops); Must weed once/crop 1st yr & twice/crop 2nd yr.; Sons do weeding; uses herbicide only in 2nd & 3rd yrs.	Insects make bean cultivation impossible

FARMER	SOIL FERTILITY PROBLEMS	PLANT DISEASE PROBLEMS
Belfort Brenas Mora	not aware of any problem	Diseases of both rice & corn, estimates about 10% of 1972 crops of these destroyed by disease.
Margarito Gutterez	says per hectare production declines as follows: 1st yr.: 3000 lbs rice 2nd yr.: 3000 lbs maize 3rd yr.: 3000 lbs beans 4th yr.: 2000 lbs rice 5th yr.: 2000 lbs maize 6th yr.: plant pasture or abandon	lost 1500 lbs rice in 1971, none in other years
Francisco Moreno	not mentioned	not mentioned
Anastacio Silba	on prompting mentions some problem; Says 2nd use of land just as good as 1st.	not mentioned

TABLE III-D : PERSONAL HISTORIES AND AGRICULTURAL PRACTICES OF INTERVIEWED

CAMPESINOS

FARMER	LOCALITY OF ORIGIN	PREVIOUS OCCUPATION	LENGTH OF RESIDENCY	"COOPERATION" WITH NEIGHBORS	AGRICULTURAL PRACTICES
Belfort Brenas Mora	Meseta Centrale (Vijagual de Turuales)	Had own finca	5 yrs	buys from company store	Some mixed planting of rice & corn; rat poison used at 6-7 oz for 7.5 Hect field; rats worse in 2nd yr. of cultivation; Birds also a problem for rice, same every year; plants rice in 3-4" hole to avoid losses to birds.
Margarito Gutterez	Puerto Jimenez	Cattle ranch employee	4 yrs	Eldest son arrived with a small bag of rice which he claimed was a "gift" from a friend.	Sow 60lbs/hect. bean seed 15 lb/hect rice; 25 lb/hect. maize. Plan to stock 4 cows/hect.; no mixed planting; Birds & rats only small problem. Pigs got into rice field in 1970 & destroyed about 96% of crop; plant rice & maize in April & beans in Oct, but get only 1 crop/plot/yr.
Francisco Morenco	Nicaragua	Cattle ranch employee	18 yrs here 24 yrs in Costa Rica	buys beans	herbicide "bomba"; Says he once lost a lot of money on raising staples for sale & now sticks to cattle & pigs. Stocks 1 cow/hect.; no mixed planting.
Anastacio Silba	Costa Rica	Cacao finca peon	15 yrs	Sells to Neighbors: cacao, maize (2400lbs/yr), rice (500lbs/yr.); observed transporting sugar for a comerciente	No mixed planting; Herbicide was used on weeds in one rice field which had been fallow 5 yrs @ \$ 7.00/litre, 1 litre/hectare.

TAB VI CONTINUED : SOIL SAMPLE MASTER LIST

SOIL SAMPLE NO.	FARM NAME	SIGNATURE	LOCATION	PRESENT COVER	HISTORY OF PLANT
6	Margarito Guittierrez	0%	200 M. West of Rio Pavo	Bananas	cleared 1969 1st corn crop 1970 bananas planted 1970 simultaneously with corn
7	"	0%	100 M. East of Rio Pavo	Pasture with woods	Cleared 1954 Planted in pasture 1968
8	"	0%	300 m East of Rio Pavo, Exxx forest adjoining farm	forest	
Map coordinates: cuadrícula 275800 m. N.; 513200 m. E. or 8° 31'40" N. lat., 83°32'50" W. long.					
9	Francisco Morenco	0%	300 m west of Rio Pavo between "old" trail and cat track	rice	cleared 1972 - 1st crop
10	"	0%	W. of a small creek adjoining sample 9	corn	cleared 1972, 1st crop
11	"	0%	Forest to W. of samples 9 & 10	forest	
Map coordinates: 273200 m. N ; 507400 m. E ., or 8°30'40" N. lat., 83°36'40" W. long.					
12	Nastacio Silva	0%	E. side of Rio Sirena, between trail and house, 20 m from house.	Corn	Cleared 1971, 2 yrs prod. (4 crops) 2 of corn, 2 rice) will be planted as pasture next year.
13	"	0%	Primary forest adjoining sample 12, 10 m S of trail	Forest	
14	"	0%	30 m s of Rio Sirena, 1 m E. of trail	1 yr. (cecropia)	Cleared 1970 1 yr prod. (1 crop rice, 1 crop corn) May be re-used for pasture in future.
Map coordinates: Inst. Geog. Costa Rica map Llorona cuadrante Hoja No 3441-I cuadrícula 272700 m. N. ; 506700 m. E. or; 8°30'00" N. Long.; 83°36'20" W. lat.					

REPORT DE LAS FINCAS OCUPADAS POR POSTERIORIS IN FERRARIO O INVALIDAS POR PARACITOS

(MINCON AREA)

Nombre del Parácito & Date	No. Persons	Years occupancp	Year of arrival	Hec. Rice	Hec. Beans	Hect. Corn	Hect Cacao	Hect.ot Bananas	Other Hect. Pasture	Total Occup-icd	Volte-ada but abandon.	Total Voltcada
1) Juan Llerera Vega (Jul. 31, '63)	13	8		--	--	0.75	0.25	5 frut frut	5	11	20	31
2) Emilia Nieto Nieto (July 31, 1963)	5	37					0.25	1 1.25 fruit		2.5	17.5	20 0.541 0.108
3) Iase Nieto Nieto (Aug. 3, 1963)	1							1	5	6		6
BAHIA DRAKE AREA												
1) Bernardo Betancurt (Feb. 28, '63)	3 (incl 1 peon)	1	1963	x	x	x	x	x	x	x	10	10 (10.00) (3.733)
5) Fortunato Quiros Montoya (Feb. 28, 1963)	2	1						1.5		1.5	0	1.5 1.500 2.750
6) Miguel Angel Tenorio J. (Feb., 28, 1963)	2	8						1		1	3	4 (2.500) (1.250)
7) Manuel Quintero Q. (Feb. 28, 1963)	1	1						1.5		1.5	0	1.5 (1.500) (1.500)
8) Jásus Conabes (Feb. 28, '63)	3	7 mos 6-33				1				1	1	2 (note has 25 hec for future)
9) Rumizui Baltodano Martinez (Feb. 28, '63)	7	14				1		0.5 1.5 coco- nut		3	17	30 2.143 2.300
10) Eloy Leon Cambrenero (Feb. 28, '63)	20 (incl 3 peons & 6 rel of peons for last 1 yr)	12				1	6	2		9	61	70 (cleared for "copra") (5.733) (6.771)
11) Julio Rojas Araya (Feb. 27, 1963)	1	6 mos		2		0.5				0.5	0	0.5 (has 13 hec forest for future)

REPORTE DE LAS FINCAS OCUPADAS POR POSTEDORES EN PRECARIO O INVADIDAS POR PARACITOS (CONTINUED)

BAHIA DRANE (CONT.)

Nombre del paracito	No. Persons	Years Occup.	Year Arriv.	Hects. Rice	Hects. Beans	Hects. Corn.	Hects. Cacao	Hects. Bananas	Hects. Other	Hects. Pasture	Totq1 Occup.	Volt. Aband.	Total Volteada
Concepción Amaya Amaya (Feb. 26, '63)	8	7		1	1	1		1			4 (31 hect. forest)	0	4 0.571 0.171
Odilio Garita Mejia (Feb. 26, '63)	12	10 mos		0.5		1		0.5			2 (7 hec. forest)	0	2 2.000 0.157
Inocente Amaya Amaya (Feb. 26, 1963)	5	3 yrs		0.5		1		0.5			2 (8 hec. forest)	0	2 0.667 0.222
Herman Vangenindan (Feb. 26, '63)	6	5		2			0.5		1.5 fruit		5 (25 hec forest)	0	5 1.000 0.167
Bernardo Betancurt & Carmen Pizerro (Feb. 28, '63)	3 or 4	1		(incl. 1 peon of 1 yr)							0	10	10
Fortunato Quiros Montoya (Feb. 28, '63)	2	1						1.5			1.5		1.5
David Morales Torres (Feb. 2, '63)	7	4					0.25	0.5	0.25 caña 0.25 piña 0.25 frutos		6	2	8 2.000 0.286
Francisco Hernandez Cortes (Feb. 26, '63)	5	16 mos		1	1	1		1			5 (14 hec. forest)	0	5 2.500 0.500
Mmanuel Agilos Agilos (Feb. 28, '63)	10	1				2		1			3 (52 hec. forest)	5	8 2.000 0.125
Wilfredo Salguera Chauvez (Feb. 27, '63)	13	3			2	8	1.5	2	0.5 caña	0.5	15 (25 hec forest)	0	15 5.000 0.285
Elpidio Puiroz Valverde (Feb. 25, '63)	11	8						4		3	7 (14 hec. forest)	4	11 1.375 0.125
Estauislao Guevera Castillo (Feb. 25, 1963)	8	8				22		2			24 (25 hec. forest)	11	35 4.375 0.547
Elpidio Ruiron Valverde & Domingo Rodriguez R.	2(partners)	8			2	15	0.5	5	0.5 caña		23 (10 hec. forest)	17	40 5.000

REPORTE DE LAS FINCAS OCUPADAS POR POSTEDORES EN FREGARIO O INVADIDAS POR PARACITOS (CONTINUED)

FINCA LAJUNE AREA

CONTI

Nombre del Paracito	No. Persons	Years Occ.	Year arriv.	Hects. Rice	Hects. Beans	Hects. Corn	Hects. Cacao	Hects. Banana	Hects. other	Hects. Pasture	Total Occup.	Volt. Aband.	Total Volteada
Alberto Madrigal (Feb. 27, '63)	1	5				3					3.33	5	8 (1.600)
Hernan Bravo Vasquez (Feb. 26, '63)	2	8 mos						2			2	0	2 (2.000)
Agustina Serrano Serrano (Feb. 27, '63)	1	12 yrs						4			4	0	4 (10 hec. forest for future)
Manuel Acorta Acosta (Feb. 27, '63)	9	12		3	1	7		14			25	5	30 (has 15 hec. forest for future)
Benjamin Costeño Serru (Feb. 27, '63)	2			2		1		1.5			4.5	6.5	11 (has 25 hec. forest)
Benjamin Costeño Serru (Feb. 27, '63)	2												
Marcos Tubis Quintero Q. (Feb. 27, '63)	9	6 mos						2			2	0	2 (26 hec forest)
Adrian Carillo Torres (Feb. 27, '63)	1	2 yrs						1			1	3	4 (2.000)
Domingo Rodriguez (Feb. 27, '63)	10	2						6			6	2	8 (22 hec forest for future)
Manuel Rojas Morales (Feb. 26, '63)	5	8						3			3	7	10 (10 hec forest for future)
Santiago Bustos Bustos (Feb. 27, '63)	6	1						0.5			0.5	0	2 (26 hec forest for future)
Carlos Gabuerdi Chararria (Feb. 27, '63)	7	1				1					1	3	4 (24 Hects forest for future)
Manuel Madrigal (Feb. 28, '63)	1	3									0	4(?)	4 (4.000)
Doysi Gonzales (Feb. 26, '63)	6	5					0.25	1			1	2.25	8 (23 hec. forest for future)
Romaldo Azaya A.	4	7 mos			1						1	0	1 (9 hec forest for future)

REPORTE DE LAS FINCAS POR POSTEDORES EN PRECARIO O INVAJIDAS POR PARACITOS (CONT²)

BARIA BRAHEI-CONTE

Nombre del paracito	No. persons	Years Occup.	Year Arriv.	Hect. Ride	Hect. Beans	Hect. corn	Hects cacao	Hects bananas	Hects other	Hects Past.	Total Occup.	Volt. Aban.	Total Volt.	Forest for future	Date of Obserf.
27) Victor Orlando Espinoza	7	4			1	9		0.5	0.5 caña		11	0	11	24	2-25-63
32) Justo Serrano Chauvarría	3	4			0.5	4	0.5	1			6	3	9	26	2-26-63
39) José Villalohos Villalohos	1	5						1			1	0	1	29	2-26-63
42) Eladio Ganozo Caballero	1	5				2		1			3	9	12	13	2-26-63
41) Román Abellán Obellán	5	4			1	1	2.5	1.5	0.5 caña		6.5	3.5	10	15	2-27-63
41) Feliz Arias Arias	1	5					0.5	4			4.5	5.5	10	5	2-27-63
43) Francisco Baldelomar Cortes	2	3		1		1		0.5	0.5 caña		3	1	4	31	2-27-63
44) Salvador Gahuordi Gnavarría	3	1									—		—		
45) Rosalio Bravo Flores	9	1									—		—		
46) Jesus Juarrez Gomez	2	3			3		1	1	0.5 caña		3	9	12	18	2-25-63
47) Manuel Juarez Gomez	5	2			0.5	0.5		0.5	0.5 caña		2	2	4	26	2-28-63
48) Marcos Rojas Rojas	4	6			0.5	2		1			3.5	6.5	10	20	2-25-63
49) Daniel Rojas Rojas	6	6			0.5	1		1		8	10.5	14.5	25	15	2-28-63
50) Emilio Juarez Gomez	7	4			1	3	1.5	2	0.5 caña		8	12	20	20	2-28-63
51) Fernando Araya	1	—									0	23	23		2-28-63
		+ 2 fams working													

allan forest
 2-28-63
 2-25-63
 2-28-63
 2-25-63
 2-28-63
 2-28-63
 2-28-63
 (Repurpose land for "finca agropecuarias")

TABLE III-E : LAND CLEARING HISTORIES OF INTERVIEWED CAMPESINOS:

64

		YEAR				
		1968	1969	1970	1971	1972
BELFORT	HECTS. CLEARED:	-				
BRENAS	IN YEAR:	1.5	6.75	6.75	3.0	0
MORA	TOTAL CLEARED AREA:	1.5	8.25	15.00	18.0	18.0
		TO DATE				

		1967				
		0, (5	6	5	8	5
MARGARITO	HEC. CLEARED					
GUITTEREZ	IN YEAR:	(bought farm)				
TOTAL CL. AREA		8	13	19	24	32
		TO DATE				

FRANCISCO MORENCO
 Claims to have cleared at a rate of 5 hecets/year from 1954 to 1967, and to have cleared at a rate of 10 hectares/year since 1968. Note: this gives a total of 120 hectares cleared, while he only claims to have a total of 100 hectares cleared, 6 of which have been abandoned to second growth.

		1957	1958	1959	1960	1961	1962
ANASTACIO	Hect. CLEARED:						
SILBA	IN YEAR	1	5	6	5	6	6
TOTAL CL. AREA		1	6	12	17	23	29
		TO DATE:					

Note: From 1963 through 1969 Anastacio cleared no land due to a Company crackdown on clearing new land. See section III-D in text.

		1970	1971	1972
Hect. Cleared	in year	8	6	0
		(now fallow)		
TOTAL CL. AREA		37	43	43
		TO DATE:		

TABLE IV : PRODUCTION OF FIELDS OF VARIOUS AGES

25

FARMER	INFO- MATION TYPE	PRODUCTIONS IN KGS. / HECTARE				PRODUCTIONS IN KGS. / HECTARE				BEANS
		RICE				MAIZE				
		1st yr.	2nd.yr	3rd.yr	Ave. of 3	1st.yr.	2nd.yr.	3rd.yr.	Ave.	
ANASTACIO SILBA	"actual"	901.1	1363	-	1132	909.1	1363	-	1136.5	0 (bottom-land)
FRANCISCO MORENCO	"actual"	1272.7	-	-						0
	"claimed"	1818.2				2181.8				
MARGARITO GUITTEREZ	"actual"	454.5 901.9				227.3 227.3			795.2	454.5 (bottom (2nd yr.
		ave: 681.8 (bottom.)				ave: 227.3 (bottom.) 227.3 (hillside)			227.3 (hillside)	
	"claimed"	1363.0	-	909.1		1363	909.1		1363	1363 (3rd yr)
							ave: 681.8 ave: 795.5 (5th.yr)			
SIRENA AVERAGE	"actual"	954.5 (bottom)	1363 (bottom)	-	1158.8 (bottom)	568.2 (bottom)	1363 (bottom)	-		
	"claimed"	1590.6 (bottom)	-	909.1 (bottom)	2181.8 (bottom)	1363 (bottom)	-			
	"actual"	-	-	-	-	227.3 (hillside)	-	-		
BELFORT BRENAS MORA	"actual"	727.3 (bottom)	606.1 (bottom)	303 (bottom)	666.7 (bottom)	-	303.0 (bottom)	363.6 (bottom)		
			(after 1.33 ave crops)	3.33 crops + 1yr fallow	ave		2.33 ave crops)	252.5 (after 4.33 ave crops + 1yr fallow) (bottom)		
	"actual"	202.0 454.3					134.7 227.3		34.1	(kgs net 1st yr; hillside)
		ave: 328.2 (hillside)					ave: 181.0 (hillside)			
GRAND AVERAGE (OF "ACTUAL" VALUES ONLY)		HILLSIDE: 328.2 kgs/Ha.				HILLSIDE : 204.2 Kgs/HA				HILLSIDE 244.1 Kgs Hect
		BOTTOMLAND: 1250.1				BOTTOMLAND : 754.5 Kgs/Ha				Bottom: -

Note: "Actual" values refer to answers of interviewed farmers to questions about the yields of particular fields in particular years; "claimed" values refer to more general statements made by the farmer about the production of his fields.

TABLE VI : SOIL SAMPLE MASTER LIST

Soil sample number	Farmer & date of sample	Slope	Exposure	Location	Present condition	History of field
1	Belfort Brenas Mora Aug. 9, 1972	0%	—	S. side of road middle of field (Field C)	recently harvested rice	Cleared 1969 Production: 1969: 606.1 kg per hect rice 363.6 Kg/Hect corn 1970-71: fallow 1972: 303.0 Kg/Hect rice 252.5 Kg./Hect Corn
2	"	0%	—	10 m S of Agua Buena opposite site of sample No 1	Forest	high graded
3	"	0%	—	S. side of road midway between road & Agua Buena (Field C')	second year second growth	cleared 1969 1969: 606.1 kgs/hect rice 363.6 kgs/hect corn 1970-72 : fallow
4	"	22% 22%	22° E of S	N. side of road behind house 20 m from forest edge. (Field D)	1st yr 2nd growth	cleared 1970 1970: 202 kg/Hect rice 134.7 kgs/hect corn 1971-72: fallow
5	"	22%	22° E of S	Forest above sample 4, 10 m inside forest	large cassava 2nd growth	

Map coordinates on Instituto Geo. C.R. grid 294050 meters N ; 517500 meters E
or 8° 41' 40" N. Lat. ; 83° 30' 20" W. Longitude. on Sierpe Hoja 3442-II.

REPORTS DE LAS FINCAS OCUPADAS POR FOMISADORES EN PRECARIO O INVADIDAS
POR PARACITOS

Barla Drake Area, CONT: (LOTS 2,3,4,5,&8)

Nombre del paracito	No. Persons	yrs. Occ.	Yr. Arr.	Hect. Rice	Hect. Bean	Hect. Corn	Hect. Cacao	Hect. Banan.	Hect. Past.	Hect. Other	Total Occup.	Volt Aban	TOTAL VOLT.	FUTURE	DATE OF OBSERV.
52) Bernardo Betaucourt (lives Puntarenas), (1 cultiv + wife + lpeon)	4	3										?	?	17 5.667 units	OCT. 22, '63
53) Geferius Jimenez J.	6	1				7.5		1.5				9	0	9.333 units	OCT. 24 '63
54) Manuela Quintero	1	3						2				2	1	3	OCT. 22, '63
55) Remigio Baltosaus Martinez	5	17										0	15	15	OCT. 24 '63
56) Rojelio Rojas (formerly sloy Leon Cambronero)	6	1				1						1	1.5	2.5	OCT. 24, '63
57) Julio Rojas Araya	1	1										?	?	2.5	OCT. 25, '63
57) Alberto Madrigal	1	3				8						?	?	15	OCT. 25, '63
58) Ernan Brava Vasquez	1	2						1		0.25 caña & fruit		1.25	0.75	2	OCT. 24, '63
60) Augustus Serraus S. & Antonio Serraus	8	13	4					9	2	1 fruit		16	14	30	OCT. 24, '63
61) Manuel Acosta A.	1	15				3	1	1		? fruit		5	3	8	OCT. 24, '63
62) Benjamen Cedeña Serru	3	4						3	3			6	6	12	OCT. 24, '63
63) Reyes Tulio Quintero Q. &	6	1yr3mos						8				8	2	10	OCT. 22, '63
64) Adrian Carrillo Torres	2	3					0.25	3				3.25	36.75	40	OCT. 22, '63
65) Domingo Rodriguez R.	10	8						8				8	0	8	OCT. 22, '63
66) Manuel Rojas Morales	6	8				0.5 2x23		5				5.5	14	19.5	OCT. 22, '63
67) Santiago Bustos Bustos	6	2						0.5				0.5	2.5	3	OCT. 22, '63
68) Carlos Gauardi Chauvarris	8	2				0.5		0.5				1.25	2.75	4	OCT. 24, '63
69) Manuel Madrigal Arollo	8	llmos				1		1.25				3.25	0	3.25	SEPT. 19, 1963
														6	OCT. 22, '63
70) Deysi Gonzales GAUETA	7	1						3				3.25	?	?	

REPORT DE LAS FINCAS OCUPADAS POR POSEDORES EMPLEADO O INVADIDAS POR PARACITOS

AREA DE LA ZONA, CONT.

Nombre del paracito	No. Pers.	Yrs. Occ.	Yr. Arr.	Hect. Rice	Hect. Beans	Hect. Corn	Hect. Cacao	Hect. Banan.	Hect. Past.	Hect. Other	Total Occup.	Volt. Aban.	TOTAL UCUTECA	DATE obs.
1) Rómulo Amalla A.	4	?					0.25	0.5		caña cafe	0.75	1.25	2	OCT. 24, '63
2) Asunción Amalla A.	6	2		1		3		4		0.5	8	0	8	OCT. 24, '63
3) Odilio Garita Agila	5	2					1.25	1.5		caña 0.125 cana	3	0	3	OCT. 24, '63
4) Inocente Amalla A.	5	4						1.5		0.125 piña, + fruit	1.75	3.25	5	OCT. 24, '63
5) David Morales Torres	4	4				0.25		5		caña 0.25	6	2	8	OCT. 28, '63
6) Manuel Aguilos Agilos & Pranita Juarez G	10							2		caña 0.25, frutales 0.250 Piña 0.25, fruit 0.25			8	OCT. 23, '63
7) Denis Salguera Chevez (also known as Wilfrido Salguera Chevez) + Felipa Corrales A.	10 8	4					1.5	5.5	0.5	frutales 1.25 caña	10.25	30.75	41	OCT. 23, '63
8) Alpidio Quiros Valdes											5	2	7	OCT. 23, '63
9) Estanislao Guebara Castillo	6	10		0.5		1		2		? fruit	3.5	36.5	40	OCT. 24, '63
10) Justo Serrano Chavarria	5					2	0.5	1			3.5	6.5	10	OCT. 24, '63
11) Eladio Gamaso Caballero	1	6					0.25			0.25	0.5	10	10	OCT. 24, '63
12) Ramón Abellán Abellán	5	7					4	3		fruit		10	17	OCT. 23, '63
13) Feliz Arias	1	5				2	0.25	4			6.25	3.75	10	OCT. 23, '63
14) Francisco Baldelomar C.	2	4				1		0.5		some fruit			10	OCT. 23, '63

REPORTA DE LAS FINCAS OCUPADAS POR POSIBLES EN REGIMEN O INVADIDAS POR PARASITOS

AREA DRANE AREA, CONT.

Nombre del parásito	No. Pers.	Yrs. Occ.	Yr. Arr.	Hect. Rice	Hect. Beans	Hect. corn	Hect. Cacao	Hect. Banan.	Hect. Past.	Hect. Other	Tot. Occ.	Mat. UOIAC	UOIAC	DATE of OBSERVATION
Rosalio Bravo Flores	5	2						0.5	0.5	some fruit	1	5	6	OCT. 23, '63
Jesus Juarez Gomez	2	5						2		"	5	5	10	OCT. 23, '63
Manuel Juarez Gomez	6	3						1.25 1.25		fruit mixed with bananas	1.25 1.25	2	4	SEPT 19, '63
Marcos Rojas Rojas	3	7						1	fruit	0.125	1.25 1.25	2.5	8.5	OCT. 23, '63
Daniel Rojas Rojas	8	8				5			10		15	30	40	OCT. 23, '63
Eusebio Juarez G.	7	7				6	1.25	3			10.25	3.25	20	OCT. 23, '63
Fernando Araya	1										0	23	23	OCT. 25, '63
Santiago Marchero Gutierrez	3	6								worked before	0	5	5	SEPT 9, '63
Victor Santannaria	1	5								nobody lives on property & nobody cult.		2	2	SEPT 9, '63
Wilfrido Hernandez Paniagua	1	5						0.25		some fruit + 100 matas of pina	0.25	6	6.5	SEPT 9, '63
Fernin Serrano	1	1				4					4	0	4	OCT. 24, '63
Pablo Garcia Garcia	2	6								has some frutales and the rest is for agri.		?	30	OCT. 24, '63
Francisco Hernando Cortez	4	2				0.5	0.25	2.25	fruit		3.5	4.5	8	OCT. 24, '63
Juan Castro Gaurardi	8	6mos				0.5		0.75		0.25 yucca	1.5	1.25	2.75	SEPT. 19, '63
Manuel Tacallo Romero	4	4mos				0.5	0.85	1.25			2	0	2	SEPT. 19, '63
Hernando Gomez	1	3						3	16.5	0.5 caña	20	0	20	OCT. 24, '63
Aula Juarez G.	3							0.5			2.5	0.5	3	OCT. 24, '63
Joel Janora Rojas	3	8mos									0	1.5	1.5	SEPT. 3, '63

30 REPORTE DE LAS FINCAS OCUPADAS POR POSTULANTES IN PROBARIO O INVADIDAS POR PARACITOS

PARAYA BLANCA AREA

Nombre del paracito	no. perso	Yrs. Occ.	Yr. arr.	Hect. Rice	Hect. Beans	Hect. Corn	Hect. Cacao	Hect. Banan.	Hect. Past.	Hect. Other	Tot. Occ.	Volunt. Admision	TOTAL VULNERA-DA	DATE of OBSERV.
33) Roberto Franceschi Henrique	25						18			2	50	10	60	25-2-63
34) Rosendo Sanchez Quintero	13									fruit				
(incl. 3 peons) (Nota: SURV. OCC. LAND 75 HECT. 5244.57 M ²)														
(also known by Cedula as Rosendo Quintero Quintero)	1	10				0.5		1.5		0.5	3	7	10	25-2-63
(Nota: occupied land was surveyed & found to be XXXXXXXXXXXXXXXXXXXX "9 hec. 8044.56 m ² ") (14 indiv. fruit trees)														
35) Jacinta Quintero Quintero	8	20			0.5	0.5		8		15	30	8	32	25-2-63
34 pigs ter surveyed at "35 hec. 9471.91 metros 2")														
36) Fernin Chavarria Camaño	9	13			1	1		5		10	18	32	50	26-2-63
(Nota: later surveying showed 37 hect. 5310.39 m ² occupied)														
37) José Centeno Venite	1	13				1		10		4	(25 indiv. fruit trees)	15	30	26-2-63
has cattle & "aves de corral"														
38) Roberto Mora Torres	4	2				1	0.5	0.5	2	20	(40 fr. trees)	51	75	25-2-63
(Nota: surv. Occ. Land: 33 hect. 1877.08 M ²) (incl. 1 peon of 1 week) (has 20 cows)														
39) Felix Colindres C.	1	18			0.5	7		5		15	0.5	22	37	25-2-63
(has 16 cows, 10 pigs, + "aves de corral") (Surv., occ. land 15 hect. 4765.65 m ²)														
40) Nicolas Arias Marriac	5	6					0.25	3			(25 indiv. fr. tre.)	3.25	6.75	26-2-63
(has 8 pigs + 1 yegua) (Surv. occ. land: 11 Hect. 8031.25 M ²)														
41) Juan Gonzales Cores	1	6					0.25	3.5		coffee	5.5	2.5	8	8-8-63
42) Juan Hernandez Hernandez	15									0.25	none	8.5	8.5	26-2-63
(incl. 6 peons of 10mo, 15 days, 3 mo. 5 yr, 2 yr, 25mos + 2 cooks & 3 relatives of servants)														
43) Eulico España, Aurelio Adelaida	1	10					1.5				1.5	3.5	5	20-2-63

REPORTE DE LAS FINCAS OCUPADAS POR POSTEDORES EN PRECARIO O INVADIDAS POR PARACITOS

PLAYA BLANCA, R.D.A. CONT.

Nombre del paracito	Ac. Pers.	Yrs. Occ.	Yr. Arr.	Hect. Rice	Hect. Beans	Hect. Corn	Hect. Cacao	Hect. Banan.	Hect. Past.	Hect. Other	Tot. Occ.	Volt. Aband	TOTAL VALTEFA	DATE OF OBSERVATIONS
114) Felicita Bosquez Aparicio hus: Roberto Gallo G.7		6		(doesn't know how much land occ., calc. by Ocsat Breilly to be about 40 hecets.)								40	3 Aug '63	
115) Roberto Aguirre Ortega	1	1						2	8	some fruit	10	25	35	10 Aug '63
116) Gaspar Cedeno Celles	7	15				1	1	15	1 fru.	18	22	40	9 Aug '63	
7) Rodolfo Aguirre Ortega	4	?				0.5	1			1.5	335	35	9 Aug '63	
7) Concepción Sánchez S.	5	8		(nota: Surv. Occ. Land: 8 hect. 5644.31 m ²)			0.5	4	0.5 fru.	5	4	9	28-Feb '63	
9) Jorge Ortiz Castro	7	3						3		3	7	10	27-Feb '63	
1) Francisco Culrillo Olmo	3	4				0.25	2		0.25 fruit (50 trees)	2.5	15	17.5	28 Feb. '63	
1) Efrain Romérez Paniagua	2	21						5		5	10	15	28. Feb '63	
4) Ramón Ramírez (now sold to Froilán Elix)	3	11						2		2	10	12	27. Feb '63	
3) Isabel Barrozo (Chauvelo Ortiz)	2	12			1			1	2 (20 indiv.fru.trees)	10	20	30	1 Mar '63	
1) Filimón Sánchez S.	5	11						7	13	13	7	20	8 Aug '63	
(Nota: Bananas on land of Emilio Saballo & he is certified as a "paracito" by the Cia.)														
1) Sixto Aldaigo Gomez	12	8						3.5	5	0.5 fruit	9	11	20	8 Aug '63
1) Ambrosio Magin Cubillo G.	14	12						<	10	12	20	40	8 Aug. '63	
1) Pedro Muñoz	1	4		(lives alone, has a "tacoal" where he intensas to work)								5	5	JULY 1963

1) Birgilio Chavez n. Hernandez 9 10 1952 (land is divided into 3 subdivisions run by Birgilio Ch.H., weftali Ch.H., & xxxxxxxxxx Galso Ch.H.) 3 56 102 3 102 10 Aug '63

Finca Blanca Andá:

Nombre del parácito	no.	Yrs. Yr.	Hect. Hect. Hect.	Hect. Hect. Hect. Hect.	Tot.	Voltes	Work	Date					
	Pers. Occ.	Arr.	Rice	beans	Corn	Cacao	Bana.	Past.	other	Occ.	Aband.	Voltes	Observations
21) Rufiro Medina	4	10			1					2	10	12	8 Aug. '63
(Nota: xxxxxx Sixto Hidalgo claim this land is his)													
30) Santos Atencio Flores	1	?								?			Aug. '63
(not visited)													
>1) Damesa Miranda Miranda	1	?											Aug. '63
(not visited)													
32) Cayetano Muñoz													Aug. '63
(not visited)													
xx) Miguel Barranco													Aug. '63
(not visited)													
34) Miguel Angel Cordero Alvarado													Aug. '63
(not visited)													
35) Lorenzo Moraga	1	13											Sept 5, 1963
(HAS xi 50 hecets forest of which 8 are plowed, has)													

SIRENA MIRA

REPORTE DE LAS FINCAS OCUPADAS POR POSISSIONES EN YUCA ARIO O INVADIDAS POR PARACITOS

Nombre del Paracito	No.	Yrs.	Yr.	Hect.	Hect.	Hect.	Hect.	Hect.	Hect.	Hect.	Hect.	Hect.	Tot.	Voltea	Total	Date of Observ.
SIRENA	Hops.	Obs.	Arr.	Rice	Beans	MAIZE	Cacao	Bana.	Past.	Fruit	Other	Occ.	Aband.	ever		
J. Anastacio Silva	10	5	1959	2	0	0.5	4	5	10	0.25	0.25		22.5	6	clear d	
rice & maize also observed in "abandoned" land.																
Francisco Moreno	6	8	1956	8	1	3	1	12	12				37	29	66	29 Aug. '63
(incl 1 peon)																
Desiderio Sanchez G.	1	4	mos 1953	0	0	0	0	1.5	0				1.5	1	2.5	28 Aug. '63
(land bought from Julio Calderón)																
Unnamed	1	2	1952					0.5		0.5	tiguisul		1	7	8	28 Aug. '63
Tránsito Mefrano Lara	1	7	1958					5.5		1			6.5	0	6.5	28 Feb. '63
("waited 3 mos after he had to low to land bananas")																
Alberto Llernando Filartes	2	6	1958					6.75		0.25	0.25	coffee	7.25	5	12.25	28 Aug. '63
Cipriano Valera							1		3				8	40	48	28 Feb. '63
Alfredo Arias Cordero	2	7	1958					0.25	1	0.75	1 piña	4	19	23	28 Feb. '63	
(other is a socio)																

TABLE VIII-B : ADDITIONAL CAMPESINOS IN SIRENA AREA:

(40)

FROM OSCAR BREILLY, AUG. 10, 1972:

- Antonio Lopez - runs finca owned by Oscar Breilly
- Alijandro Moreno & Harnaldo Marenco - sons of Francisco Moreno with separate fincas
- Juan Silba - has cut a new plot on Company caterpillar track.
- Margarito Gutterez - bought out someone else 4 yrs ago
- Juan Valdez & Cipriano Valdez - sold out recently to Feliz Alivaro of Rio Oro Finca. Cipriano runs Rio Claro Pulparia.
- Vernal Saldaña
- Lisandro Galiano Antunez

FROM RONOLDO MORENCO, AUG. 13, 1972:

- Orphilip Sanchez
- Narciso Forta
- Rodolfo Medina
- Vernabia Moreno
- Lico Jiminez
- Pavulo Gomez
- Jibo Salazar
- Maroto
- Jovel

TABLE IX : CLEARED LAND AREAS FROM AERIAL PHOTOS, 1961:

SIRENA:

Anastacio Silba :	9.57 hect
	<u>5.12 hect</u>
tot:	14.69 hect
Rodolfo Medina :	4.8 hect
Unidentified, N. branch of Rio Pavo above Moreno	3.84 hect
Unidentified, below Anastacio Silba:	3.84 hect
Sirena total:	<u>27.17 hect</u>

RINCON: 7.68 hect

PLAYA BLANCA:

88.32 hect
47.36 hect
7.68 hect
74.24 hect
15.36 hect
<u>23.04 hect</u>

Playa: 256.00 hect total

DRAKE :

San Pedricito area:	3.84 hect
	3.84 hect
	3.84 hect
other Drake :	2.56 hect
	<u>17.92 hect</u>
	12.16 hect
	<u>2.56 hect</u>
Drake total :	46.72 hect

TOTAL CLEARED IN STUDIED AREA: 337.6 hect

TABLE X : FAMILY-WISE TABULATION OF YEARLY PER-CAPITA LAND CLEARING:

(from Table VIII information)

REGION	FAMILY NO.	TOTAL CLEARED AREA/yr OCCUPANCY (HECTS)	TOTAL CLEARED AREA/YR. OCC/ PERSON LISTED	REGION	FAMILY NO.	TOTAL CLEARED AREA/YR OCCUP. (HECTS)	TOTAL CLEARED AREA/YR.OCC/ PERSON LISTED
RINCON	1	2.380	0.298	DRAKE, CONT.	34	1.333	1.333*
	2	0.541	0.108		35	1.500	0.267
	3	-	-		36	1.000	0.250
	Rincon average	1.460 (2)	0.406 (2)		37	2.750	0.393
BAHIA DRAKE	4	10.000	3.333	38	2.250	0.750	
	5	1.500	0.750	39	0.200	0.200*	
	6	0.500	0.250	40	2.400	2.400*	
	7	1.500	1.500*	41	2.500	0.500	
	8	2.000	0.667	42	2.000	2.000*	
	9	2.143	0.306	43	1.333	0.667	
	10	5.833	0.292	44	--	--	
	11	0.500	0.500	45	--	--	
	12	0.571	0.171	46	4.000	2.000	
	13	2.000	0.167	47	2.000	0.400	
	14	0.667	0.222	48	1.666	0.417	
	15	1.000	0.167	49	4.167	0.694	
	16	2.000	0.286	50	5.000	0.714	
	17	2.500	0.500	51	--	--	
	18	8.000	0.125	52	5.667	1.412	
	19	0.500	0.385	53	9.000	1.333	
	20	1.375	0.125	54	1.000	1.000*	
	21	4.375	0.547	55	0.882	1.176	
	22	5.000	2.500*	56	2.500	0.417	
	23	1.600	1.600*	57	2.500	2.500*	
	24	2.000	1.000	58	5.000	5.000*	
	25	3.000	3.000*	59	1.000	1.000*	
	26	2.500	0.278	60	2.308	0.288	
	27	5.600	0.550	61	0.533	0.533*	
	28	2.000	0.222	62	3.000	1.000	
	29	2.000	2.000*	63	5.000	0.834	
	30	4.000	0.400	64	13.333	6.667	
	31	1.250	0.250	65	1.000	0.800	
	32	2.000	0.333	66	2.438	0.406	
	33	4.000	0.571	67	1.500	0.250	
			68	2.000	0.250		

note: values marked with an asterick (*) are families with only 1 listed, these have not been used computing the averages

TABLE X, CONTINUED:

REGION	FAMILY NO.	TOTAL CLEARED AREA/YR OCCUPANCY (HECTS.)	TOTAL CLEARED AREA/YR. OCC./ PERSON LISTED	REGION	FAMILY NO.	TOTAL CLEARED AREA/YR. OCCUP. (HECTS.)	TOTAL CLEARED AREA/YR. OCC/ PERSON LISTED
BAHIA DRAKE, CONT.	69	3.250	0.406	PLAYA BLANCA	103	2.400	0.185
	70	6.000	0.857		104	1.000	1.000*
	71	--	--		105	1.600	0.200
	72	4.000	0.667		106	3.845	0.427
	73	1.500	0.500		107	2.308	2.308*
	74	1.250	0.250		? 108	37.500	9.375
	75	2.000	0.250		109	2.056	2.056*
	76	8.000	0.800		110	1.600	0.320
	77	10.250	1.025		111	1.333	1.333*
	78	2.333	0.212		112	0.567	0.033
	79	4.000	0.667		113	0.500	0.500*
	80	2.000	2.000*		114	6.667	0.952
	81	1.667	1.667*		115	35.000	35.000*
	82	2.429	0.486		116	2.667	0.381
	83	2.000	2.000*		117	--	--
	84	1.250	0.621		118	1.125	0.225
	85	3.000	0.600		119	3.333	0.476
	86	2.000	1.000		120	4.375	1.458
	87	1.333	0.222		121	0.714	0.357
	88	1.214	0.405		122	0.090	0.364
89	5.000	0.625	123	2.500	1.250		
90	2.857	0.408	124	1.818	0.364		
81	--	--	125	2.500	0.208		
92	0.834	0.278	126	3.333	0.238		
93	0.400	0.400*	127	1.250	1.250*		
94	1.300	1.300*	128	5.667	0.630		
95	4.000	4.000*	129	1.200	0.300		
96	5.000	2.500	130-135	--	--		
97	4.000	1.000		***-----	-----		
98	2.750	0.344		Playa Blanca	4.858	0.934	
99	2.000	0.500		average (26)	(19)		
100	6.667	6.667*	SIRENA	136	5.200	0.520	
101	--	--		137	8.250	1.375	
102	<u>1.500</u>	<u>0.500</u>		138	2.500	2.500*	
Drake average	2.909 (93)	0.675 (72)		139	4.000	4.000*	
				140	0.929	0.929*	

Note: values in parentheses under average values represent number of values on which average is taken.

TABLE X, CONTINUED:

REGION	FAMILY NUMBER	TOTAL CLEARED AREA/YR. OCCUPANCY (HECTS.)	TOTAL CLEARED AREA/YR. OCC.// PERSON LISTED
SIRENA, CONTINUED	141	2.042	1.021
	142	1.000	0.333
	143	2.714	1.357
	Sirena average	<u>3.329</u> (8)	<u>0.921</u> (5)

TABLE XI-A

FAMILY-WISE TABULATION OF PROPORTIONS OF LAND USED FOR VARIOUS CROPS

FAMILY NO. (from Table VIII)	PROPORTIONS OF TOTAL OCCUPIED LAND								Total Occupied Land (Hects)	PROP. OF TOT. LAND EVER CLEARED	AMT. LAND EVER CLEARED (HA)	DOM. INAN CROPS (MOR THAN 40% ABAND.)
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PASTURE				
<u>RINCON</u>												
1	0	0	0.068	0.023	0.455	0	0	0.455	11	0.645	31	B&P
2	0	0	0	0.100	0.400	0.500	0	0	2.5	0.143	17.5	B
3	0	0	0	0	0.167	0	0	0.833	6	0	6	P
<u>BAHIA DRAKE:</u>												
4	0	not occupied							0	1.0	10	0
5	0	0	0	0	1.000	0	0	0	1.5	0	1.5	B
6	0	0	0	0	1.000	0	0	0	1.0	0.75	4.0	B
7	0	0	0	0	1.000	0	0	0	1.5	0	1.5	B
8	0	0	1.000	0	0	0	0	0	1.0	0.5	2.0	M
9	0	0	0.333	0	0.167	0	0.5	0	3.0	5.67	30	Unsp
10	0	0	0.111	0.667	0.222	0	0	0	9	0.871	70	Cacao
11	0.800	0	0.200	0	0	0	0	0	2.5	0	2.5	R
12	0.250	0.25	0.250	0	0.250	0	0	0	4.0	0	4.0	Unsp
13	0.250	0	0.500	0	0.250	0	0	0	2	0	2	M
14	0.250	0	0.500	0	0.250	0	0	0	2	0	2	M
15	0.40	0	0	0.10	0	0.30	0	0	5	0	5	R
16	--	--	--	0.042	0.083	0.042	0.042	--	6	0.250	8	--
								Sugar cane 0.042 pineapple				
17	0.200	0.200	0.200	0	0.200	0	0	0	5	0	5	Unsp
18	0	0	0.667	0	0.333	0	0	0	3	0.625	8	M
19	0	0.133	0.533	0.100	0.133	0	0.033	0.033	15	0	15	M
							sugar cane					
20	0	0	0	0	0.571	0	0	0.429	7	0.364	11	B&P
21	0	0	0.917	0	0.083	0	0	0	24	0.314	35	M
22	0	0.087	0.652	0.22	0.217	0	0	0	23	0.425	40	M
							sugar cane					

TABLE XI-A , continued

FAMILY NO.	PROPORTIONS OF TOTAL OCCUPIED LAND								TOTAL OCC. LAND (HA)	PROP. TOT. LAND EVER CLEAR ABAND.	AMT. LAND EVER CLEAR (HA)	DOM- INANT CROP
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PAST- URE				
DRAKE, CONT.												
23	0	0	0.000	0	0	0	0	0	3	0.625	8	M
24	0	0	0	0	1.000	0	0	0	2	0	2	B
25	0	0	0	0	1.000	0	0	0	4	0	4	B
26	0.120	0.040	0.280	0	0.560	0	0	0	25	0.167	30	B
27	0.444	0	0.222	0	0.333	0	0	0	4.5	0.50	11	R
28	0	0	0	0	1.000	0	0	0	2	0	2	B
29	0	0	0	0	1.000	0	0	0	1	0.75	4	B
30	0	0	0	0	1.000	0	0	0	6	0.25	8	B
31	0	0	0	0	1.000	0	0	0	3	0.70	10	B
32	0.750	0	0	0	0.250	0	0	0	2	0	2	R
33	0.750	0	0.250	0	0	0	0	0	4	0	4	R
34	1.000	0	0	0	0	0	0	0	4	0	4	R
35	0	0	0	0.111	0.444	0	0	0.444	2.25	0.719	8	B&P
36	0	1.00	0	0	0	0	0	0	1	0	1	bean
37	0	0.09	0.818	0	0.045	0	0.045	0	11	0	11	M
38	0	0.034	0.667	0.084	0.167	0	0	0	6	0.333	9	M
39	0	0	0	0	1.000	0	0	0	1	0	1	B
40	0	0	0.667	0	0.333	0	0	0	3	0.750	12	M
41	0	0.154	0.154	0.385	0.231	0	0.077	0	6.5	0.350	10	Unsp.
42	0	0	0	0.222	0.889	0	0	0	4.5	0.550	10	B
43	0.333	0	0.333	0	0.167	0	0.167	0	3	0.250	4	Unsp.
44	-- no information --											
45	-- no information --											
46	0	0.167	0	0.333	0.333	0	0.167	0	3	0.750	12	Unsp.
47	0	0.250	0.250	0	0.250	0	0.250	0	2	0.500	4	Unsp.
48	0	0.143	0.571	0	0.286	0	0	0	3.5	0.650	10	M
49	0	0.048	0.096	0	0.096	0	0	0.762	10.5	0.580	25	P

TABLE XI-A, continued

FAMILY NUMBER	PROPORTIONS OF TOTAL OCCUPIED LAND (IN 1963)								TOTAL OCC. LAND (HA)	PROP. TOT. OCC. LAND ABAND.	AMT. LAND EVER CLEARED	D C
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PASTURE				
BRAKE, CONT.												
50	0	0.125	0.375	0.188	0.250	0	0.063 cane	0	8	0.600	20	U
51			unoccupied						0	1.000	23	
52			no information								17	
53	0	0	0.834	0	0.167	0	0	0	9	0	9	M
54	0	0	0	0	1.000	0	0	0	2	0.333	3	B
55			unoccupied						0	1.000	15	
56	0	0	1.00	0	0	0	0	0	1.0	0.600	2.5	
57			no information								2.5	
58	0	0	1.00	0	0	0	0	0	8	0.467	15	
59	0	0	0	0	0.800	0	0.200 cane	0	1.25	0.375	2	
60	0.250	0	0	0	0.563	0.063	0	0.125	16	0.467	30	
61	0.	0	0.60	0.200	0.200	present	0	0	5	0.375	8	
62	0	0	0	0	0.500	0	0	0.500	6	0.500	12	B
63	0	0	0	0	1.000	0	0	0	8	0.200	10	B
64	0	0	0	0.077	0.923	0	0	0	3.25	0.919	40	
65	0	0	0	0	1.000	0	0	0	8	0	8	B
66	0	0	0.101	0	0.909	0	0	0	5.5	0.718	19.5	
67	0	0	0	0	1.000	0	0	0	0.5	0.833	3	B
68	-	-	0.400	-	0.400	-	-	-	1.25	0.688	4	M&
69	0	0	0.308	0	0.385	0	0.308 pineapple, yucca, cane	0	3.25	0	3.25	
70	0	0	0	0	1.000	0	0	0	3	0.500	6	B
71	0	0	0	0.333	0.667	0	present: cane, coffee	0	0.75	0.625	2	F
72	0.125	0	0.375	0	0.500	0	0.063 cane	0	8	0	8	F
73	0	0	0	0.417	0.500	0.021 c	0.042 cane	0	3	0	3	C&
74	0	0	0	0	0.857	0.071	0.071 cane	0	1.75	0.650	5	F
75	0	0	0.042	0	0.833	0.042	0.042 cane + 0.025 pineapple	0	6	0.250	8	F

Table XI-A, continued

FAMILY NUMBER	PROPORTIONS OF TOTAL OCCUPIED LAND (IN 1963)								TOTAL PROP. AMT. DOCC. LAND EVER ABAND. CLEA.			
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PAST-URE	OCC. LAND (HA)	TOT. OCC. ABAND.	LAND EVER CLEA.	
DRAKE, CONT.												
76	0	0	0	0	0.800	0.100	0.100	0	2.5	0.375	8	
77	0	0	0	0.146	0.537	0.122	0.171	0.490	10.25	0.750	41	
78	0	0	0	0	0.400	present	0	0.600	5	0.286	7	
79	0.143	0	0.286	0	0.571	present	0	0	3.5	0.913	40	
80	0	0	0.571	0.143	0.286	0	0	0	3.5	0.650	10	
81	0	0	0	0.500	0	0.500	0	0	0.5	0.952	10	
82	0	0	0	0.571	0.429	0	0	0	7	0.588	17	
83	0	0	0.320	0.040	0.640	mixed w. banana	0	0	6.25	0.375	10	
84	0	0	0.667	0	0.333	present	0	0	1.5	0.700	5	
85	0	0	0	0	0.500	present	0	0.500	1	0.833	6	
86	-	-	-	-	0.400	present	-	-	5	0.500	10	
87	0	0	0	0	1.000	present	0	0	1.75	0.500	4	
88	0	0	0	0	1.000	0.125	0	0	1	0.882	8.5	
89	0	0	0.333	0	0	0	0	0.667	15	0.750	40	
90	0	0	0.583	0.122	0.293	0	0	0	10.25	0.186	20	
91					not occupied				0	1.00	23	
92					not occupied				0	1.00	5	
93					not occupied				0	1.00	2	
94	0	0	0	0	1.000	0	Present: pineapple	0	0.25	0.960	6.5	
95	0	0	1.000	0	0	0	0	0	4.0	0	4	
96					present	incomplete info.						30
97	0	0	0.143	0.710	0.643	0.143	0	0	3.5	0.563	8	
98	0	0	0.333	0	0.500	0	0.167	0	1.5	0.455	0.2	
99	0.250	0	0.125	0	0.625	0	0	0	2	0	2	
100	0	0	0	0	0.150	0	0.025	0.825	20	0	20	
101	-	-	-	-	0.200	-	-	-	2.5	0.167	3	
102					not occupied				0	1.00	1.5	

TABLE XI-A, continued

FAMILY NUMBER	PROPORTIONS OF TOTAL OCCUPIED LAND (IN 1963)								TOTAL OCC. LAND (HA)	PROP. TOT. OCC. LAND ABAND.	AMT D. LAND EVER CLEARED
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PASTURE			
<u>PLAYA BLANCA</u>											
103	-	-	-	-	0.360	0.040 (approx)	-	-	50	0.167	60
104	0	0	0.167	0	0.500	0.040 (approx)	0.167 yucca	0	3	0.700	10
105	0	0.021	0.021	0	0.333	0.063	0	0.625	24	0.250	32
106	0	0.055	0.055	0	0.278	0.055 (approx)	0	0.556	18	0.640	50
107	0	0	0.067	0	0.667	0.034 (approx)	0	0.267	15	0.500	30
108	0	0.042	0.021	0.021	0.083	0.013	0	0.392	24	0.680	75 un
109	0	0.023	0.318	0	0.227	0.023 (approx)	0	0.682	22	0.405	37
110	0	0	0	0.077	0.923	0.154	0	0	3.25	0.675	10
111	0	0	0	0.045	0.636	0	0.045 coffee	0	5.5	0.313	8
112					not occupied				0	1.00	8.5
113	0	0	0	1.000	0	0	0	0	1.5	0.700	5
114	-	-	-	-	-	present	incomplete info.				40
115	0	0	0	0	0.200	present	0	0.800	10	0.714	35
116	0	0	0	0.056	0.056	0.056	0	0.833	18	0.550	40
117	0	0	0	0.333	0.667	0	0	0	1.5	0.957	35
118	0	0	0	0	0.100	0.100	0	0.800	5	0.444	9
119	0	0	0	0	1.000	0	0	0	3	0.700	10
120	0	0	0	0.100	0.800	0.250	0	0	2.5	0.857	17.5
121	0	0	0	0	0	0	0	1.000	5	0.667	15
122	0	0	0	0	1.000	0	0	0	2	0.833	12
123	-	0.100	-	-	0.100	0.025	-	0.200	10	0.667	30
124	0	0	0	0	0.259	0	0	0.650	20	0.259	27
125	0	0	0	0	0.389	0.056	0	0.560	9	0.550	20
126	0	0	0	0	0.167	0	0	0.833	12	0.700	40
127					not occupied				0	1.000	5
128	0	0	0	0	0.029	0	0	0.941	102	0.029	102
129	0	0	0.500	0	0.500	0	0	0	2	0.833	12M

TABLE XI-A, continued

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FAMILY NUMBER	PROPORTIONS OF TOTAL OCCUPIED LAND (IN 1963)								TOTAL OCC. LAND (HA)	PROP. TOT. OCC. LAND ABAND.	AMT. LAND EVER CLEAR (HA)	DOM. CRE	
	RICE	BEANS	MAIZE	CACAO	BANANA	FRUIT	OTHER	PAST-URE					

PIA YA BIANCA, continued													
130													
	no information												
131													
	no information												
132													
	no information												
133													
	no information												
134													
	no information												
135													8
<u>SIRENA</u>													
136	0.089	0	0.022	0.178	0.222	0.011	0.033	0.444	22.5	0.231	26	P	
				(approx)			coffee						
137	0.216	0.207	0.108	0.014	0.324	0	0.014	0.324	37	0.439	66	Unsp	
							coffee						
138	0	0	0	0	1.000	0	0	0	1.5	0.400	2.5	B	
139	-	-	-	-	0.500	0.250	tiquisque	-	1	0.875	8	B	
							present						
140	0	0	0	0	0.846	0.154	0	0	6.5	0	6.5	B	
141	0	0	0	0	0.931	0.034	0.034	0	7.25	0.408	12.25	B	
							coffee						
142	0.125	0.375	0	0.125	0	0	0	0.375	8	0.833	48	Unsp	
143	0	0	0	0.063	0.250	0.188	0.125	0	4	0.826	23	Unsp	
							cane +	0.250		pineapple			

*-----													

TABLE XI-B : CROP SPECIALIZATION OF FAMILIES BY REGION

REGION	SPECIALIZATION									TOTAL
	BANANA	PAST.	MAIZE	RICE	CACAO	BANAN. + PAST	BANAN. +CACAO	OTMER	UNSP- ECIAL* IZED	
RINCON #	1	1				1				3
%	33.3%	33.3%				33.3%				100%
FLAYA BLANCA #	8	11			1			1	1	22
%	36.4%	50%			4.5%			1 Ban.& Maize 4.5%	4.5%	100%
SIRENA #	4	1							3	8
%	50%	12.5%							37.5%	100%
DRAKE #	34	2	20	6	1	7	3	B&M 1 (1.2%) Bean 1 (1.2%) Ca&Fr 1 (1.2%)	9	85
%	40%	2.4%	24%	7.1%	1.2%	8.2%	3.5%		10.6%	100%
TOTAL #	47	15	20	6	2	8	3	B&M 2 (1.7%) Bean 1 (0.9%) C&F 1 (0.9%)	13	118
%	39.8%	12.7%	16.9%	5.1%	1.7%	6.8%	2.5%		11%	100%

**TABLE XII : REGION-WISE TABULATION OF LAND PER POPULATION FOR VARIOUS CROPS
IN 1963 SURVEY**

REGION	DATES OF OBSERVATIONS	NO. OF FAMILIES LISTED	NO. FAM. W. MORE THAN 1 PERSON LISTED	AVE. NO. PERSONS PER FAM. W. MORE THAN 1	AVE. YRS. W. OCC. UPAN-CY	NO. FAM. OCC. INFO. AVAIL.	EST. POP. (FROM COLS. 3 & 5)	NO. PERS. LISTED	NO. FAM. ON WHI-CH CROP INFO. AVAIL.	ESTIMATED NO. PERS. IN FAMILIES FOR WHICH CROPS INFO AVAIL (FROM 5&11)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
RINCON	Jul-Aug. 1963	3	2	9	22.5	2	27	19	3	27
PLAYA BLANCA	Feb-Aug. 1963	33	20	7	10.962	27	231	153	24	168
SIRENA	Feb-Aug. 1963	8	5	4.2	9.5	8	37	26	8	37
BAHIA DRAKE	Feb-Oct. 1963	99	75	6.213	4.467	94	615	491	88	546.7
TOTAL	Feb-Oct. 1963	143	102	6.343	6.381	131	910	689	123	782.8

CROP	REGION	TOT. HECTS. OF CROP	AVE. HECTS PER FAM.	HECTS. PER CAPITA	NO. OF FAMILIES GROWING CROP	PERCENT OCCURRENCE	AVERAGE PROPORTION OF TOTAL OCCUPIED LAND
(12)	(1)	(13)	(14)	(15)	(16)	(17)	(18)
RICE	RINCON	0	0	0	0	0%	0
	PLAYA BLANCA	0	0	0	0	0%	0
	SIRENA	11	1.4	0.297	3	37.5%	0.125
	BAHIA DRAKE	23.5	0.267	0.043	15	17.0%	0.049
	TOTAL	34.5	0.280	0.044	18	14.6%	0.036
BEANS	RINCON	0	0	0	0	0%	0
	PLAYA BLANCA	4.0	0.167	0.024	5	20.8%	0.011
	SIRENA	4.0	0.5	0.108	2	25.0%	0.046
	Drake	13.5	0.153	0.025	14	15.9%	0.028
	TOTAL	21.5	0.175	0.027	21	17.1%	0.023

CROP	REGION	TOT. HECTS. OF CROP	AVERAGE HECTS. PER FAM.	HECTS. PER CAPITA	NO. OF FAMILIES GROWING CROP	PERCENT OCCURRENCE	AVERAGE PROPORTION OF TOTAL OCCUPIED LAND
(12)	(1)	(13)	(14)	(15)	(16)	(17)	(18)
MAIZE	RINCON	0.75	0.25	0.028	1	23.3%	0.038
	PLAYA BLANCA	11.5	0.479	0.068	7	29.2%	0.032
	SIRENA	3.5	0.438	0.095	2	25.0%	0.040
	BAHIA DRAKE	137	1.557	0.251	44	50.0%	0.287
	TOTAL	152.75	1.242	0.195	54	43.9%	0.161
CACAO	RINCON	0.5	1.667	0.018	2	66.7%	0.026
	PLAYA BLANCA	4.25	0.177	0.025	7	29.2%	0.012
	SIRENA	5.75	0.719	0.155	4	50.0%	0.066
	BAHIA DRAKE	25.75	0.293	0.047	22	25.0%	0.054
	TOTAL	36.25	0.295	0.046	35	28.5%	0.038
BANANAS	RINCON	7.0	2.333	0.259	3	100.0%	0.360
	PLAYA BLANCA	85.0	3.54	0.506	22	91.7%	0.235
	SIRENA	32.25	4.03	0.872	7	87.5%	0.368
	BAHIA DRAKE	169	1.920	0.310	75	85.2%	0.354
	TOTAL	293.25	2.384	0.375	107	87.0%	0.310
FRUIT	RINCON	1.25	0.42	0.0463	1	33.3%	0.064
	PLAYA BLANCA	8.5	0.354	0.051	15	62.5%	0.024
	SIRENA	4.0	0.500	0.180	6	75.0%	0.046
	BAHIA DRAKE	6.75	0.077	0.012	20	22.7%	0.014
	TOTAL	20.5	0.167	0.026	42	34.1%	0.022

(incl. 8 w.
area unreported)

CROP	REGION	TOT. HECTS. OF CROP	AVERAGE HECTS. PER FAM.	HECTS. PER CAPITA	NO. OF FAMIDIES GROWING CROP	PERCENT OCCURRENCE	AVERAGE PROPORTIO OF TOT. OCC. LAND
(12)	(1)	(13)	(14)	(15)	(16)	(17)	(18)
SUGAR CANE	RINCON	0	0	0	0	0%	0
	PLAYA BLANCA	0	0	0	0	0%	0
	SIRENA	0.5	0.063	0.014	2	25.0%	0.006
	BAHIA DRAKE	7.88	0.090	0.014	18 (incl. 2 not reporting area)	20.5%	0.016
	TOTAL	8.38	0.068	0.012	20	16.3%	0.009
PASTURE	RINCON	10	0.33	0.370	2	66.7%	0.513
	PLAYA BLANCA	222.0	9.25	1.321	14	58.3%	0.615
	SIRENA	25.0	3.125	0.676	3	37.5%	0.285
	BAHIA DRAKE	48.0	0.545	0.088	11	12.5%	0.100
	TOTAL	305	2.480	0.390	30	24.4%	0.322
OCCUPIED LAND	RINCON	19.5	6.5	0.722	3	100%	1.000
	PLAYA BLANCA	361.25	15.05	2.15	24	100%	1.000
	SIRENA	87.75	11.0	2.365	8	100%	1.000
	BAHIA DRAKE	477.75	5.43	0.874	88	100%	1.000
	TOTAL	946.25	7.693	1.210	123	100%	1.000

MISC. OTHER CROPS	REGION	YUCCA		PINEAPPLE		COCONUT		COFFEE	
		TOTAL HECTS.	NO. FRM. REPORTING	TOT. HECTS.	NO. REPT.	TOT. HECTS.	NO. RPT.	TOT. HECTS	NO. REPT.
	RINCON	0.5	1	0	0	0	0	-	1
	PLAYA BLANCA	0.5	1	0	0	0	0	0.25	1
	SIRENA	0	0	0	0	0	0	1.94	3
	DRAKE	0.25	2	0.37	5	1.5	1	-	1
	TOTAL	0.75	3 (1 w/o area)	0.37	5 (2 w/o area)	1.5	1	-	6

TABLE XII, CONTINUED

REGION	<u>"CLEARED BUT ABANDONED" LAND</u>					<u>TOTAL CLEARED LAND</u>				
	TOT. HECTS.	AVE. HECTS. PER FAM.	HECTS. PER CAPITA	NO. OF FAMILIES REPORTING	PERCENT OCCURRENCE	AVE. PROP. OF LAND EVER CL.	TOTAL HECTS. LAND EVER CLEAR.	HECTS. PER CAPITA CLEAR- ed	"FOR- EST FOR FUTURE"	NO. FAM. REP FOR F.FU
RINCON	37.5	12.5	1.389	2	66.7%	0.658	57	2.111	-	-
PLAYA BLANCA	369.75	15.41	2.20	26	100.0%	0.481	768	4.571	-	-
SIRENA	107.0	13.4	2.892	7	87.5%	0.493	217	5.865	-	-
BAHIA DRAKE	586.0	6.659	1.072	67	76.1%	0.541	1083.5	1.982	681	34
TOTAL	1100.25	8.945	1.406	102	82.9%	0.518	2125.5	2.715	681	34

TABLE VIII : AMOUNTS OF LAND AVAILABLE IN EACH LAND QUALITY CATEGORY

Region	Total Hectares	Hects. swamp, beach, lake, & river bed	Useable total Hects.	Hects. Hills	Hects. Bottomland	Proport. Hills	Proport. Bottom land
Rincon	16835	236	16599	2227	14372	0.134	0.866
P Playa Blanca	4148	123	4025	814	3211	0.202	0.798
Sirena	22809	2222	20587	3993	16594	0.194	0.806
Bahia Drake	21880	71	21809	4941	16868	0.226	0.774
Total	65672	2652	63020	11975	51045	0.190	0.810

Areas were measured off an inch-to-the-mile Osa Productos Forestales Map entitled: "Logging area showing existing road system plus proposed major development roads". The Map was drawn by company engineer Oscar Breilly in August 1963 from aerial photos taken by the U.S.A.F. in 1960.

1961

Areas arbitrarily defined as "hillside" are land within 0.3 miles of one of the ridges shown on the Osa Productos Forestales map. "Useable Land" is taken to be all land not shown as beaches, swamps, lakes, or river beds on the company map. This value for the amount of useable land should be considered as very much a maximum figure.

TABLE XIV-A : CARRYING CAPACITY FROM CONSUMPTION/ PRODUCTION INFORMATION

Land quality category	crop	Yield (Kgs)	Recov. Time (yrs)	Farmed Time (Yrs)	Consumption (Kgs)	Short Term Hects/capita	No. of plots	Hects/capita at K	Prop. staple land	1963 prop staple land
hillside	Rice	328.2	3	1	107.5	0.33	4	1.31	0.343	0.165
	Corn	204.2	3	1	87.1	0.43	4	1.72	0.450	0.732
	Beans	244.1	3	1	48.0	0.20	4	0.80	0.209	0.103
						<u>Tot: 0.96</u>		<u>Tot: 3.82</u>		
Bottomland	Rice	1250.1	3	2	107.5	0.086	2.5	0.21	0.442	
	Corn	754.5	3	2	87.1	0.12	2.5	0.29	0.52	
	(Beans)					(use: 0.20)		(use: 0.80)		
						<u>Total 0.41</u>		<u>Total: 1.30</u>		

Cash crops (no land category breakdown available)	Yield (colonos)	Consumpt. (\$)	Hects/capita	1963 Prop. Cash crop land
Cattle	\$156	\$254	1.63	0.510
Pigs	\$432	\$254	0.59	0.490

assuming pig:cattle ratio remains constant, Hects. / capita cash crops = 0.83 plus 0.29 & 1.12 hec/cap cash crops.

Other Crops from prop. 1963 land: 0.084 0.084

Short term hec/cap (size of a "unit area") : 2.16 hec/cap. for hillside
1.59 hec/cap. for bottomland

Long term Hects/cap (total staples, cash crops, & other crops needed / person at K): 5.02 hec./cap for hillside
2.50 hec/cap. for bottomland

11975 hec hilly land available - 2360 persons supportable in hills
~~51045~~ 5.02 hec/person required

51045 Hects bottomland available - 20400 persons supportable in bottomland
2.50 hec/person required

22760 Total persons supportable
at 35 ^{of} persons/sq.km.
total land area.

TABLE XIV-B : CARRYING CAPACITY FROM PRESENT HECTARES OCCUPIED PER CAPITA

Crop	land qual.	Recovery time (yrs)	Farmed time (yrs)	Hects per cap. 1963	No. of plots	Hects. per cap. at K
Rice	hillside	3	1	0.044	4	0.176
	Bottomland	3	2	0.044	2.5	0.11
Corn	Hillside	3	1	0.195	4	0.78
	Bottomland	3	2	0.195	2.5	0.745
Beans	Hillside		(use: 0.027)		4	0.108
	Bottomland		(use: 0.027)		2.5	0.068
Cash Crops	H & B.			0.764	1	0.764
Other Crops	H & B			0.083	1	0.083

Total hectares / capita : 1.911 on hillside
~~1.770~~ on bottomland
1.770
51045 hecets bottomland = 28900 persons supportable in bottomland
1.77 hecets/person
11975 hecets hillside = 6300 persons supportable on hillsides
1.911 hecets/persons 37200 total persons supportable
= 57 persons / hectare of total area.

TABLE XIV-C : THE NO-BEANS-IN-THE-LOWLANDS SCENARIO

ESTIMATION technique	Pop. supportable in bottomland	Hects. highland beans required for lowlands	Hects. hillside remaining	Hillside Population	† total population
from consumpt on-yield information	26366	13093	1118	200 (at 5.02 hect/cap)	13293 (20.42 perkm ²)
from present land use info.	39739	31791	19816	13789 (at 1.911 hecets/cap)	53528 (82 per sq km.)