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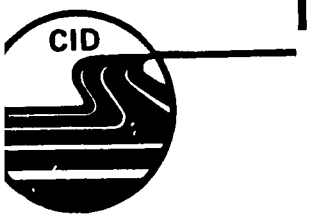

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SOCIO-ECONOMIC STUDY OF SANTIESTEBAN PROVINCE

No. 1: THE STRUCTURE OF AGRICULTURAL PRODUCTION

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CIAT

Dr. Allen LeBaron
Dr. Kendall Adams
Dr. Larry Bond
CID

Santa Cruz, May 1, 1978

JUSTIFICATION AND ACKNOWLEDGEMENTS

This study, which was begun in September and completed in December, 1977, was conducted for the purpose of providing statistics about farm-families in the Santiesteban region. The statistics collected provide the base for planning the type of research and extension work needed by farm-families living there.

Santiesteban was selected for this first or "pilot" study for several reasons. For example, it is one of the most important agricultural provinces in the Department of Santa Cruz. Also the farmers there have come from both nearby places and the interior of the country, making the population representative of many other agricultural areas in the department.

It was decided to limit this first study to only one department in order to evaluate more easily the changes in programs resulting from the data obtained. Some of the data was collected by rural school-teachers supervised by seven extension agents. Each school teacher interviewed in his or her school district which, of course, is an area well known to the school teacher. However, in the southern section, all interviews were done by extension agents because of a school vacation during the time of the study.

As a result of supervising this study, the extension agents involved have gained experience in working with questionnaires and performing studies of this type. With this training, SEA of CIAT will have personnel trained to do more of this type of work in the future.

Dr. Larry Bond (with suggestions from Dr. Allen LeBaron), CID, helped design the questionnaire and made suggestions about the sample design and survey execution.

The general method followed was to pre-test the questionnaire in April and May, 1977. Then, a list of all farmers in each community was obtained. From this list, approximately 30-35 percent of the families were selected randomly for interviewing. In this manner, almost 1,300 interviews were held with farmers in the province.[1]

Once the fieldwork was complete, the task of tabulation was begun. This work was performed by Ing. Manuel Ortiz, Ing. Nestor Suarez, Ing. Elias del Castillo, Fernando Chavez y Edmundo Candia. Each section of the questionnaire wa was averaged over the families in each village and expanded estimates of each average were made, village by village. These "expanded" estimates can then be summed to obtain various totals.

Finally, Dr. LeBaron and Dr. Adams arranged part of the tabulated data into the summaries presented in this study. They also wrote an initial draft of the report in English.[2]

Reproduction: Norah López de Soto.

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[1] Extension agents from CIAT involved: Ing. Melvin Pozo, Ing. Diógenes Chavez, Ing. Cleto Siles, Agr. Daniel Vilela, Agr. Emilio Merida, Agr. Miguel Eid, Agr. Jaime Guzmán y Agr. José García.

[2] The present paper.

SUMMARY

The whole study area is bi-sected north-west to south-east by the Rio Chane and this natural barrier is the dividing line between a more developed southern section and a lesser developed north. A large share of total farm capital is found in the south and this means that farmers above the river utilize generally simple cultivation techniques and rely upon fewer cash crops.

Farms in the south tend to be smaller than those in the north, however, this more than offset by the higher land values in the south. The average value per hectare in the south is reported to be $b. 1,229 whereas in the north the average of responses is $b. 711. If we concentrate on the most common farm sizes in both sections, 27 percent in the south have values ranging from $b. 1,845 to $b. 24,580. In the north, 35 percent of the farms would range in value from $b. 14,220 to $b. 21,330.

Almost all farmers report owning their farms. And in 51 percent of the cases, ownership is the result of purchase. The effect on ownership of agencies or institutions such as Instituto Nacional de Colonización (INC) or Reforma Agraria is much more evident in the north section above the river. In that section, over 30 percent of the land came through these sources, whereas, in the south, the same percentage is 7.

The pattern of modern input use is quite mixed, except for pesticides, the use of which is fairly general. The most important form of weed control is hand labor, but some herbicides are used and, according to the survey sample, it appears that more are used in the north than the south. The estimated

number of farmers, after expansion of the total sample, is less than 10 insofar as the four major crops, rice, cane, corn and yucca are concerned. There may be some other fertilizer use on horticultural or fruit crops, but, for all practical purposes, fertilizer use is nil in the study area. Harvesting is virtually all accomplished by hand--only two cases of mechanical rice harvesting are estimated to have occurred in the whole study region during 1977.

Credit is not a big "input" factor at the present time. Only about 10 percent of the farmers report using credit, most of which comes through cooperatives.

Family size is not large. The average is about five members. In addition, preliminary analysis does not suggest much evidence of extended family patterns since relatives and non-relatives make up only about 5 percent of total family membership.

The percentages of families estimated to produce various agricultural products are shown in Table 1. Over 50 percent produce cane, 14 percent yucca, 45 percent produce corn, and nearly 60 percent produce rice. Farm flocks of one sort or another are important, and nearly 85 percent keep chickens, 35 percent keep ducks, and 33 percent have hogs. Over one/third of the families have cattle and the average herd size would be about 42 head for such families. This means, as shown in Table 1, that there are enough cattle for <u>all</u> the rural families to have an average of 14,5 head. The remainder of Table 1 is read in the same manner: for example, 13 percent of all cultivated land is devoted to rice and over 50 percent is estimated to be devoted to cane.

TABLE 1 Summary of family, land, and cattle holding relationships

	Estimated No. Families	%	Estimated No. Cultivated ha/ or Animals	%	Estimated Quantity Production
Crop					
Rice	2,120	33.5	8,447.7	13.1	70,414.7
Yucca	489	7.7	448.2	0.7	3,815.4
Corn	1,383	21.8	4,034.o	6.3	178,309.2
Tomato	32	0.5	23.76	-	5,654.o
Banana	105	1.7	295.8	0.5	211.65
Plantain	100	1.6	174.o	0.3	70,308.o
Potato	23	0.4	17.o	-	114
Beans	30	0.5	11.o	-	14.6
Citrus	60	0.9	383.o	0.6	3,182,401.o
Fruits (various)	14	0.2	25.o	-	-
Watermelon	11	0.2	10.o	-	27,263.o
Pineapple	95	0.2	15.o	-	218,610.o
Cane	2,147	33.9	34,350.6	53.3	1,730,959.o
Cotton	9	0.1	2,773.o	4.3	23,209.o
Sorghum	2	-	31.o	-	78,571.o
Soybean	37	0.6	2,943.o	4.6	20,126.o
Peanut	29	0.5	5.o	-	4,811.o
Pasture	683	10.8	11,326.o	17.6	-
Animal					
			Who own/overall Average		Inventory
Cattle	1,210	34.82	41.72/14.53		50,483
Swine	1,151	33.12	5.75/1.90		6.618
Sheep	564	16.23	7.78/1.26		4,386
Horse	563	16.20	4.09/0.66		2,301
Turkeys	406	11.65	6.27/0.73		2,541
Chickens	2,858	82.24	36.59/30.1		104,582
Ducks	1,214	34.94	9.56/3.34		11,603
Rabbits	72	20.07	18.89/0.39		1,360

Finally, it appears that it is correct to infer a fairly clear-cut distinction between families that emphasize cattle production and those that concentrate on crops.

Figures 1, 2 and 3 are designed to give a visual impression of land utilization in the study region. In this summary, lands called "pasto" have been improved and are included in the "cultivated" totals. Figure 1 shows the general relationships. In Figure 2, cultivated land is divided by type, arado (mechanically plowed land), chaqueado (land that has just recently had trees and brush removed) and barbecho (land that after initial clearing and use, has been re-cleared of heavy regrowth). It is apparent that cane is grown where ever possible. The only other "crop" activity that shows this characteristic is pasto; this underscores the number and importance of animals (esp. cattle) in the Santiesteban rural economy. Very little rice and corn are grown on tractor-plowed land. Soybean and cotton are grown instead. A number of other crops were reported grown but they occupy portions of land so small they cannot be plotted on graphs of the size used here.

Figure 3 relates the share of total production, by crop, to land type and division into hectares. Thus, it is possible to get a quick impression of relative yields according to cultivation practice. Reported yields of peanut, pineapple and citrus, for example, are far higher under chaqueado conditions than when planted on barbecho land. At the other extreme, type of cultivation makes little difference on yields of the most important crop - caña.

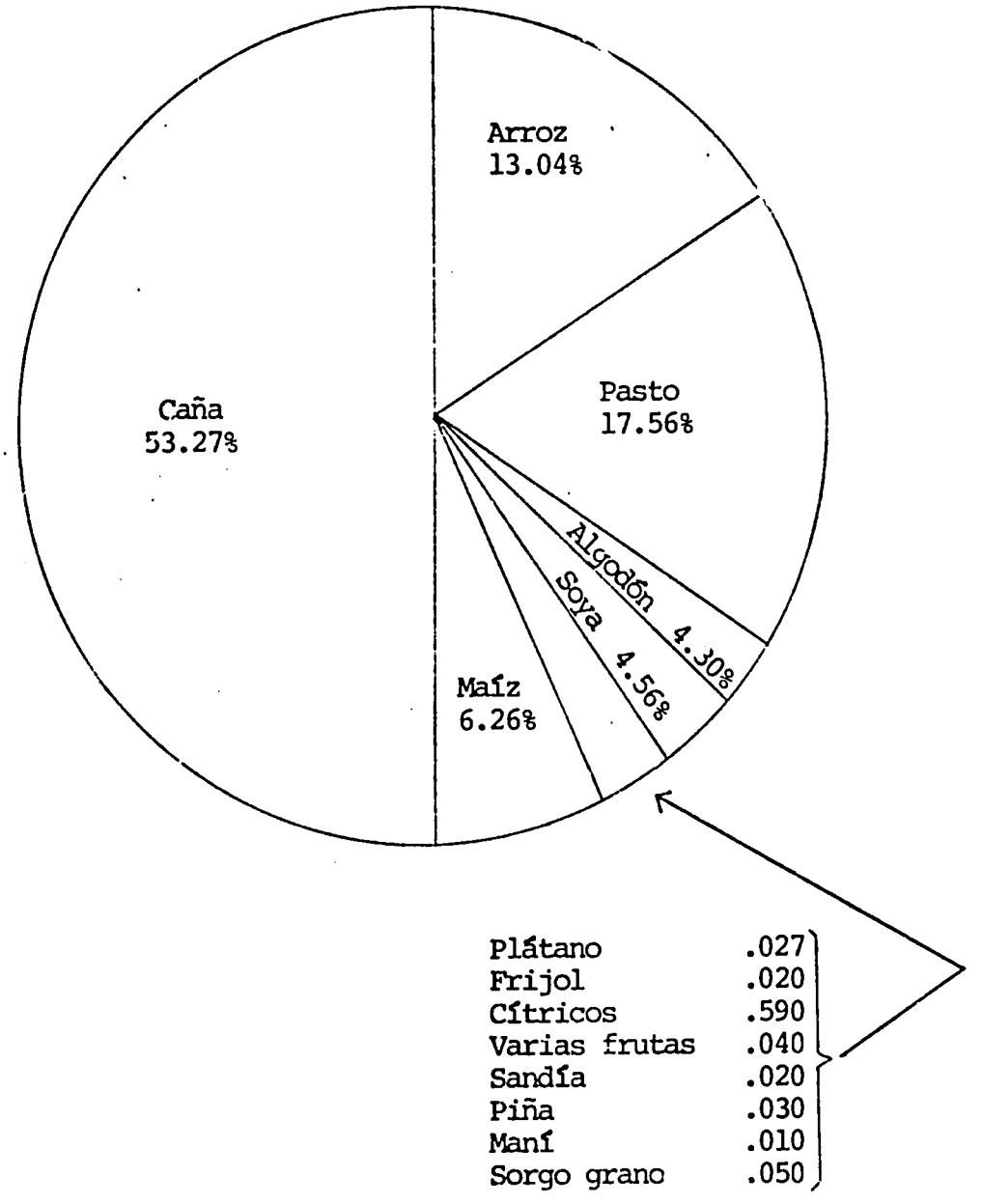

Fig. 1 Use of all cultivated or improved land (percent).

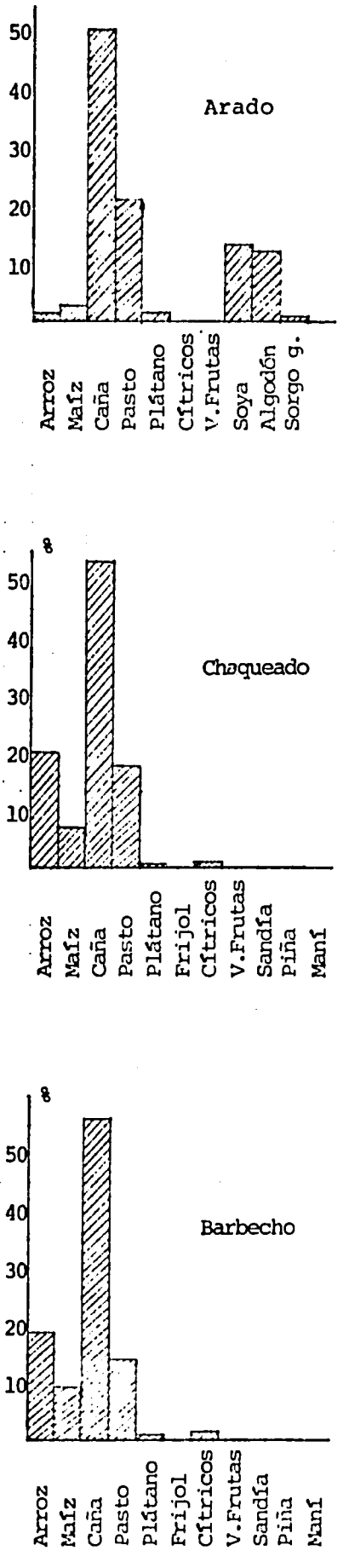

Fig. 2. Use of cultivated or improved land by type.

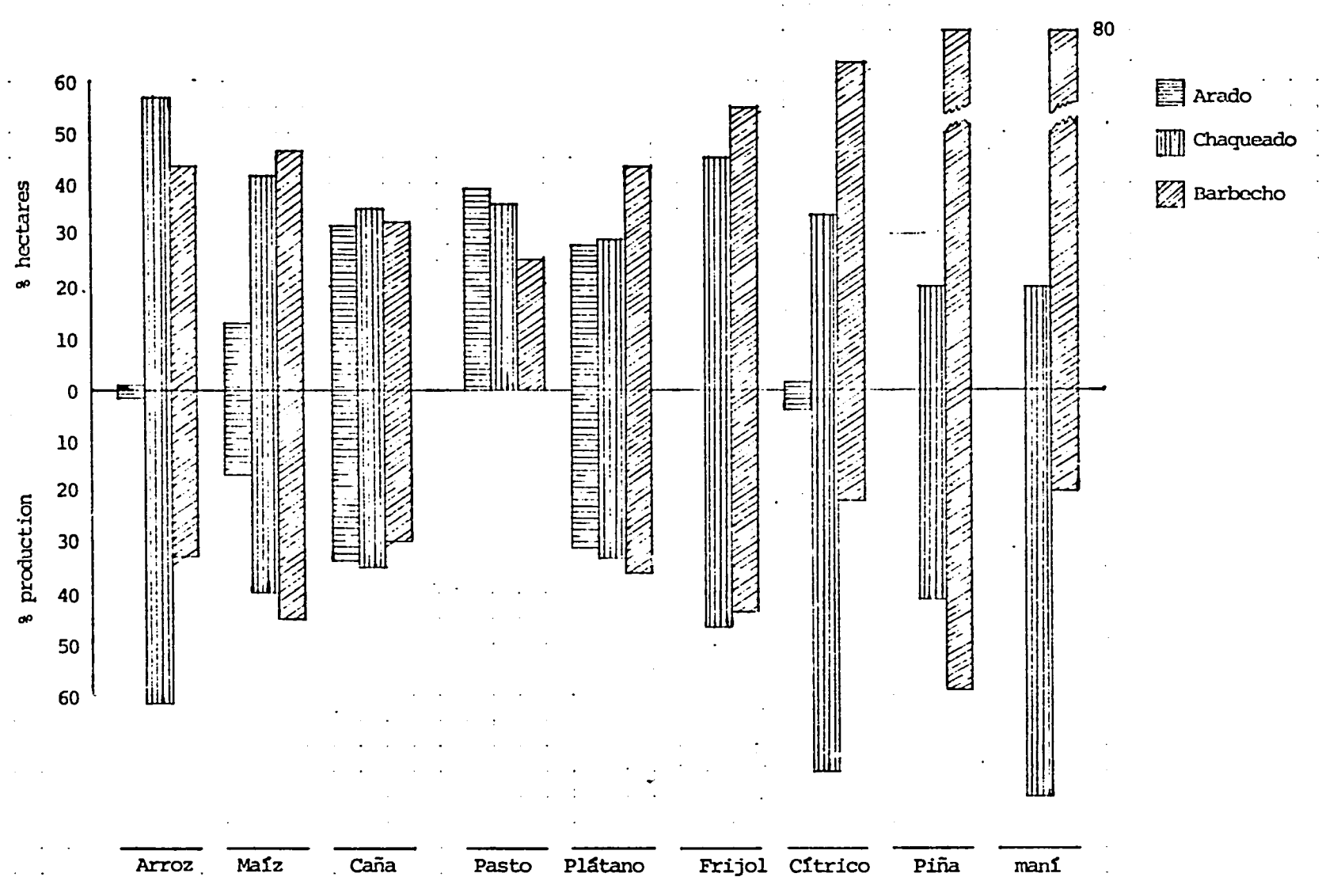

Fig. 3. Share of crop hectarage and production according to cultivation method.

PART I

Overall Agricultural Profile of the Study Area

The following tables summarize the general results of the survey of rural families in Santiesteban Province. Some of the data have been converted to percentages directly from the sample results. In other cases, the sample results have been expanded to estimates of total amounts or values for the entire province (this leads to some slight differences in the percentages that would be obtained directly from the sample results--but these differences are very minor). Expanded estimates are obtained by multiplying the sample data by factors which are the ratios of the number of families sampled to the total number of families in each community. The titles of each table clearly specify whether just the sample results or total estimates are involved.

As is well known to local observers, the northern portion of the province is much less developed than the south. Therefore, a number of tables have been designed to quantify such impressions in the form of numerical magnitudes. By highlighting the difference in the two situations, we facilitate more rational development planning for the areas above and below the Chane river.

The sample shows the following family characteristics of the people living in this region: there is an average of 2.38 children per family; there is an average of 4.91 members per family.

Within the 1255 families interviewed, 94 relatives were identified as family members. Similarly, 195 non-relatives were identified as members. When combined, relatives and non-relatives make up about 5 percent of the total

Table 2. Family structure in Santiesteban Province.

Total number families	Fathers		Mothers		Children		Relatives		Others		Total	
	N°	%	N°	%	N°	%	N°	%	N°	%	N°	%
1,255	1174	19	1089	18	3613	59	94	2	195	3	6165	100

sample. All of these averages and percentages would be little changed if the sample is expanded to an overall estimate. The estimated totals are shown in Table 3.

Assuming one father and one mother per family, the results show fathers missing from 6 percent of the families and mothers missing from 13 percent. These figures support the notion that women find living in the developing areas rather difficult.

Table 3. Estimated population distribution within the study area.

Total number families	Total provinces		South section		North section	
	Families	Persons	Families	Persons	Families	Persons
Sample total	1255	6165	-	-	-	-
Est. Actual Total	3472 3386	17072	2338 2280	12142	1154 1106	4930

Purchasing is the principal means of obtaining land ownership representing 51 percent of the sources of ownership. Reforma Agraria is the next most frequent source accounting for 29 percent of ownership for the entire sample. INC accounts for 12 percent of the ownership, but almost all of this is in the north

Table 4. Pattern of land tenancy in Santiesteban Province.

	Hectares	%	SOUTH		NORTH	
			Hectares	%	Hectares	%
Inherited	6169	6,0	4071	4,0	2098	2,0
Purchased	50837	51,0	24305	25,0	26532	26,0
Rent free	487	1,0	202	0,5	284	0,5
Reforma Agraria	28516	29,0	4679	5.0	23837	24,0
I.N.C.	11849	12,0	2336	2,0	9513	10,0
Rented	616	1,0	329	0,5	287	0,5
Other	576	1,0	180	0,5	396	0,5
Sample Total	99050		36102	37,5	62947	63,5

section. Similarly, almost all of those using reforma agraria to acquire land are in the north section. Land purchase as a source of ownership is evenly divided between north and south in terms of the total hectares involved. However, within each of the sub-zones, the patterns are quite different: over 67 percent of the land in the south section was obtained by purchase, and 13 per cent was obtained through the reforma agraria. These percentages are 41 percent and 38 percent in the north.

Farmers in the sample report almost no land rental.

For the total sample, title to land has already been obtained or is in the process of clearing (en trámite) for approximately 96 percent of the respondents. For those with title en trámite, approximately 60 percent are in the north

section. The title is in the name of the farmer for approximately 95 percent of the farms in both north and south sections.

It will be noted that the estimated number of farm families is approximately 3,500, out of which only about 150 do not claim some kind of title. The totals do not exactly agree because some farmers did not respond clearly to the questions and due to small errors in coding all the responses and making the expansions to provincial estimates.

Table 5. Estimates of the land actually titled and who holds the title.

Item	Total of region	Total % of region	Total South	Percentage Region	Percentage South	Total North	Percentage Region	Percentage North
Title?								
Yes	1677	48,2	1306	37,5	54,6	371	10,7	34,1
No	144	4,1	94	2,7	3,9	50	1,7	4,6
En trámite	1661	47,7	994	28,5	41,5	667	19,2	61,3
Total	3482	100,0	2394	68,7	100,0	1088	31,6	100,0
In the name of:								
farmer	3296	94,7	2168	64,0	95,1	1038	30,7	93,9
wife	144	4,3	76	2,2	3,3	68	2,0	6,1
children	17	0,5	17	0,5	0,7	0	0	0
other	19	0,6	19	0,6	0,8	0	0	0
Total	3386	100,0	2280	67,3	99,9	1106	32,7	100,0

Land values in the south exceed those of the north by 60 to 85 percent. The pattern of rental values is mixed. A rental market apparently exists but it is not large enough to gain good impressions from a sample survey.

Land value for the monte class averages almost 30 percent more than for the next most valuable class , barbecho. The south section of the region shows values for the monte class 20 percent higher than average. Similarly, average land values for barbecho class land in the south are almost

Table 6. Average land and rental values ($b per Ha) in Santiesteban Province.

Class	Sample total of region	South	North	Average rentals		
				Region	South	North
Monte	1804	2165	1273	497	428,5	609
Pampa	1003	1084	675	340,5	347	200*
Barbecho	1398	1668	898	386	418	333

*One report only.

20 percent higher than average. Looking at average rentals, monte class in the north is 23 percent higher than similar class land in the south. However, for the pampa and barbecho classes, average rental in the south exceeds slightly the average rental for the region, especially in the barbecho class, where the rental in the south exceeds the average by 8 percent.

In order to convey a better impression of actual land use, the sample data have been expanded to estimates of total land use in Santiesteban Province. The result is an estimated 234,436 hectares in farms. Most of this total is in

Table 7. Land use as estimated for the total area in farms: Santiesteban Prov.

Uses	Province		South			North		
				Share			Share	
	Hectares	Total %	Hectares	Type %	Prov. %	Hectares	Type %	Prov. %
Cultivation	62,670.85	26.73	54,980.67	87.73	23.45	7,690.21	12.27	3.28
Preparation for Cultivation	7,498.82	3.2	4,574.87	61.01	1.95	2,923.95	38.99	1.25
Monte	50,898.89	21.71	41,812.49	82.15	17.84	9,086.4	17.85	3.88
Pampa	2,783.91	1.19	2,199.56	79.01	0.94	584.35	20.99	0.25
Barbecho	73,872.38	31.51	48,711.98	65.94	20.78	25,160.4	34.06	10.73
Descanso	34,355.45	14.65	25,552.95	74.38	10.38	8,802.5	25.62	3.75
Buildings	1,292.83	0.55	1,149.31	88.90	0.49	143.52	11.10	0.06
Others	1,062.87	0.45	496.68	46.73	0.21	566.19	53.27	0.24
Est. Total	234,436.0	100.0	179,478.49	76.56	--	54,957.5	23.44	--

the southern section where more land has been cleared and the population is greater.

During the 1977 crop year, 26 percent of the estimated total land was under cultivation. About 46 percent was either in some type of fallow (descanso or barbecho). It is when these figures are broken down according to section, that the relative level of development is put into perspective: 87.73 percent of all the 1977 cultivated use was in the south. Land taken out by buildings has the same pattern. In fact, in every use category reported, over 60 percent is in the south section.

Table 8. Farm size according to survey sample.

Size by hectare	Province		North		South	
	No.	%	No.	%	No.	%
0,1 - 5	90	7	18	5	72	8
5,1 - 10	110	9	14	4	96	11
10,1 - 15	91	7	27	7	64	7
15,1 - 20	262	21	30	8	232	27
20,1 - 30	256	21	136	35	120	14
30,1 - 40	106	8	25	6	81	9
40,1 - 50	127	10	55	14	72	8
50,1 - 100	126	10	62	16	64	7
100,1 - 500	62	5	14	4	48	6
500,1 - 1000	13	1	4	1	9	1
1000,1 - 5000	4	-	4	1	-	-
5000,1 -------	1	-	1	-	-	-
Sample Total*	1,248	99	390	101	858	98

*Due to slight tabulation errors, the number of sample families differs between Tables 8 and 2.

The most common farm size in the south portion of the region is 15-20 hectares accounting for 27 percent of the 858 farms reporting. In the north, the most common farm size is slightly larger, 20-30 hectares, accounting for 35 percent of the farms. For the entire region, 42 percent of the farms are in the 15-30 hectares range. There is some tendency for the north to have

larger farms. For example, 36 percent of the north section farms are larger than 40 hectares compared to 22 percent in the south section.

The disparity between the northern section and the south is extremely marked in terms of relative capital availabilities. In Table 9 we have calculated the total estimated amount of capital in the rural area of Santiesteban Province. This amounted to $b. 193,791,002 in 1977 ($9,593,614).

Of the total capital invested in machinery and vehicles, approximately 92 percent is invested in the southern section. Almost all of the remaining 8 percent invested in the north is in vehicles. By far the largest machinery investment is in tractors, which accounts for almost two thirds of the total machinery investment. All of the tractors are in the southern area.

The distribution of total province investment for the three classes is as follows: tools, 2 percent; vehicles, 47 percent and machinery, 51 percent.

The actual provincial investment in hand tools is low enough that we have not bothered to divide the amount between north and south. We assume the distribution is about the same as that of population. The sectional division for vehicles and machinery is instructive, however. In 18 out of 20 machinery categories, virtually all the implement value is in the south. Where vehicles are concerned, there are at least a few of every category in the north although, admittedly, the 16.5 percent in the north is not a very large share of the total value of vehicles.

Table 9 also shows the actual numbers of each item estimated to exist in the rural area of Santiesteban during 1977. In addition, these totals are

Table 9 a. Estimated number and value of machinery.

Machinery	Numbers T	B	R	M	$b. value	% G	South T	B	R	M	$b. value	% T	% G	North T	B	R	M	$b. value	T	G
Tractor rueda	269	193	67	9	65,048,007	66.0	269	193	67	-	65,048,007	100.0	66.0							
Tractor oruga	2	2			1,000,000	1.0					1,000,000	100.0	1.0						0	
Sembradoras	72	61	9	2	3,368,134	3.0	69	61	6	2	3,362,134	99.8	3.0	3		3		6,000	0.2	.1
Semb. fertil.	9	9	-	-	392,000	0.4	9	9	-	-	392,000	100.0	0.4						0	
Cultivadoras	150	141	9	-	3,035,000	3.0	150	141	9	-	3,035,100	100.0	3.0						0	
Desbrazadoras	82	64	18	-	2,077,800	2.0	82	64	18	-	2,077,800	100.0	2.0						0	
Arados discos	188	153	35	-	6,212,632	6.3	188	153	35	-	6,212,632	100.0	6.3						0	
Arados verteb.	10	-	10	-	75,400	0.1	10	-	10	-	75,400	100.0	0.1						0	
Rastras discos	155	137	18	-	7,327,262	7.4	152	134	18	-	7,322,762	99.9	7.0	3	3			4,500	0.06	.1
Rastras flejes	6	3	3	-	36,100	0.03	3	3	-	-	34,000	94.2	0.03	3		3		2,100	0.8	
Subsoladores	13	10	3	-	260,000	0.3	11	8	3	-	252,000	96,9	0.3	2	2			8,000	3.1	
Niveladoras	6	6	-	-	105,000	0.1	6	6	-	-	105,000	100.0	0.1						0	
Fumig. tractor	55	35	20	-	2,824,361	2.8	53	35	18	-	2,800,861	99.2	2.7	2		2		24,000	0.8	.1
Fumig. mochila	60	56	4	-	561,050	0.6	60	56	4	-	561,050	100.0	0.6						0	
Cosech. comb.	17	10	-	7	3,143,000	3.2	17	10	-	7	3,143,000	100.0	3.2						0	
Trillad. estac.	14	14	-	-	412,000	0.4	8	8	-	-	232,000	56.3	0.3	6	6			180,000	43.7	.1
Desgranadora	26	26	-	-	254,000	0.3	26	26	-	-	254,000	100.0	0.3						0	
Fumig.palanca	1000	728	269	3	1,847,148	1.9	698	497	200	-	1,355,047	73.4	1.0	302	231	69	3	492,101	26.6	.9
Otra (caña)					1,080,000	1.1					1,080,000	100.0	1.1						0	
Otra					218,000	0.2					218,000	100.0	0.2						0	
Total parcial					99,277,494	100.0					98,560,793	99.3						716,701	0.7	

Table 9b. Estimated number and value of vehicles.

Vehicles	Numbers T	B	R	M	$b. value	% G	South T	B	R	M	$b value	% T	% G	North T	B	R	M	$b value	% T	% G
Motocicletas	98	50	48	-	1,687,722	1.9	93	49	44	-	1,648,722	97.7	1.8	5	1	4	-	39,000	2.3	.1
Chatas,carretas campetones	456	350	106	-	16,708,950	18.86	439	333	97	-	16,556,450		18.0	26	17	9	-	151,500		.1
Bicicletas	2611	998	1520	93	4,430,256	5.0	1724				2,828,481	63.8	3.0	887				1,601,775	36.2	2
Jeeps	97	78	19	-	10,378,000	11.71	89	75	14	-	9,858,000		11,0	8	4	4	-	520,000		1
Camionetas	165	104	61	-	19,784,000	22.3	149	104	45	-	18,064,000		20.0	16		16		1,720,000		2
Camiones																				
Nissan	47	40	7	-	8,066,000	9.1	42	35	7	-	6,746,000		7.0	5	5			1,320,000		2
Toyota	104	51	53	-	18,740,000	21.15	79	31	48	-	14,030,000		16.0	25	20	5		4,710,000		5
Isuzu	24	10	14	-	4,720,000	5.3	20	17			3,720,000		4.0	4	4			1,000,000		1
Otros	31	21	10	-	5,635,000	6.4	16	9	7	-	1,820,000		2.0	15	12	3		3,815,000		4
Total partial					90,149,928	102					75,271,653	83.5						14,878,275	16.5	

Table 9c. Estimated number and value of tools.

Tools			
Palas	19872	991,600	22.88
Hachas	12094	996,720	23.0
Machetes	22730	997,390	22.55
Azadones	12825	769,500	17.76
Hoces	4351	435,700	10.05
Cabadoras	546	54,600	1.26
Lampas	923	92,300	2.13
Otros			
Cadillas	1064	21,280	0.49
Pecoras	124	12,400	0.28
Remaches	90	7,830	0.18
Morillos	71	4,260	0.10
Total partial		4,363,580	100.0
Total overall		193,791,002	173,832,446	15,594,976

Table 9b. Estimated number and value of vehicles.

Vehicles	Numbers T	B	R	M	$b. value	% G	South T	B	R	M	$b value	% T	% G	North T	B	R	M	$b value	% T	% G
Motocicletas	98	50	48	-	1,687,722	1.9	93	49	44	-	1,648,722	97.7	1.8	5	1	4	-	39,000	2.3	.1
Chatas,carretas campetones	456	350	106	-	16,708,950	18.86	439	333	97	-	16,556,450		18.0	26	17	9	-	151,500		.1
Bicicletas	2611	998	1520	93	4,430,256	5.0	1724				2,828,481	63.8	3.0	887				1,601,775	36.2	2
Jeeps	97	78	19	-	10,378,000	11.71	89	75	14	-	9,858,000		11,0	8	4	4	-	520,000		1
Camionetas	165	104	61	-	19,784,000	22.3	149	104	45	-	18,064,000		20.0	16		16		1,720,000		2
Camiones																				
Nissan	47	40	7	-	8,066,000	9.1	42	35	7	-	6,746,000		7.0	5	5			1,320,000		2
Toyota	104	51	53	-	18,740,000	21.15	79	31	48	-	14,030,000		16.0	25	20	5		4,710,000		5
Isuzu	24	10	14	-	4,720,000	5.3	20	17			3,720,000		4.0	4	4			1,000,000		1
Otros	31	21	10	-	5,635,000	6.4	16	9	7	-	1,820,000		2.0	15	12	3		3,815,000		4
Total partial					90,149,928	102					75,271,653	83.5						14,878,275	16.5	

Table 9c. Estimated number and value of tools.

Tools			
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Lampas	923	92,300	2.13
Otros			
Cadillas	1064	21,280	0.49
Pecoras	124	12,400	0.28
Remaches	90	7,830	0.18
Morillos	71	4,260	0.10
Total partial		4,363,580	100.0
Total overall		193,791,002	
		173,832,446	
		15,594,976	

subdivided according to equipment condition, that is, buena, regular or mala. The only type of equipment that appears to be evenly distributed is fumigador de palanca (back-pack sprayers). (These are used mainly for insecticides, not herbicides.) The next most evenly distributed item (other than hand tools) appears to be bicycles. In value terms, bicycles equal 36.2 percent and back sprayers equal 26.6 percent. Trilladoras estacionarias actually reach 43.7 percent in the north, but there are not many of these items in any case.

As will be shown later on, machinery use is concentrated in sugar cane production so it is important to learn whether other types of modern inputs are as concentrated on particular crops. In Table 10 we show the various techniques utilized according to crop and share of farmers.[3]

Table 10 only includes the data collected for major crops. The amounts shown are estimates for the total study area, as expanded from the original sample. For example, the following techniques for controlling malezas were tabulated: manual, machinery cultivation, and herbicides (of course, a single farmer may utilize more than a single technique, so percentages may sum to over 100 percent).[4] Thus, for rice, we see that almost 500 farmers are estimated to have used herbicides. This is a number just under 25 percent of all the farmers who grew rice in 1977. In the same manner, we see that 11.5 percent reported using herbicides on rice in the south vs. 33 percent in the north. As a result, of the farmers estimated to use herbicides on rice in the

[3]The survey data do not include the actual quantities of chemicals or fertilizers applied, they simply indicate whether or not some use of a particular factor or technique was made.

[4]Information on the number of farmers using pesticides was not collected for the reasons that such use is very widespread.

TABLE 10. Estimated Total Use of Various Production Factors in Four Main Crops

	Entire Study Area							
	Weed Control			Fertilizer Use		Harvest Method		No. Who
	Manual	Machine	Herbicides	Yes	No	Manual	Machine	Planted*
CROP								
Rice								
Est. Number **	1,827.5	2.o	495.62	4.47	1,882.2	2,085.o	2.14	2,085.o
% Who grew	86.2	0.1	23.4	0.3	99.7	99.9	0.1	
% Total crop or practice**								
Cane								
Est. Number **	1,906.7	39.13	389.3	26.6	1,921.9	1,934.2	0	1,935.o
% Who grew	98.5	2.o	20.1	1.4	98.6	100.o	0	
% Total crop or practice**								
Corn								
Est. Number **	1,543.4	10.47	133.1	2.81	1,550.6	1,549.5	0	1,550.o
% Who grew	99.6	0.7	8.6	0.2	100.o	100.o	0	
% Total crop or practice**								
Yucca								
Est. Number **	563.7	0	3.56	0	562.6	563.7	0	564.o
% Who grew	100.o	0	0.6	0	100.o	100.o	0	
% Total crop or practice**								

	South Portion							
	Weed Control			Fertilizer Use		Harvest Method		No. Who
	Manual	Machine	Herbicides	Yes	No	Manual	Machine	Planted*
CROP								
Rice								
Est. Number	888.9	0	108.6	2.8	904.o	907.o	1.4	908.o
% Who grew**	94.4	0	11.5	0.3	99.5	99.8	0.2	
% Total crop or Practice**	47.7	0	21.9	62.9	48.0	37.4	100.o	
Cane								
Est. Number	1,841.3	39.1	375.3	26.57	1,856.5	1,863.8	0	1,870.o
% Who grew**	98.4	2.1	20.1	1.4	98.6	100.o	0	
% Total crop or Practice**	97.o	100.o	96.4	100.o	96.6	96.6	0	

TABLE 10 (Cont.)

Corn								
Est. Number **	1,019.8	8.47	71.93	2.81	1,022.5	1,021.4	0	1,022.5
% Who grew	99.7	0.8	7.0	0.3	100.o	99.9	0	
% Total crop or Practice**	66.o	80.9	54.o	100.o	65.9	65.9	0	
Yucca								
Est. Number	400.2	0	3.56	0	399.1	400.2	0	400.2
% Who grew**	100.o	0	0.9	0	100.o	100.o	0	
% Total crop or Practice**	71.o	100.o	100.o	0	70.9	71.o	0	

North Portion

	Weed Control			Fertilizer Use		Harvest Method		No. Who*
	Manual	Machine	Herbicides	Yes	No	Manual	Machine	Planted
CROP								
Rice								
Est. Number	938.2	2.o	387.6	1.66	978.o	1,178.1	0	1,178.o
% Who grew**	79.6	0.2	33.o	0.2	99.8	100.o	0	
% Total crop or Practice**	51.3	100.o	78.1	37.1	52.o	62.6	0	
Cane								
Est. Number	65.4	0	14.o	0	65.4	65.4	0	65.4
% Who grew**	100.o	0	21.5	0	100.o	100.o	0	
% Total crop or Practice**	3.o	0	3.6	0	3.4	3.4	0	
Corn								
Est. Number	524.1	2.o	61.17	0	528.1	528.1	0	528.1
% Who grew**	99.2	0.4	11.6	0	100.o	100.o	0	
% Total crop or Practice**	34.o	19.1	46.o	0	34.1	34.1	0	
Yucca								
Est. Number	163.5	0	0	0	163.5	163.5	0	164
% Who grew**	100.o	0	0	0	100.o	100.o	0	
% Total crop or Practice**	29.o	0	0	0	29.1	29.o	0	

*Expansions based on No. of farmers who answered these questions. As a result the totals will not match other estimates of No. of farmers actually planting because the figures in this table are somewhat under estimated. The percentages should be applicable to the actual total number of farmers, however.

**% Who grew is calculated by geographic division; % of total crop or practice is the proportion in the north vs. the proportion in the South.

whole study area, about 22 percent were in the south and 78 percent in the north. The rest of the table is read the same way. An estimated 99.7 per cent of all farmers use no fertilizer on rice and there is no difference between the zones. Of the tiny bit that is used, 63 percent is in the south. Virtually, the same percentages hold true for harvesting: almost without exception it is done by hand.

Where sugar cane is concerned, 20 percent of farmers in the study area are estimated to use some herbicides for weed control. This percentage is the same in the two zones. Practically, 100 percent also employ hand weeding, and in the south zone about 2 percent use some mechanical weeding. Fertilizer use is nil in the north and almost nil in the south. Harvesting is 100 percent by hand.

Even smaller percentages of herbicides are employed on corn and yucca. Again, neither crop receives fertilizer and all harvesting is by hand.

Overall credit is used by very few. For example, only 123 families out of the 1253 interviewed received some credit. In other words, only about 10 percent of the farms sampled received credit.

Five sources of credit were considered in the survey. Of the five, cooperatives, intermediaries and "other sources" were used the most. Cooperatives were used almost five times as much as the next most common source, intermediaries.

Table 11. Estimated amount of credit and source - 1977 crop year.

Source	Number families sampled	Number receiving credit	$b.	%	North $b.	North %	South $b.	South %
Cooperatives	1253	93	543,150	68	38,380	5	503,770	63
Intermediaries (banks?)	1253	19	75,800	9	47,600	6	28,200	4
On loan (personal credits)	1253	1	10,000	1	10,000	1	--	--
On harvest (payment in products)	1253	1	--	--	--	--	--	--
Other	1253	9	172,300	22	89,800	11	82,500	10
TOTAL	1253	123	801,259	100	185,780	23	614,470	77

When we consider the total amount of credit, cooperatives loaned almost eight times as much as intermediaries and three times as much as "other sources." The south zone utilized 77 percent of the total amount borrowed.[5]

[5] In the present summary of the survey results, we have no way of indicating whether farmers who received credit also had generally higher incomes or had greater capital assets. A future publication is planned to assess the effect of credit, as well as other insumos, upon income.

PART II

Estimates of Output - 1976-77[6/]

The key features of Provincia Santiestehan crop and livestock production are readily apparent in the data of Tables 12 and 13. Rice, sugar cane, corn and yucca dominate the crop scene from the standpoint of the percentage of families planting these crops, but in terms of actual harvested land area, there is really only one crop: sugar cane; rice is a distant second. Average cultivated area per family is a little over, 11 Ha, but the average is greater for those who produce sugar cane, and a typical "larger" farm would probably have about 25 Ha of cultivated land. Larger land owners show definite preferences for particular varieties of sugar cane (C.B.) and rice (Bluebonnet).

An even more mixed pattern is indicated in the data for the two most important animals, cattle and swine. While the great bulk of the cattle owners still hold only a few criollo or Dutch animals, the middle size herds are being crossed with Cebu and a few of the largest herds are composed solely of introduced crosses such as Pardo x Cebu.

Where hogs are concerned, there is still a very heavy reliance on criollos and some evidence of a spread of improved breds. Only about 35 percent of the farm families in the survey provinces are estimated to raise hogs and the typical herd size is from 5-9 animals.

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[6]Some of the total estimates of number of cultivators, number of hectares on total production vary slightly from the summary tables or from other tables such as 2 . These variances are caused by slight inconsistencies in answers given to various interrelated questions in the original forms. None of these differences have a very significant effect on calculations of overall amounts, percentages or impressions obtained of the situation in the study area.

Table 12. Estimated number of cultivators, land area, production and yields by tillage practice, Crop year 1976-77.

	Arado				Chaqueado				Barbecho				Total			
	No. Cult.	No. Ha.	Prod.	Yield	No. Cult.	No. Ha.	Prod.	Yield	No. Cult.	No. Ha.	Prod.	Yield	No. Cult.	No. Ha.	Prod.	Yield
Arroz													2035.0	7169.26	70245.69	
Durado	3.81	26.67	266.7	10.0	636.32	1878.5	20081.96	10.69	427.86	1214.91	100994.89	9.05	1067.99	3120.09	31343.55	10.05
Carolina					59.69	125.07	1289.71	10.31	51.98	100.33	678.49	6.76	111.67	225.4	1968.2	8.73
Down					9.07	30.37	193.35	6.37	6.56	14.57	105.08	7.21	15.63	44.94	298.53	6.64
Pico Negro	3.07	3.07	15.35	5.0	8.77	36.0	459.47	12.76	14.06	15.69	143.15	9.12	25.9	53.76	617.97	11.29
Bluebonnet					504.61	2413.95	24200.11	10.03	309.11	1311.12	11817.33	9.01	813.77	3725.07	36017.44	9.67
Yuca													488.5	448.21	3815.41	
90 days-Azubi/Br.					29.14	35.09	171.86	4.90	21.14	19.44	141.52	7.28	50.28	54.53	313.38	5.75
Moja blanca rosada					53.30	24.64	268.43	10.89	75.37	50.48	518.99	10.28	128.67	75.12	787.21	10.48
Para negra	7.0	21.0	126.0	6.0	1.66	0.83	4.15	5.0	17.2	19.59	83.19	4.25	25.86	41.42	213.34	5.15
Ganchao colla					70.64	68.33	554.57	8.12	173.83	178.77	764.85	9.87	244.47	247.1	2319.42	9.39
Chaparral					27.76	21.7	104.59	4.82	11.46	8.34	77.47	9.28	39.22	30.04	182.06	6.06
Maíz																
Cubano	21.75	294.82	16752.84	56.82	623.96	1413.39	54687.89	38.69	893.57	1678.41	69243.84	41.26	1539.28	3386.61	140684.57	41.54
Blando	3.07	7.68	383.75	50.0	13.85	90.32	2832.1	31.36	2.75	8.25	247.5	30.0	19.67	106.24	3463.35	32.6
Tomate	2.4	2.4	1200.0	500.0	10.56	9.43	2513.0	266.50	18.98	11.93	1941.0	162.76	31.94	23.76	5654.0	238.01
Guineos					27.78	120.32	102.33	0.85	77.15	175.49	109.32	0.62	104.93	295.81	211.65	0.72
Plátanos (racos)	7.0	49.0	22.05	0.45	37.36	43.52	22.38	0.51	48.1	62.15	2528.0	400.0	92.46	154.67	69.71	420.0
Papas					7.55	4.52	39.07	8.65	15.77	12.5	74.98	6.0	23.32	17.02	114.05	6.7
Frijoles (qq)					3.8	0.38	7.6	20.0	3.41	0.34	6.82	20.0	7.21	0.72	14.42	20.0
Caña													1897.0	27967.47	1408577.5	
# 421	103.54	5423.75	295056.15	54.4	632.62	9484.69	482947.95	50.92	956.93	9926.97	461040.9	46.44	1693.09	24835.4	1239044.99	49.89
Java					25.83	173.29	8750.1	50.49	62.18	645.92	32945.29	51.01	88.01	819.21	41695.39	50.9
Varios	14.0	280.0	14700.0	52.5	8.54	155.08	7754.0	50.0	3.0	49.4	2521.63	51.04	29.06	484.48	24975.63	51.37
C.B.	18.71	872.0	49761.0	57.07	34.45	266.12	13082.7	49.16	33.67	417.56	26098.4	62.5	86.83	1555.68	88942.1	57.17

Table 12 can be referred to as a good indication of the method under which the major crops are produced. It will be noted that mechanization (arado) is significant only in the case of sugar cane and corn. Rice is produced mainly in chaqueado, sugar cane in barbecho, and etc. A considerable variation in average yields is also apparent in Table 12, among varieties and among techniques. Generally, the differences among techniques do not seem too large, and probably would be statistically significant in only a few cases.[7] Yield differences among varieties seem to be somewhat more significant.

In Tables 14 and 15, the total estimates of production and animal holdings are broken down into averages. Beginning with rice, we see that the average farmer producing variety "Durado" under chaqueado conditions has 2.95 Has which produce 31.56 fanegas (Kg) for a yield of 10.69 fanegas. The overall average rice producer of variety "Durado" has 2.92 Has, producing 29.35 fanegas for a yield of 10.05 fanegas/Ha. The remainder of the Table 13 is read in the same manner.

Table 13 suggests some yield differences associated with crop varieties: Pico negro (rice), Maja blanca-rosada (yucca), Cubano (corn), and, possibly, variety C.B. (sugar cane).

Average hectares of sugar cane planted is the largest under machine plowed conditions, but a typical planting is 10 hectares or more under most conditions, that is to say, as large or larger than the average farm size for the whole survey.

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[7] This inference seems justified in many instances due to the small number of families estimated to be involved in production. Unfortunately, in this summary, it has not been possible to include an analysis of variance of answers to the various questions.

Table 13. Estimated number of husbandrymen, and animal inventories, crop year 1976-77.

Animal/class	Number of ranchers	%	# Females	# Males	Total	% Females
Vacunos						
Criollos	604	17.38	4335	1097	5432	79.8
Holandés	202	5.81	579	218	797	72.6
Cr.x Holandés	49	1.01	928	285	1213	76.5
Jersey	2	0.06	7	5	12	58.3
Cr. x Jersey	5	0.14	55	15	70	78.6
Pardo x Cebú	206	5.93	29410	8601	38011	77.4
Pardo suizo	66	1.90	256	324	580	44.1
Pardo x criollo	9	0.26	233	85	318	73.3
Cebú gyr	6	0.17	18	603	621	2.9
Cebú Nellore	20	0.58	820	447	1267	64.7
Cebú Brahman	1	0.03	10	6	16	62.5
Santa Gertrudis	4	0.12	7	8	15	46.7
Pardo x Cebú	4	0.12	1089	99	1188	91.7
Totals	1210	34.82	38611	11872	50483	76.5
Porcinos						
Criollos	1014	29.18	3325	2255	5580	
Poland-China	51	1.47	179	142	321	
Duroc Jersey	72	2.07	484	167	651	
Criollo x P. China	9	0.26	6	11	17	
Criollo x D. Jersey	4	0.12	9	2	11	
P.C. x Duroc x York	1	0.03	16	22	38	
Totals	1151	33.12	4019	2599	6618	
Ovinos	564	16.23	3365	1021	4386	
Equinos	563	16.2	1115	1186	2301	
Pavos	406	11.68	1790	757	2547	
Gallinas	2858	82.24	65203	39379	104582	
Patos	1214	34.94	8780	2823	11603	
Conejos	72	2.07	1112	248	1360	

Table 14. Average production statistics for farms which produce the four major crops -- by variety and land type.

	Arado			Chaqueado			Barbecho			Totals		
	Has.	Prod.	Yield	Has.	Prod.	Yield	Has.	Prod.	Yield	Has.	Prod.	Yield
Arroz												
Durado	7.0	70.0	10.0	2.95	31.56	10.69	2.84	25.70	9.05	2.92	29.35	10.05
Carolina				2.10	21.61	10.31	1.93	13.05	6.76	2.52	17.63	8.73
Down				3.35	21.33	6.37	2.22	16.02	7.21	2.87	19.10	6.64
Pico negro	1.0	5.0	5.0	4.10	52.39	12.76	1.12	10.18	9.12	2.11	23.86	11.29
Bluebonnet				4.78	47.95	10.03	4.24	38.23	9.01	4.58	44.26	9.67
Yuca												
90 dias Azubi/Br.				1.2	5.9	4.9	0.92	6.69	7.28	1.08	6.23	5.75
Moja blanca rosada	3.0	18.0	6.0	0.46	5.09	10.89	0.68	6.91	10.28	0.59	6.12	10.48
Rama-negra				0.50	2.50	5.0	1.14	4.84	4.25	1.60	8.25	5.15
Ganchao colla				0.97	7.85	8.12	1.03	10.15	9.87	1.01	9.49	9.39
Chaparral				0.78	3.77	4.82	0.77	6.76	9.28	0.77	4.64	6.06
Maiz												
Cubano	13.55	770.25	56.82	2.28	87.65	38.69	1.88	77.49	41.26	2.21		
Blando	2.50	125.00	50.00	6.52	204.48	31.36	3.0	90.0	30.0	5.40	176.07	32.6
Tomate	1.0	500.0	500.0	0.89	237.98	266.50	4.0	0.63		0.74	177.02	238.01
Guineos				4.33	3.68	0.85	2.27	1.42	0.62	2.82	18.55	0.72
Plátanos	7.0	3.15	0.45	1.17	0.6	0.51	1.29	52.56	0.4	1.65	75.0	0.12
Papas				0.60	5.17	8.65	0.79	4.75	6.0	0.73	4.89	6.7
Frijoles				0.10	2.00	20.0	0.10	2.0	20.0	0.10	2.00	20.0
Caña												
# 421	52.38	2849.68	54.40	14.65	746.14	50.92	10.37	481.79	46.44	14.67	731.82	49.89
Java				6.71	338.76	50.49	10.39	529.84	51.01	9.31	473.76	50.9
Varios	20.0	1050.00	52.5	18.16	907.96	50.00	16.47	840.84	51.04	16.67	859.45	51.37
C.B.	46.61	2659.59	57.07	7.72	379.76	49.16	12.40	775.12	62.50	17.92	1024.32	57.17

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The table of average animal holdings is pretty much self-explanatory. Any farmer owning cattle (criollos) would be estimated to have 8.99 animals. However, due to some fair sized herds (142 to 432 head), the average number of vacas per family that owns them would be 41.72. About 1/3 of all families own vacas and about the same percentage own hogs. Over 80 percent of the families are estimated to have chickens and the average flock size would be 36.59. About 30 percent of all families have ducks, the average flock size is 9.56.

Table 16 summarizes the disposition (distribution) farmers make of the various main crops. These percentages may vary from year-to-year, especially the ones for which not much sample data could be collected. For rice and sugar cane, we may assume the results to be quite accurate, unless there are major production shifts (as may be the case this year with rice).

Ninety percent of all rice was reported sold, an amount almost as great as for sugar cane (96.5). Major shares of maize and yucca were reported sold, but the number of respondents was relatively low in these cases and those not answering may be smaller producers who utilize much higher percentages in their homes. It will be noted, for example, that few of those farmers who responded with information on yucca or maize, indicated any utilization by animals. It is therefore possible that the farmers who gave the most details in the "commercialization" section of the questionnaire, were the ones who normally sold the most or widest variety.

Table 17 is included to show what happened to the crops reported sold. The direct role played by ENA and FENCA in rice sales is quite interesting, since in this particular sample, together they only purchase 25% of the total. According

Table 15. Average inventory for farms which hold a particular animal or variety.

Animal/class	Estimated number of ranchers	Av. # females	Av. # males	Av. # Both
Vacunoss	604	7.18	1.82	8.99
Criollos	202	2.87	1.08	3.95
Holandés	49	18.94	5.82	24.76
Criollo x Holandés	2	3.50	2.50	6.0
Jersey	5	11.0	3.0	14.0
Criollo x Jersey	2	432.0	39.5	471.5
Pardo x Holandés	206	142.77	41.75	184.52
Criollo x Cebú	66	3.88	4.91	8.79
Pardo-Suizo	9	25.89	9.44	35.33
Pardo x criollo	6	3.0	100.5	103.5
Cebú gyr	20	41.0	22.35	63.35
Cebú Nellore	1	10.0	6.0	16.0
Cebú Brahman	4	1.75	2.00	3.75
Santa Gertrudis	4	272.25	24.75	297.0
Pardo x Cebú	1210	31.91	9.81	41.72
Totals				
Porcinos	1014	3.28	2.22	5.50
Criollos	51	3.51	2.78	6.29
Poland-China	72	6.72	2.32	9.04
Duroc Jersey	9	0.67	1.22	1.89
Criollo x P.C.	4	2.25	0.5	2.75
Criollo x D.J.	1	16.0	22.0	38.0
P.C. x Duroc x York	1151	3.49	2.26	5.75
Totals				
Ovinos	564	5.97	1.81	7.78
Equinos	563	1.98	2.11	4.09
Pavos	406	4.41	1.86	6.27
Gallinas	2858	22.81	13.78	36.59
Patos	1211	7.23	2.33	9.56
Conejos	72	15.44	3.44	18.88

Table 16. Disposition of major crop production - Percent

	Arroz	Yuca	Maíz	Tomate	Banana/ Plátano	Soya	Algodón	Caña
No. respondents	1212	51	198	14	6	21	13	1738
Human consumption	6.80	17.11	6.95	2.18	0.33	--	--	0.02
Animal consumption	1.2	2.92	4.86	--	0.89	--	--	0.0
Seed	2.0	0.0	2.41	--	--	--	--	3.53
Sale	90.0	79.97	85.78	97.82	98.77	100.0	100.0	96.45
When sold								
at harvest	98.0	64.44		100.0		100.0	100.0	
after harvest	2.0	35.56		0.0				

Table 17. Point of sale for principal product (percent) and average prices received.

	Arroz		Yuca		Maíz		Tomate		Soya*		Algodón		Caña	
	%	Price[f]	%	Price[k]	%	Price	%	Price[k]	%	Price[t]	%	Price[t]	%	Price[t]
ENA	20.56	414.4												
FENCA	4.44	399.8												
Ingenios	40.87	415.5							33.33	3920			97.4	187
Comerciantes	27.39	388.6	84.31	1	73.75	79.4	100	7	33.33	3840	72.73	1150	2.6	122
Oil factories									90.48	3497	9.09	1200		
Other factories					15.0	83.0								
Consumidores	1.36	485.0	15.69	1	6.25									
Home consumption					1.88									
Adeda-desmontadora	0.17				1.88						18.18	850		
No planting	2.22				1.25									
No harvest	2.0 est.													

*Sell to more than one type of purchaser

f = fanega k = kilo t = ton

to the sample of about 200 maize producers who answered the marketing section of the questionnaire, a substantial amount of maize is sold for (animal) feeding purposes. Only 15% goes directly to manufacturers.