

this mileage considerably, since many rivers are impassable during the rainy season. Existing all-weather roads are concentrated along the axis of the south coast Interamerican Highway and northward through Tegucigalpa and Comayagua to San Pedro Sula. It is expected that this system will soon continue to Puerto Cortés on the north coast. Over most of the rest of the country dry-weather roads are passable to small trucks and jeeps. Most of these could be made all-weather and usable by at least jeep and small trucks at very little expense, mostly through the construction of bridges. Airlines serve some 28 of the more important isolated communities, which would otherwise be practically inaccessible during the rainy season.

### AGRICULTURAL PRODUCTION IN HONDURAS

According to the 1952 Agricultural Census, Honduras had some 1,573,000 acres of land in cultivation. About 170,000 acres were planted to coffee and 70,000 acres in bananas, or about 20% of the total. Thus one-fifth of the cultivated land produced the bulk of the export commodities for the country. In general, it may be said that agricultural and other extractive products are exported in exchange for various manufactured articles, since very few of these last are produced in Honduras. Tables II and III show the extent of foreign commerce, the principal items exported, the most important groups of items imported and the countries which had trade relations with Honduras during the fiscal years of 1953-54 — 1954-55 and 1956. Probably the most important features of this table are: 1) *Total Exports*, which dropped some L 34,000,000 between 1953-54 and 1954-55; 2) *Bananas*, which accounted for L 25,500,000 of this loss; 3) *Silver*, which diminished by another L 6,000,000 and 4) *Coffee*, which showed a decline of L 3,600,000. As will be seen, only three export items accounted for the entire loss. By the calendar year of 1956 exports had exceeded the 1953-54 total, with silver the only important item failing to recover its former position. Forest products (mostly pine) increased almost 50% while miscellaneous products almost doubled in export value.

## NATURAL CONDITIONS

*GEOLOGIC FEATURES.* The geologic features of Honduras are so complicated that few professionals in the field attempt to map the formations except for the alluvial regions and those of recent volcanic activity. The contemporary geologic history of the country has been tranquil and there are no active volcanoes in Honduras at present. The geology, from the viewpoint of agriculture, is that of a very old, degraded and highly dissected area with only relatively small plains and valleys usable for cultivation.

*TOPOGRAPHIC FEATURES.* Honduras is generally mountainous, with relatively small coastal plains on the Pacific slope near the Gulf of Fonseca and on the Caribbean side in the region of Mosquitia. Extensions of the plains penetrate the larger valleys of the north and northeast, particularly those of the Ulúa and Chamelecón rivers and numerous valleys of smaller size exist in the mountains. The topographical features of Honduras present many difficulties to agricultural development. The broken nature of the terrain makes the study and evaluation of the available agricultural lands very cumbersome; adds many complications to the development of small farm units and to the effective control of erosion; leaves only small possibilities for the mechanization of agriculture; handicaps the efficient operation of organizations for rural adult education and community centers and greatly hinders adequate road development. The agricultural economy of Honduras is, in brief, broken up into small sections in a way that makes the establishment of strong agricultural centers an impossibility on the majority of the lands now in use.

*CLIMATOLOGICAL DATA.* Honduras has a weather bureau that has accumulated data from most areas of the nation except the eastern part, the Mosquitia Plains. The records of the Bureau are at present used mostly by the local airlines but are of great potential value for agricultural planning and will be increasingly important in this respect when continuous records have been maintained for a longer time.

**Table II**  
**EXPORTS — 1953-54 to 1956**

<i>Country of Destination</i>	<i>1953-54 Value in Lempiras</i>	<i>%</i>	<i>1954-55 Value in Lempiras</i>	<i>%</i>	<i>1956 Value in Lempiras</i>	<i>%</i>
<b>TOTAL</b> .....	133.146.485	100.00	101.192.928	100.00	135.955.804	100.00
U. S . A. ....	102.769.986	77.18	67.920.319	67.12	88.817.885	65.33
EL SALVADOR .....	7.986.913	6.00	7.436.641	7.35	12.186.227	8.95
HOLLAND .....	6.310.528	4.74	2.516.758	2.48	1.094.366	0.80
CUBA .....	2.737.346	2.06	2.970.535	2.94	3.144.770	2.31
CANADA .....	8.784.715	6.60	1.761.987	1.74	12.032.737	8.85
OTHERS .....	4.556.997	3.42	18.586.688	18.37	18.679.817	13.75
<b>TOTAL</b> .....	133.146.485	100.00	101.192.928	100.00	135.955.804	100.00
BANANAS .....	79.584.842	59.77	54.003.971	53.37	78.862.136	58.01
COFFEE .....	25.588.506	19.22	21.959.900	21.70	27.007.096	19.86
FOREST PRODUCTS .....	6.275.388	4.71	8.481.372	8.38	9.592.950	7.06
LIVESTOCK .....	3.428.641	2.58	3.256.649	3.22	4.518.608	3.32
SILVER .....	10 053.805	7.55	3.251.637	3.21	1.161.493	0.85
ABACA .....	1.361.212	1.02	2.617.223	2.59	2.306.048	1.70
TOBACCO .....	1.650.150	1.24	911.020	0.90	2.020.290	1.49
DAIRY PRODUCTS .....	152.162	0.11	211.188	0.22	241.701	0.18
OTHERS .....	5.051.779	3.80	6.489.963	6.41	10.245.482	7.53

**SOURCE: Dirección General de Censos y Estadísticas**

NOTE: L 2.00 Lempiras = \$ 1.00

**Table III**  
**IMPORTS 1953-54 to 1956**

<i>Country of Origin</i>	<i>1953-54 Value in Lempiras</i>	<i>%</i>	<i>1954-55 Value in Lempiras</i>	<i>%</i>	<i>1956 Value in Lempiras</i>	<i>%</i>
<b>TOTALS</b> .....	98.466.668	100.00	112.874.031	100.00	117.243.433	100.00
U. S. A. ....	68.226.890	69.28	76.211.729	67.52	79.180.281	67.53
GERMANY .....	4.495.476	4.57	6.863.776	6.08	7.458.800	6.36
JAPAN .....	2.888.231	2.94	5.601.729	4.96	6.165.385	5.26
DUTCH INDIES .....	5.494.929	5.58	4.597.886	4.07	5.475.205	4.67
EL SALVADOR .....	3.235.703	3.29	3.559.090	3.15	2.581.239	2.20
GREAT BRITAIN .....	2.596.130	2.64	3.434.891	3.05	2.899.969	2.47
OTHERS .....	11.529.309	11.70	12.604.930	11.17	13.493.654	11.51
<b>COMMODITIES</b>						
<b>TOTALS</b> .....	98.466.668	100.00	112.874.031	100.00	117.243.433	100.00
FOODS .....	9.507.262	9.66	12.668.574	11.22	12.027.289	10.26
DRINKS & TOBACCO .....	1.273.016	1.29	1.690.821	1.50	643.837	0.55
NON FOOD .....	814.285	0.83	820.482	0.73	448.099	0.38
OILS .....	7.085.075	7.20	6.570.011	5.82	8.687.302	7.41
ANIMAL & VEGETABLE OILS .....	304.200	0.31	268.573	0.24	591.540	0.50
CHEMICAL PRODUCTS .....	15.106.206	15.34	17.548.957	15.55	20.994.252	17.91
MANUFACTURED PRODS. ....	31.273.325	31.76	36.443.641	32.28	35.295.524	30.10
TRANSPORT MACHINERY .....	20.739.511	21.05	21.724.975	19.25	25.841.105	22.04
MISCELLANEOUS .....	12.171.291	12.36	15.034.724	13.32	12.047.558	10.28
TRANSACTIONS .....	192.497	0.20	103.267	0.09	666.927	0.57

**SOURCE: Dirección General de Censos y Estadísticas**

NOTE: L 2.00 Lempiras = \$ 1.00

Table IV

**SQUARE MILES OF LAND AT VARIOUS  
ELEVATIONS BY CLIMATIC ZONES <sup>(1)</sup>**

ZONES CLIMATIC	to 1000 0	to 2000 1001	to 3000 2001	to 5000 3001	5000 OVER	TOTALS
A .....	1,310	360	270	375	85	2,400
B .....	7,790	1,415	515	130	.....	9,850
C .....	790	480	560	555	25	2,410
D .....	1,740	3,205	2,990	3,575	600	12,110
E .....	145	490	1,535	3,305	905	6,380
F .....	205	970	2,170	3,570	1,145	8,060
G .....	1,140	405	290	225	.....	2,060
TOTALS .....	13,120	7,325	8,330	11,735	2,760	43,270

(1) Elevations above sea level in feet.

*WINDS.* Winds in Honduras are influenced by the north-east trades and by the deflected south-east trade winds which blow on the Pacific slope in a mostly south-westerly direction. During the summer and fall months of May through October this trade wind is intensified by a monsoonal impetuous which is the rainmaker on the Pacific coast. During the winter and spring months the north-east trade penetrates to the Pacific and almost completely loses its humidity en route, and is a very dry wind when it reaches its destination. This north-east trade is supplemented during the winter months by cold air masses (northers) which lower the temperature and produce heavy rainfall from October to January along the north coast and on the exposed northern slopes of the higher mountains. These general conditions are modified in many localities by breezes between land and sea and between mountain and valley. Hurricanes from the Atlantic and Caribbean seldom affect Honduras and gales of lesser intensity are largely limited to the north coast and to the offshore islands, but may produce disastrous blowdowns in the banana-growing areas on occasion.

*ATMOSPHERIC TEMPERATURES.* Temperatures in Honduras range from those which are decidedly tropical on the coast to those which are moderately temperate at the higher elevations. Killing frosts seldom occur in Honduras and then only at very high altitudes. The Mete-

rological Section maintains temperature records from some 19 stations in various parts of the country where they have been taken for periods of from 2 to 9 years. The annual average atmospheric temperatures in Fahrenheit degrees at these stations are as follows: Amapala 83°, Catacamas 76°, Comayagua 76°, Guanaja 81°, Guayabillas 79°, La Ceiba 79°, La Esperanza 64°, La Venta 72°, Nueva Oco-tepeque 76°, Puerto Cortés 82°, Obispo 74°, San Pedro 79°, Santa Rosa de Copán 68°, Telica 78°, Toncontín 70°, Tela 79°, Villa San Antonio 78°, Yoro 77°, and Zambra-no 67°. The lowest monthly average, taken over a three year period was that of 58 degrees for the month of January from La Esperanza, in the Department of Intibucá and the highest average 87 degrees for April during a five year period from Amapala in the Gulf of Fonseca. (See Table V).

*ATMOSPHERIC HUMIDITY.* The weather bureau now has humidity records from 9 different stations in Honduras covering periods of from 4 to 12 years. The percentages of annual average atmospheric humidity recorded for the nine stations are: Amapala 66, Catacamas 74, Comayagua 71, Guanaja 78, La Ceiba 74, San Pedro Sula 75, Santa Rosa de Copán 78, Toncontín 72, and Tela 83. The lowest monthly average humidity reported during a four year period was 54 per cent in the month of February at Amapala, while the highest was from an eight year average of 87 percent in December at Tela (See Table VI).

*SUNLIGHT.* No records have been maintained on the amount of sunlight or overcast weather that may be expected for any of the above mentioned sites in Honduras.

*RAINFALL.* The complicated topography of Honduras makes the rainfall data from any given station useful to a very limited area. The weather bureau is collecting rainfall information at more than fifty stations which are located in nearly all parts of the Republic with the exception of Mosquitia on the extreme eastern limits of the national territory. These records were analyzed and the country divided on the basis of the climatological data collected into eight zones that will be used in evaluating current agricultural situations and for crop prognostication. Rainfall characteristics and distribution were considered on the basis of the MOHRS (1937) classification for the tropics

Table V

## AVERAGE MONTHLY ATMOSPHERIC TEMPERATURE IN DEGREES F°

	YEARS	AN.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DIC.
Amapala .....	4	83	82	84	86	87	84	82	84	84	81	80	82	83
Catacamas .....	5	76	71	73	75	78	80	78	77	77	78	76	74	72
Comayagua .....	3	76	73	73	75	77	77	77	76	79	78	75	78	75
Guanaja .....	5	81	77	78	80	81	83	83	82	84	84	81	80	78
Guayabillas .....	2	79	75	75	78	82	82	81	79	80	79	79	78	75
La Ceiba .....	6	79	72	75	79	79	81	81	81	82	83	79	76	75
La Esperanza .....	3	64	58	60	63	65	65	66	65	66	67	69	63	63
La Venta .....	3	72	66	70	73	76	76	75	73	74	74	73	70	69
Ocotepeque .....	5	76	72	74	77	79	78	77	76	77	76	75	73	74
Puerto Cortés .....	2	82	75	79	83	82	84	85	85	84	85	81	78	79
Obispo .....	3	74	68	70	75	76	77	77	76	76	76	75	71	70
San Pedro .....	6	79	73	75	79	81	82	83	81	81	82	78	76	73
Santa Rosa .....	5	68	62	64	67	71	71	71	69	70	70	67	67	63
Tela .....	9	79	75	75	77	80	81	81	80	81	82	80	76	75
Telica .....	2	78	72	78	81	81	82	80	77	79	79	79	74	73
Toncontín .....	7	70	65	67	69	73	73	73	72	73	72	70	68	67
San Antonio .....	3	78	75	76	78	81	81	79	78	78	78	78	77	77
Yoro .....	4	77	72	73	79	82	82	81	77	79	79	75	74	75
Zambrano .....	3	67	63	63	66	68	68	70	68	68	68	67	65	64

Table VI

AVERAGE MONTHLY ATMOSPHERIC HUMIDITY IN  
% IN HONDURAS

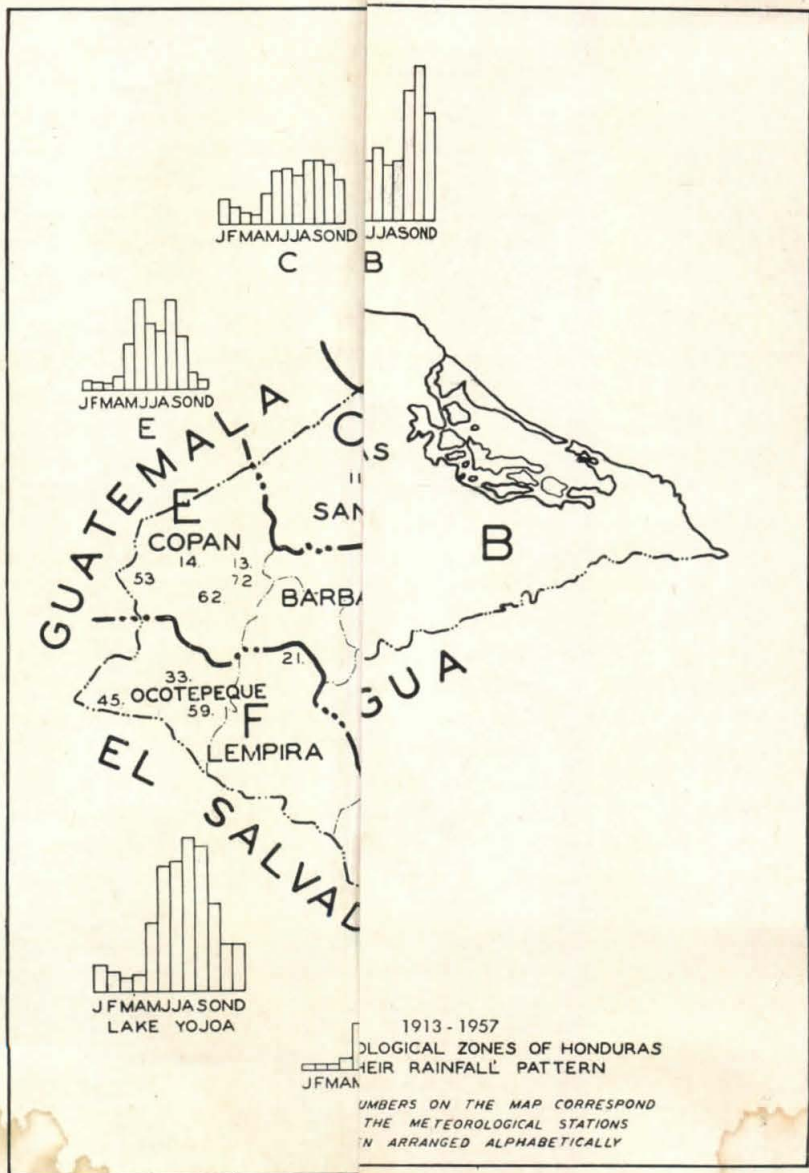
	YEARS	AN.	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DIC.
Amapala .....	4	66	56	55	54	59	69	73	70	69	79	80	68	61
Catacamas .....	4	74	74	68	64	61	67	76	81	80	78	81	77	78
Comayagua .....	4	71	72	65	57	60	70	73	75	72	75	77	77	77
Guanaja .....	5	78	78	79	77	75	77	79	80	77	76	82	80	81
La Ceiba .....	6	74	76	73	71	76	72	73	72	71	73	77	77	78
San Pedro .....	5	75	77	75	69	67	68	75	77	76	76	84	81	81
Santa Rosa .....	5	78	81	75	69	64	71	78	79	78	81	86	85	85
Tela .....	8	83	84	83	81	81	81	81	82	82	82	84	86	87
Tonontin .....	12	72	73	67	61	60	67	77	76	74	79	80	78	76

(dry if the mean monthly precipitation is less than 2.36 inches and wet when it is more than 3.94 inches). Six different patterns of rainfall exist but since two nearly identical patterns were found in a pair of separate areas it was thought desirable to call each of them a separate zone. Differences in elevation with their accompanying differences in temperature make it convenient to establish separate zones for these areas even though the rainfall patterns are very similar. (See Table VII and the map of Honduras which shows the location of the zones, their rainfall pattern and the location of the meteorological stations).

*SOILS.* Very little is available in the way of published information on the soils of Honduras. Some few widely scattered tracts of land, particularly in the banana zones have been surveyed but no organized or extensive studies have been attempted for the country as a whole. The geological, topographical and climatological features in general make for soils that vary widely within areas of quite limited extent. Most of the soils are formed from types of bedrock which yield rather uniformly poor soil-building materials. The two main soil-forming processes are 1) weathering of the underlying strata over long periods of time, followed by geological erosion which produces both alluvial and residual soils in the mountains and 2) secondary deposition of soils transported by rivers or other types of surface water which leave old alluvial soils on the upland plains and valleys and may form either old or recent alluvial soils in the lowlands or alluvial strips of recent origin along the rivers. Centuries of human occupation and interference with the natural vegetation in the central and western highlands have accelerated erosion over vast areas and have added silt to the by now serious flood hazards, particularly in the lower courses of the larger streams such as the Chamelecón, Ulúa and Aguán.

Existing soils would indicate that climatic factors may have been of considerable significance in their formation. There is a wide difference, for example, between the soils in zones A and B where heavy precipitation occurs during most of the year and the rest of Honduras where there is less total rainfall and where definite wet and dry seasons are experienced. In the wet regions residual soils are mainly





## SUMMARY OF RAINFALL BY CLIMATOLOGICAL ZONES IN HONDURAS

Seventy-one of the meteorological stations in Honduras had sufficient rainfall data at the end of 1957 to be included in this summary by zones. These stations were grouped according to their locations and the pattern of the rainfall recorded. There are from four to 23 stations in each of the eight zones. The boundaries of these zones were made to coincide with departmental or municipal boundaries to facilitate the collection of data from the agricultural census.

**Table VII**  
**RAINFALL IN ALL THE ZONES IN HONDURAS <sup>1/</sup>**

ZONE	A	B	C	D	E	F	G	L
Note 2 .....	8	4	13	9	16	23	6	6
Annual .....	105.1	104.8	60.5	52.4	57.3	42.8	65.1	111.4
January .....	9.8	9.5	3.4	2.0	1.0	0.4	0.1	3.5
February .....	5.6	4.6	2.0	1.2	0.7	0.4	0.2	2.4
March .....	3.8	2.9	1.5	0.7	0.7	0.4	0.4	1.8
April .....	3.6	3.3	1.4	1.1	1.4	1.2	1.2	1.9
May .....	4.1	5.4	4.0	4.9	5.4	5.8	10.0	8.6
June .....	5.6	7.3	6.7	7.8	11.1	8.3	11.3	15.9
July .....	7.9	9.0	6.9	7.6	8.1	5.4	5.8	16.4
August .....	8.8	6.7	6.0	5.6	7.2	4.4	7.1	19.5
September .....	8.0	7.3	7.8	6.6	11.1	8.7	16.9	18.4
October .....	15.3	16.0	7.8	7.5	6.7	5.8	10.7	11.2
November .....	17.5	19.3	7.4	4.1	2.1	1.3	1.2	5.9
December .....	14.8	13.5	5.6	3.3	1.2	0.7	0.2	5.9
Note 3 .....	0-2-10	0-2-10	3-1-8	4-1-7	6-0-6	6-0-6	6-0-6	2-2-8

1/ All data are in inches.

2/ This is the number of stations in each zone.

3/ The first figure is the number of dry months (with less than 2.36 inches); the second figure is the number of months with intermediate rainfall; and the third figure is the number of wet months (with 3.94 inches or more rainfall).

river valleys where slender threads of productive soil may be found deposited along the banks.

B) The alluvial soils in the mountains which extend to the north coast and which have been developed under humid conditions. Again quoting PENDLETON: "where the mountains are exposed to much heavier rainfall and the profiles are more mature, striking differences in natural vegetation are not apparent. The soils are not fertile. For tens of miles at intermediate elevations the tall dense tropical rain forest is unbroken by a single clearing or other sign of human activity. As with most profiles, where the soils is undisturbed, the color of the uppermost decimeter is considerably darkened by organic matter and the clay texture is frequently masked by mountain granulation".

C) The alluvial soils of secondary deposition in the smaller upland valleys and inland plains in the semi-arid regions.

The soils in these valleys and on the lower slopes of the bordering hills are mainly blackish gray to grayish white, sometimes with a glint of red or brown. They are mainly very poor in nitrogen and humus and a wide variation is often found within restricted areas in the content of phosphorous. Most of the soils seem to be well supplied with potassium. Most of these soils are acid, with a pH between 6 and 8 and are sandy or silty loams which are very light in texture. These are very friable when moist, but generally very hard when dry. Good Jaragua pasture may often be encountered on these lands, as well as satisfactory crops of corn, beans, sugar cane and rice, especially where irrigation is available. Careful management, with the object of maintaining, or if possible increasing the humus content should be the principal aim in the use of these soils. A well balanced program of diversified agriculture in which the soil is left for several years under grass or legumes between plantings of corn or other annual crops should be developed to assure improved yields in the future.

D) The old alluvial soils of the Choluteca and Valle plains which have developed under semi-arid conditions.

Some restricted areas of good soils of recent alluvial origin are to be found on the west bank of the Choluteca river near its mouth and bordering the mangrove formation along the coast. Shallow, sandy and infertile soils exist

however over much of this plain, where the savanna-type vegetation consists, in large part, of extremely poor grasses, unproductive herbs and Jicaro trees (*Crescentia alata*) which give the landscape a distinctive appearance. In this region two critical moisture conditions obtain at different times of the year.

Since the surface soils are mainly very shallow and of an impervious and unfavorable physical structure they tend to become very wet, or even marshy during the rains, but this condition is followed by deep and severe cracking and a serious moisture deficiency during the dry season. Most of these lands would be extremely difficult to reclaim and their present usefulness tends to be limited to grazing during favorable periods.

E) The old alluvial soils of the Mosquitia plain, which have developed under humid conditions.

The only available source of information regarding the soils of this region is PENDLETON who pointed out: "Of interest pedologically, yet practically useless agriculturally, is the vast mass of sediment carried out during earlier times by the Coco and Patuca rivers in north-eastern Honduras. Elevated roughly 20 meters above the present sea level, these materials have been exposed to heavy and nearly continuous rainfall for such a long time that the surface portions of these deposits have become extremely impoverished and are now a light yellowish, very acid lixivium. In places, at least, the weathering process has reached the senile (true BUCHANAN) laterite stage. These soils normally carry short, sparse grasses and diminutive sedges, Where ravines have cut back into this plain exposing less drastically weathered sediments the slopes are occupied by shrubs and dwarfish broad-leaved trees. The lower courses of the rivers are through poorly drained and often swampy regions. The recent sediment deposited by the Coco river has formed very narrow natural levees of fine brown sandy loam and silt loam. These are considered better agricultural soils". It is to be expected that similar soil conditions exist along other rivers of the Mosquitia plain. The lower valley of the Patuca river broadens however and probably has larger areas of recent and fertile alluvial soil.

F) The recent alluvial soils along the banks of rivers to the north and of the plains built up by these rivers.

than a small part of the farm lands due to their stoniness and the generally broken topography. No real surveys have been made to accurately determine or even estimate the amount of land that might be suited to mechanization. Agricultural development will be limited by the number of individuals available to till a few manzanas each as long as the machete is the sole agricultural implement in use. Admittedly, most of the land now under cultivation is on steep hillsides where it would be difficult, if not impossible to use anything larger than a machete or ox-drawn wooden plow. Where heavy machinery cannot be used, however, jungle is likely to retake fields even on good level land. Only a few years operations are usually possible under existing practices before the land is abandoned to the jungle.

Another hazard to the proper development of the potential agricultural lands of Honduras is the pattern of land ownership or tenure. The 1950 census reports 156,135 farm operators. Of this total 21.3 per cent are private individuals on government land, held under longtime lease or other arrangement; 19.1 per cent private individuals mostly on private land owned by others than the operator and a final 25.7 per cent private operators on communal or state lands with temporary or no arrangements and with little security of tenure. The amounts of land controlled by each group are reported as: 2,897,00 acres in the hands of owners; 1,542,000 acres of government land held under permanent agreements almost equal to ownership; 676,000 acres of private lands operated under combinations of tenancy but mostly private land not owned by the operator; and 1,153,000 acres of mostly government-owned land held under mixed tenancy. Many of these holdings are too small for efficient production. The group of operators with the largest average holdings (116.5 acres) are those with some privately owned land and some government land under permanent agreement. Owners who manage their own lands come next with 87 acres each. The group with the largest number of operators, or those renting government land on a permanent basis, handle an average of 29 acres, while squatters average only 5 acres each.

Considerable study, including the preparation of maps and inventories of existing resources would be required to

provide an even reasonably accurate estimate of the amount of land in Honduras that might warrant mechanization or some other type of modern exploitation. Current maps give a fair estimate of the amount of land at the various elevations in Honduras. There is much speculation as to the extent of the good, but undeveloped agricultural lands in Mosquitia, in the eastern part of the country, but the nature of the soils and climate and the general lack of means of transportation make only the roughest of estimates possible. Reconnaissance procedures can be developed, however, by which the extent of the various land-classes in such remote regions can be known, within reasonable limits, so that some of the speculation can be replaced by actual knowledge. An estimate of the areas found at the various elevations in the seven climatological zones is given in Table IV. Table VIII shows, by zones, the amount of farm land reported by the 1952 census, the amount of good agricultural land not now in cultivation and the probable amount of land that might be used for mechanized agriculture.

Soil, including its structure and relative freedom from stones, *climate* including elevation, rainfall and its distribution, and *topography* are the principal natural features that determine or limit land use, but these may be profoundly modified by social factors such as the ownership or tenancy pattern or the actual size of individual holdings, which may further complicate practical exploitation.

*WATER RESOURCES:* Development of water power resources in Honduras can profoundly affect adjacent agricultural use by: a) attracting industries and making markets for agricultural production; b) regulating stream flow with water storage that can increase the amount of irrigation possible on downstream agricultural lands; and c) diverting water from a stream and thereby making it unavailable to agricultural lands below. The results from any utilization will vary according to the specific conditions in each area. In any case a thorough study of the water power possibilities should be made along with a study of all other natural resources of the various areas of Honduras. Stream flow studies can produce useful data for use in industrial and in agricultural planning for economic development.

from Nicaragua completes the part along the international boundary.

There are no dry months. March and April have an intermediate precipitation and the period from May to February is wet. The mean annual rainfall at the four stations is 104.8 inches. These figures cover periods of from 4 to 30 years, and may be modified by later findings, or records from other parts of the zone. The ascent, peak and descent in precipitation in Zone B are in October, November and December, or the same months as in Zone A. This type of rainfall is suitable for a wide range of tropical crops of economic importance and is more favorable to mechanization than that of Zone A, if the reports of sandy and gravelly soils are correct, with the exception that the high rainfall in November and December might interfere with the gathering of crops needing dry weather for harvest, or with extensive land preparations for secondary plantings. Climatic conditions in this zone would appear to be good for such perennial crops as rubber, oil palms, cacao, coconuts, kapok or citrus. Rice, sweet potatoes, roselle and cassava are among the annual crops that should do well with this type of rainfall. More data on climatological factors and other natural resources are needed from further inland to make a better evaluation of this situation. Adequate information would probably show that part of this area should be placed in Zone A.

**ZONE C:** This zone is in the Sula and Quimistan Valleys to the south of the Sierra de Omoa and San Espiritu. Rainfall records from thirteen stations covering periods of from 7 to 36 years were used in calculating the averages for this zone. Here three months of the year are dry, one intermediate and eight wet, with an annual average rainfall of 60.5 inches, with station averages varying from 43.5 to 79.3 inches, the least precipitation occurring in March and April. The boundaries of this zone are such that no entire Department is included, the whole being made up of parts of Cortes, Santa Barbara and Yoro. The climate of this zone is favorable for mixed farming in smaller units. Some of the best banana plantations in Honduras are along the Rio Chamelecon, Rio Ulua and Rio Comayagua, in this area. These plantations are irrigated during the dry

season, and the zone in general probably the most highly developed in all Honduras. Most of the cattle are on pastures which have been planted to improved grasses, and several wide valleys with fairly good, level land promise much to future mechanization and irrigation. A wide variety of crops are now being grown here, such as bananas, plantains, sugar cane, pineapples, coffee, corn, rice, sorghum, cassava, beans, tobacco, oranges, mangos, and avocados. The area around San Pedro Sula supports a large percentage of the industry of the country.

**ZONE D:** The rainfall in this zone is next to the lowest in Honduras. The annual average is 52.4 inches for nine stations, individual averages varying from 36.1 to 61.8 inches. This zone is composed of the Departments of Olancho and Yoro, except for the municipality of Progreso, which is placed in Zone C. The Sierra of Nombre de Dios and the Cerros de Cangrejal are north of this zone, forcing the moisture-laden winds from the north to an altitude of four to eight thousand feet. Four months (January through April) are dry; seven months (May through November) wet, and one month (December) intermediate, so that agriculture is hazardous excepting in areas where irrigation is available to supplement the rainfall. There are some excellent banana plantations along the Rio Aguan, for example, but they are irrigated. General farming includes such crops as corn, beans, rice, plantains, and other tropical fruits, with some coffee at higher elevations. Extensive livestock operations produce many cattle for export. Expansion of agricultural production in most of this zone will be difficult without greatly increased irrigation facilities, but considerable tracts of valley lands could be mechanized and put into a wide variety of crops or pasture if water were available.

**ZONE E:** This zone is north of the high mountains that form the continental divide and for the most part west of Tegucigalpa.

The rainfall is calculated from the records of 16 stations for 2 to 43 year periods, with the average annual rainfall varying from 40.9 to 70.1 inches. These stations range



in elevation above sea level from 900 feet to 5,000 feet. The rainfall distribution here is six months dry (November to April) and six months wet (May to October). There are two peaks, June and September with 11.1 inches each. There are no months with excessive rainfall. The average annual rainfall for the zone is 57.3 inches. Farming is mostly in small units on the mountain sides. The valleys are generally narrow and form a small proportion of the total land. Corn, beans, plantains, rice, tobacco and sorghum are the general crops. Most of the tobacco of Honduras is grown in the western end and coffee grows well at the intermediate altitudes. The weather is such that the small operators are forced into mixed farming and second plantings of corn are hazardous. Farming could be further diversified to minimize the risks by planting more land to cassava, plantains, sweet potatoes, sesame, several legumes, and lemon and citronella grasses. New varieties of corn, sorghum and beans that mature earlier could aid in reducing these hazards. Irrigation of the small amount of land that can be leveled is always a possibility for increasing food production. Where this is not possible the alternative is to exploit the pine forests or to continue beef-cattle raising in spite of the low production per acre from much of the land.

**ZONE F:** This zone is south of zones D and E, extending from the Department of El Paraíso to the Department of Ocotepeque. It is on the Pacific slope of the mountains, with El Salvador and the coastal plains of the Pacific to the south. The rainfall here is definitely six dry months (November to April) and six wet months (May to October). There are two months with peak rainfall; June with 8.3 inches and September with 8.7 inches, which are not excessive. This rainfall is the lowest in Honduras, with an annual average of 42.8 inches. This is calculated from the data from 23 stations where the rainfall varies from 31.2 inches at Comayagua to 59.8 inches at Nueva Ocotepeque. These records vary in length from 1 to 18 years and the station elevations are from 1,800 to 3,500 feet.

The risk of planting early is so great that many farmers grow only one crop of corn a year on a piece of land. Some follow the corn with beans or sorghum or sometimes corn that is utilized according to the late rains. If rains come

to mature grain it is left to grow. If not, it is cut for fodder. Crops in this zone are very much the same as in Zone E, except that there is less coffee grown on the southern slopes of the mountains and some cotton is grown in the valleys where machinery can be used. Cotton production in this area has great possibilities because there is adequate rain for the growing season and six months dry weather for harvesting. Insect control is expensive because insecticides must be applied by airplane. The rainfall distribution is such that expansion of intensive agriculture will be safe only as irrigation can be installed on the more level land as insurance. With proper irrigation many of the valleys could be mechanized.

**ZONE G:** This zone is on the coastal plains of the Pacific, in the Departments of Choluteca and Valle. Rainfall in this zone is distributed in six dry months (November to April) and six wet months (May to October). There are two peaks in rainfall; June with 11.3 inches and September with 16.9 inches. Records from 6 stations were used in these calculations, where rainfall varied from 43.4 inches at San Marcos to 80.8 inches at Amapala. The distribution of rainfall in this area is very similar to Zone F, except that the September peak is higher and the annual average about 40% more. Differences in elevation and therefore in temperature nevertheless make for a quite different climate and agricultural possibilities. General agriculture in this zone is very similar to the small farming operations in other sections of Honduras, with corn, beans, rice and plantains the main food crops. Cotton and sesame in the lowlands and coffee in the highlands are the principal cash or export crops. Considerable numbers of cattle and hogs are raised for sale in El Salvador. Lack of rainfall makes the pastures almost worthless for several months each year. Rivers are large, originating on the continental divide, but would require major investment, in the form of dams and canals, to make their waters available to the level lands below. Mechanized cotton production on the fertile and level areas offers the greatest possibilities for expansion. An improvement in the present situation in regard to availability of water during the dry season would permit a considerable expansion and intensification of mechanized agriculture on

the better lands in this area. The early and hard dry season makes second crops on the same land a hazardous venture, and limits most farm operations to the normal period of rains, with the exception of the livestock producers, a relatively small group of large landholders who obtain a very low profit per acre from their land.

New agricultural enterprises that could be introduced in this zone, as well in zones D, E, and F include the coarse fibers such as henequen and agave, and some of the essential oils like Ilang-Ilang. The oil of Ilang-Ilang is basic to the perfume industry, with a very stable price on the world market. On poor soils that are not acid, this tree does well without high rainfall. The greatest current expense to the producer of this crop is the hand picking of the flowers which can be done by the family. The initial investment for such a venture would be small, mostly for land, and a small steam pressure distillery, or the distillery could be handled as a cooperative enterprise for a number of families in a village.

**LAKE YOJOA:** Rainfall records have been kept at six places on the shores of Lake Yojoa, for periods from 2 to 15 years, the longest record being from Agua Azul, on Fruit Company property. The meteorological section has maintained a station on the north shore of the lake for six years, and the Rosario Mining Company has kept records at the Mochito mine, northwest of the lake, for 13 years. These records show an annual average rainfall of 111.4 inches. August is the wettest month, with an average of 19.5 inches. Weather conditions here are different from the rest of the country and have little significance in relation to agriculture, but are important in calculating the amount of overflow from lake that might be used for hydroelectric power. This potential is great, in view of the 2100 ft. elevation of the lake above the sea.

It will be obvious from a consideration of these figures that rainfall and its distribution is an exceptionally critical item in all farm operations in Honduras. Careful planning and teaching will be needed to improve the diet and standard of living of the rural population, and to develop prosperous communities. More than one generation may be required to accomplish some of these changes. Most of the

people may otherwise be expected to continue their present program of subsistence farming, with smaller numbers of large landholders, whose extensive cattle operations produce extremely low per acre profits. The needs in the different zones will vary and the programs offered must be correspondingly diverse, those holding forth the greatest promise being: irrigation; mechanization; improved seeds and livestock (which may require more and better land); better roads and transportation; more and better processing and storage facilities and better land management in general, especially in the protection of the pine forests.

### DESCRIPTION OF AGRICULTURAL ENTERPRISES

CORN is the most important crop in Honduras. The 1952 census indicates that some 634,000 acres were planted to corn. This is 48% of all crop land reported, and more nearly follows the population distribution pattern than any other agricultural product, the principal areas of deviation being in the southern part of the country, where areas planted to corn slightly exceed the national average, and in the north, where they are slightly less. Zones A, B, C and D have 35.4 percent of the total population, for example, *vs* 25.5 percent of the corn acreage, while zones E, F and G have 64.6 percent of the population and 74.4 percent of the corn.

Table IX gives the yields per acre for several of the more important crops while Table X shows the percentage of land devoted to a somewhat broader range of products in the different climatic zones. These two tables show that most of the corn in Honduras is planted on land with the lowest yield and most of the population. The reasons for this distribution of corn production are many but include: (1) The crude equipment used throughout most of rural Honduras, which makes hand labor a basic requirement for the cultivation of the crop; (2) The soil and climate, which are better suited to corn than to other crops, in the areas of greatest population concentration and (3) The traditional preference for corn as a major dietary item.

The wide variety of climatic conditions found in Honduras makes for an almost continuous corn harvest — *i.e.*

corn is harvested in some parts of the country during almost every month in the year. Some areas grow only one crop, while others plant three to five times in a given season. On the high mountains and to the south of the continental divide, weather is generally such that only one crop is attempted, although for quite different reasons. At elevations of 4,500 feet or more the temperature is low and the corn grows slowly, even where adequate rainfall is available, while in the south, in zones F and G, rainfall is so erratic, and limited to such a short season that only one crop can be undertaken with safety.

In zones C and E, and parts of D the rainfall has a better annual distribution, so that two or three crops of corn can be grown in most years. In zone A and B excessive rainfall interferes with corn production, especially at harvest time. Since most corn is grown where only one sowing is made annually, some 87 percent of the total may be classed as first planting.

Corn is generally used in Honduras for human consumption and not as a feed for livestock. Some corn is fed to chickens or hogs at harvest time, especially in isolated areas where adequate storage or transportation facilities do not exist, since the weight and volume to be hauled to market can be cut to one tenth or less, in the form of meat.

Corn plantings have been increased in many areas following the installation, by the National Development Bank of drying and storage facilities which are safe from insects, so that some large farms now plant corn with machinery in their crop rotation. These increases in acreage are in large part devoted to newly introduced types of corn which yield much more than the native varieties. Much of this additional production is directed to the export market, however, since the local population prefers the native corn, which is softer and sweeter, and better suited to the making of tortillas, even though the yields are smaller.

Tortillas are a traditional dietary staple in the area, and are consumed where they are produced, lending themselves well to the subsistence type of rural economy found throughout most of the country. They are not easily adapted to mass production methods however, since the wet dough must be ground fresh daily. Existing mills are small, and require much supervision, so that tortilla preparation is



"...newly introduced types of corn...yield much more than  
the native varieties".



"The crude equipment used. . .makes hand labor a basic requirement. . ."

largely a hand operation. The finished product is also very perishable, and must be used within a few hours, as compared with wheat flour, which can be stored for a year or more.

BEANS are the staple protein in the diet of most of the Honduran population. The 1952 census indicates that some 125,000 acres were planted to beans, or about 10.5 percent of the total area devoted to crops. Bean production follows the pattern of the corn plantings, and is mostly concentrated in the southern part of the country, where the yields are lowest.

A small red, kidney-type bean has traditionally been eaten by the people of Honduras, but a considerable acreage has recently been planted to black beans, for export to El Salvador and Guatemala. Increased production of dry beans has been encouraged near the drying and storage facilities of the National Development Bank. Beans are often produced in relatively remote areas, as compared to corn, since their unit value is greater, and they are better able to stand the increased costs of transportation.

Most beans are planted after the corn is harvested, and in places where there is sufficient rainfall to assure germination of the seed, and proper establishment of the plants. Beans are deeper rooted than corn and a crop can be matured in only two months, so that they can be grown successfully in a shorter season, and with less rain. The census reports bean yields of 360 pounds per acre for the first planting, and 400 pounds per acre for the second, indicating the importance of dry weather at harvest time for this crop.

The bean harvest generally involves hand pulling of the vines and hanging them on the corn stalks to dry, before the hand flailing of the pods to free the seeds. The threshed beans are then spread in the sun for further drying, before they are stored or marketed. Beans are served three times a day in hotels and boarding houses, in the smaller towns.

SORGHUM was reported to have been planted on about 157,000 acres in 1952, with about 100,000 acres of this total from Zone F on the southern slopes of the mountains and about 50,000 acres from Zone G, along the Pacific. These two zones reported about 97% of the national production, probably because sorghum yields more than the



national average for corn wherever it may be planted, and more than twice as much as corn in the zones specified. Here the climate is such that corn production is quite hazardous, except during the height of the rainy season, which lasts for about six months, and is followed by six months of drought. Mountainside soils are also generally poor, so that sorghum is a surer crop than corn, and can be grown after the main corn crop has been harvested, the native variety of sorghum being quite well adapted to this type of operation.

Seed of sorghum and corn are often planted at the same time on a given piece of land, after the rains have begun in May or June. Both types of seed germinate at once, but the young sorghum plants grow at a much slower rate and sink their roots deep into the subsoil, without interfering with the corn, during its normal period of development. After the corn is harvested in August or September the sorghum begins to grow in earnest, so that it may be said that the September and October rains make the sorghum crop. These late rains are usually not of long enough duration to justify a second planting of corn, but are adequate for a good crop of sorghum grain. This local variety of sorghum is not used for cattle feed, but surplus quantities may occasionally be fed to chickens or hogs. Only the heads are harvested, by hand, and the stalks are left in the field, and the grain is usually flailed from the heads by hand. Much of this sorghum is used for the making of tortillas, after the corn crop has been consumed.

BANANA production in Honduras is limited to the north coast and Bay Island areas, where transportation is available to the world markets. About 70,000 acres were reported to be planted to bananas by the 1952 census. Two large U.S. companies own and operate banana plantations on the western half of the north coast of Honduras, with many smaller independent producers further west in the same area and in the Bay Islands. All of the bananas produced by these farms are exported to the United States or to Europe.

The larger banana plantations are very efficient operations, with abundant moisture assured throughout the year by adequate irrigation facilities. Insects and diseases are controlled by sprays, which are in some cases applied

from helicopters, while commercial fertilizers are distributed each month, usually through the overhead irrigation system. The smaller plantations usually do not have such modern facilities, so that irrigation may be lacking, and sprays and fertilizers must be applied by hand.

The marketing of the crop is one of the important and limiting factors in banana production. The largest producers have become transportation specialists, who operate railroads in the tropics and steamships on the high seas. These companies have found that they must limit their production to banana varieties that are acceptable to the importing countries, and that will yield the highest possible rate of return on their investment. The smaller operations may, or may not be affiliated with the larger companies, depending on local circumstance. Current market conditions in the importing countries largely determine the extent and timing of shipments from Honduras. Only the largest stems of bananas of highest quality are selected for shipment overseas, so that there are considerable quantities of bananas available for local consumption. Some of the smaller plantations grow only for the local market.

PLANTAINS and other cooking bananas are grown in all parts of Honduras, with the 1952 census reporting 17,400 acres in such crops. There are usually a few plants around each house to supply the family needs, with a few surplus stems for sale. There are two general types of plantains in Honduras: The true plantain (called "platano macho") that is quite long and slender and another, called "chata" (or sometimes "hog banana" in English speaking areas), which is quite short and thick. Both of these are usually cooked as vegetables rather than being used as a fresh fruit. In many parts of Honduras plantains are a major part of the diet. Smaller bananas than those exported are consumed locally. The 1952 census reported 57,000 acres planted to varieties other than those used for export. These plots are distributed throughout the country and the harvest is continuous, since the nature of the fruit prevents storage for more than a few weeks, even in a green condition. They may be found in the markets at all seasons.

Green bananas and plantains are frequently fed to hogs and chickens. They are not an ideal feed for livestock, but can be used to supplement pasturage and grain.

RICE is grown in all of the climatic zones of Honduras. The best yield and largest proportion in relation to the population is in Zone B, which has only 2.5 percent of the population, but 12.3 percent of the area planted to rice. Only upland rice varieties are generally grown, with paddy rice confined to a few trial plots at the research stations. Table IX shows the yield of rice by zones and Table X the distribution of the plantings. The census reported about 27,300 acres as having been planted to rice in 1952.

Honduras does not produce all of the rice consumed in the country, so that imports consistently exceed exports. Probably the darkest cloud on the horizon for rice producers in Honduras is the fact that "hoja blanca" has been reported from the country. Most of the rice crop is cut by hand and threshed by flail, but is cleaned in power mills.

COTTON was reported by the 1952 census to be concentrated in Zones F and G in the southern part of the country. The climate, in these two zones is very favorable to the cultivation of cotton, since the crop can be grown without irrigation. Planting is done in June and July, with the advent of the first heavy rains. Cotton plants are deep rooted, and do not suffer from short periods of drought, as does corn. The long dry season, lasting from December to May, gives ample time for the cotton crop to mature and for its harvest without interference from rain. Since 1952 there has been a great increase in cotton acreage. Almost all of the cotton produced in Honduras was hauled in the seed to El Salvador for ginning, until the most recent harvest, in 1957-58. The main highways in central and southern Honduras have been much improved during the past five years, permitting the trucking of commodities to El Salvador, a fact that has greatly influenced the location of the cotton fields in Honduras. Plantings of cotton in 1957-58 are estimated at about 17,500 acres, the newer plantings extending well into Zones D and E. Much of this production will be ginned at Tegucigala, where the cotton cooperative has built a new plant to provide ginning and storage facilities.

The cotton planters of Honduras have one of the best cooperatives in the country. This organization purchases supplies and equipment, and furnishes airplane spray serv-

ices and financial assistance to members, in addition to the recently installed ginning service. Plans of the cooperative include the construcción of an oil mill to crush cotton seed, which will make cottonseed meal available for the feeding of livestock.

Cotton production is probably the most highly mechanized agricultural operation in Honduras. Nearly all of the new plantations are large enough to use tractors with two and four row equipment. Practically all of these plantings are on level valley land, but contour cultivation and terracing is used wherever needed. Many plantations have water available for irrigation, if rainfall is insufficient for the crop.

TOBACCO is a major cash crop in a small area in western Honduras, with the 1952 census reporting about 9,500 acres dedicated to its cultivation. This has probably been somewhat increased during the past five years, with 76 percent of the total acreage reported from Zone E, mostly in the Department of Copan, while about 16 percent was in Zone F, principally in the Department of Nueva Ocotepeque. Cigarettes are manufactured by a local company in San Pedro Sula, which purchases the majority of the leaf tobacco. This company finances the production of some bright leaf, of the Virginia type, which is mixed with the dark native air-dried product, more commonly found in the country. The cultivation of this bright leaf tobacco is closely controlled by the company, through the distribution of plants grown from imported seed.

Many cigars are made by hand in Santa Rosa de Copan. Santa Rosa was at one time the central market for tobacco in Honduras, but San Pedro Sula now shares in this market. Most of the export tobacco from Copan goes to El Salvador, and is shipped by plane to Nueva Ocotepeque, where truck service is available. A few truck loads of leaf tobacco have been seen on the highway from Santa Rosa to Tegucigalpa and on the Pan American Highway to San Salvador. The relatively limited markets in Honduras and El Salvador determine the acreage that can profitably be planted to tobacco.

COFFEE is a major export item in Honduras, and is produced on about 170,000 acres, according to the 1952 census. Of this total, more than 40 percent was 20 or more

years of age, an additional 30 percent between 5 and 19 years, and less than 30 percent under 5 years from date of planting. These plantations have generally been handled under the "extensive" system, and are poorly managed. No commercial fertilizers are used. Most of these plantations are very isolated, and must be serviced by pack train. Practically no pruning is done except for the high limbs that are broken off in the process of harvesting the crop. These old plantations are, for the most part under the dense shade of large trees that have grown more than the coffee plants and no attempt has been made to correct this condition by selective thinning or pruning. Young coffee plants are commonly found intermingled with the older bushes, being replacements for plants that have died. Reported production is very low, and is probably less than 200 pounds of beans per acre. Most of the coffee plantations are in the central part of the country, on mountainsides at two to four thousand feet in elevation. Good coffee land is never found in the areas that support pure stands of pine, in Honduras, principally because these lands are burned annually.

Table X shows that most of the coffee is in Zone C, D, E and F. Arabian coffee does not produce well at the lower elevations found in Zones A, B and G, where the rainfall permits plant growth the year around, so that there is no distinct season of bloom or harvest. Coffee plants in such areas often bloom at erratic intervals throughout the year, so that there are a few ripe berries at all seasons, as well as a high percentage of "star" (sterile) flowers on the Arabian varieties. The harvest season, in the principal coffee growing areas of Honduras is from November to April.

Table II shows the value of coffee exported from Honduras. Transportation is an important item of expense in coffee production, since most of the plantations are high in the mountains where only pack mule transport is available. Coffee berries are processed on the plantation, so that the weight to be transported is cut to about 20 percent, five pounds of berries producing about one pound of grain coffee (in parchment). Pack mules usually bring this type of grain coffee to a village or highway, where it can be taken by truck to a central market. Much of this Honduran coffee finds its way into El Salvador, Guatemala or Nicaragua, simply because the road nearest to the plantation

crosses the international border. In Tegucigalpa and San Pedro Sula there are large processing plants where the parchment is removed from this type of coffee and the beans graded for export or domestic consumption.

SESAME is grown along the Pacific coast for export to oil mills in El Salvador. This is not an important crop to Honduras as a whole, but is of great importance to a few small farmers. The 1952 census reported 386 farms with about 1,300 acres of sesame, the majority of this total being from the vicinity of the village of El Triunfo, in the Department of Choluteca. With a more stable world market price, and the introduction of some of the newer non-shattering varieties, this could become an important crop along the south coast, where weather conditions are very favorable for its production.

HENEQUEN and other species of fiber bearing plants are found in almost every Department of Honduras. There is quite an industry around Santa Barbara that is devoted to the collection of native and semi-cultivated fibers that are sun dried and hand spun into coarse twine, rope and other similar items for use around the home and farm. Another small business or handicraft is often associated with this industry, usually in the same families, where the men make twine and rope, while the women weave hats, made from the fiber of a palm or palmetto. Some of these hats are of very fine quality, but are sold unfinished for local use or for the export trade, since there are no facilities for blocking them in the area. A few of these nice hats are brought to Tegucigalpa for custom finishing.

There has been a considerable amount of talk of expanding these associated industries through an improvement in the cultivation of the fiber producing plants and the introduction of modern processing machinery, but the world market price for coarse fiber does not encourage the necessary investment. Only a small part of the Department of Santa Barbara is involved in this handicraft industry.

CASSAVA is well adapted to the needs of subsistence farming, and is found in all of the Departments of Honduras, since it produces a very high yield of carbohydrate on a very limited area of land. The crop does not need to be harvested at any definite date, but can be left in the ground until needed for household use. It is not generally

regarded as the best, or most palatable food, but can be grown easily and used to fill in during season when little else is available. The maintainance of the plantation is easy, since a new cutting can be taken from a given plant at harvest time and set in the opened space, where it soon takes root.

WHEAT production in Honduras is limited to the high mountains of the southwestern part of the country, with about 95 percent of the 1,410 acres reported by the 1952 census located on the divide between Zones E and F and with 85 percent of this total in the three Departments of Intibuca, Lempira and Ocotepeque. Production from this small acreage supplies only a fraction of the national needs.

Most of the wheat used in Honduras must be imported, and is milled in San Pedro Sula. The 1950 census reported that only 6.4 percent of the total population ate bread made of wheat flour, but it is probable that this percentage has increased in recent years. More than 60 percent of those reported as eating wheat bread in 1950 lived in the larger urban centers of Tegucigalpa, San Pedro Sula and La Ceiba, where there are large bakeries. It is odd to note that the principal wheat producing area of the country reported the smallest percentage of people eating wheat bread, so that it is evident that the people who produce the wheat either eat it in some other form, or grow it entirely for sale. Any wheat that is transported from its place of origin does not find its way back as flour for bread making. Most of the wheat-growing farms are inaccessible excepting to pack mule transportation.

*CITRUS FRUITS* grow in all parts of Honduras. The climate is favorable for citrus, but on the whole the soils are much too heavy and the plantations are short-lived. Next to bananas and plantains, citrus is the most widely grown fruit in Honduras. Some type of citrus can be found in the markets of the larger towns of Honduras almost the year round. The acid citrus most common to Honduras is a large lime and they are on the market more of the time than any other citrus. Usually, they are sold by the individual fruit, or at most a few fruits to each customer. Sweet oranges and tangerines are the favorite citrus fruits in Honduras. Good tangerines are found on the market for only a short period, November to January. Sweet oranges are the vol-

ume citrus fruit and they come to the larger markets, Tegucigalpa and San Pedro Sula, by truck loads. The season for oranges is very long. Good oranges can be found in the larger markets, especially San Pedro Sula, during most of the year. The two principal varieties are Valencia and Washington navel. Grapefruit is not a popular item in Honduras. Good grapefruit are produced on the north coast where rainfall is adequate and the temperature is high during the ripening period. The minor citrus fruits are found only as novelties or in experimental plots.

*PINEAPPLES* are grown widely in Honduras but only around San Pedro are they grown commercially. The census did not report the area planted to pineapples. The varieties of pineapple grown are not the same as those grown in Hawaii. The red Spanish type pineapple grows well in the warm climate around San Pedro. This type is usually deep seeded so that dark specks (really mature seeds) are found in the fruit when served. The shallow seeded varieties grown in Hawaii do not show this defect. Too, it is claimed that there are no humming birds on Hawaii to pollinate the flowers, therefore, no mature seed are produced. Anyway, pineapples in Honduras have seeds that appear as specks in the fruit when served. There has been much talk of developing a pineapple industry in Honduras. Since the United States would be the market outlet for production beyond the local needs this would mean canning. Fresh pineapple will not stand long shipment. The capital investment needs for a project of this kind are quite large. Present market outlook in competition to the established industry in Hawaii does not encourage this heavy outlay of capital. The climate of many places in zone F is favorable for the production of the type of pineapple now grown in Hawaii.

A small area planted to this type of pineapple near Santa Rosa de Copán and well managed could be worth-while.

No doubt a market could be developed in San Pedro and Tegucigalpa for a small amount of high grade pineapple.

*COCONUT* palms grow along the North Coast and on the Bay Islands. Collection of the nuts for sale in the U. S. A. and for making copra is quite an important business in those areas. There are at least two mills on the North



Coast that buys copra and extracts the oil. These mills also buy other oil bearing palm nuts for crushing. There is a large area that could be devoted to palm oil nuts, including African Oil Palm. Also, there are considerable quantities of wild palm nuts, (*Orbignya*) that are not being collected. The palm oil industry could be expanded in Honduras without great outlay of additional capital.

*CATTLE* are the most important livestock in Honduras. The 1952 census reported 1,765,000 acres of pasture and 1,146,800 head of cattle on 78,950 farms. The census did not report the quality or classification of the pasture nor the breed of cattle. Most of the pasture in Honduras is wild grass. Most of the cattle are a nondescript breed of early origin called "criollo", a Spanish term for indigenous.

Table II indicates that livestock and livestock products are important items of export. Most of this is live cattle that are driven to market in El Salvador and Guatemala. More recently with improvement of the Highways to El Salvador the cattle are driven to a loading station on a Highway in Southern Honduras then hauled by truck into El Salvador. From Western Honduras they are driven into Guatemala where a railroad is available for shipment to market.

Many cattle are milked in Honduras. The 1952 census reported 311,000 milk cows and 145,000 cows as having been milked the day before the census was taken. Usually the production is very low and would be considered unprofitable in many countries. Around the cities and towns some milk is sold as fresh milk. A common scene early in the morning on many streets of Tegucigalpa is the milk deliveryman with two cans on a pack mule dipping milk into a container of the purchaser. All of this milk is boiled or otherwise cooked before consumption. Considerable milk is made into cheese. This is a means of concentrating the protein of the pasture grasses into a form that can pay the freight to bring it to the centers of population. Most of this is a granular white cheese that is sold, wrapped in a banana leaf, in most of the markets. A few cheese factories make a very high type cheddar cheese.

Much of the land now called pasture is really open pine forest that has been burned annually to prevent new

growth of young pines from coming back to replenish the forest. There are some excellent pastures that are planted to improved grasses. In many places these pastures are being taken by a thorn brush called "Carbon". Where the Jaragua grass is planted the coarse stems are burned during the dry season, as the operators have no machinery to cut it, and the brush soon takes everything. In some parts of Honduras the long dry season burns the pasture and leaves no drinking water for the cattle. It is generally estimated that adult cattle loose 200 pounds weight per animal during this long dry season.

New breeds of cattle are being imported. There are some large herds of pure bred Zebu with smaller herds of European breeds and a few bulls of the American Santa Gertrudis. These new breeds are being crossed with the native cattle with good results. There are enough good cattle under good management to indicate that good beef cattle can be grown in Honduras. Dairying might be as feasible if other enterprise and industries can be developed to raise the standard of living of all the people to the point that their diet can include milk at a price that will pay for the good management and good breeding necessary. The Honduran Government and UNICEF have plans to build a milk dehydrating plant near San Pedro Sula. This plant will have a capacity of about 15,000 quarts of fluid milk per day and should be in operation by mid 1959.

*HOG* production in Honduras is usually a haphazard operation. Most of the pigs are scavengers around the villages, eating whatever is available. Out on the margin of transportation, surplus corn at harvest time is fed to the mature hogs to bring them to the finish desired to market them. Honduras demands fat hogs and much hog lard is used. The 1952 census reported 525,000 hogs from all Departments. The hogs commonly found over Honduras shows strains of good breeds from other parts of the world.

Hogs breed much more rapidly than cattle so that two or three good boars imported into a village two or three years apart can almost replace the common herd with nearly pure bred pigs. Seldom has this careful an operation been done but it could be done with organization.

Most hogs are driven to nearby markets for slaughter. Pork is brought to Tegucigalpa from the Department of Olancho by truck and by plane. Pork is more widely consumed in the country than beef because it is easier to dispose of or consume a pig than a steer.

*POULTRY* production in Honduras is rather haphazard with fighting cocks being the primary product and meat or egg production as secondary. The 1952 census reported 3,500,000 chickens. There have been considerable importations of improved strains of chickens from the United States but there is no local source of materials to make the balanced ration necessary for improved poultry breeds. The native hens are accustomed to "scratching" for themselves. Their diet is the insects and wild seeds found around the place. Probably the best breeds of chickens would not survive under the conditions where most chickens grow in Honduras. There are a few flocks of improved breeds being fed imported concentrates.

There is no organized market for poultry nor poultry products in Honduras. Chickens have been observed coming to market on burros, on top of buses tied by their feet and with their feet tied together over a stick on a man's shoulder. These chickens are sold alive for killing and dressing by the cook, usually after a fattening period in the back yard. Very few eggs are placed in cases like those used in the United States. Most of the eggs coming from the country are wrapped in corn shucks or banana leaves and tied with a vine or other coarse fiber. When wrapped in corn shucks usually there are two eggs to the bundle. When banana leaves are used there are six eggs to the bundle. These wrapped eggs are put in wood boxes for packing on the backs of burros, mules or horses and when hauled on the combination freight and passenger trucks that bring most of the people and produce to the markets.

There is talk of constructing a livestock slaughter house where meat scraps and blood meal can be salvaged for chicken feed. Also, there are plans for an oil seed mill in Tegucigalpa to crush cotton seed. A very small amount of cotton seed meal could be added to a mixed chicken feed. If some soy beans are grown in Honduras to be crushed in this mill a better oil-seed-meal would be available. Fish meal could be produced on the North Coast or

on the Bay Islands if there should be enough demand for such in chicken feed. Without this animal protein to make a balanced ration for the young chicks and layers there is little chance of increasing poultry production much or quickly.

*OTHER LIVESTOCK ENTERPRISES:* Most of the livestock grown in Honduras are too large and expensive for most of the people to enter into production. For the production of meat that can be consumed by the producers as well as sold in the market place, probably, the domesticated rabbit offers most. For milk production that can be consumed by the country family with little or no income, probably, some improved strains of milking goats, either purebred or crossed with the natives, offers most.

*RABBIT* production is simple enough and inexpensive enough to be widely used as 4-H Club projects. The costs of initiating a project are quite small. The needs are quite simple — a home-made hutch with wire floor and a pair of rabbits and the kid is in business. One buck (male rabbit) could serve several does of the various members of a club.

The problems of feed that makes a balanced diet are much simpler with rabbits than with chickens. They relish many of the native plants and crops that are available the year-round in Honduras, such as sweet potatoes and their vines, cassava and many grasses. Also, they can use a diet with more fiber than chickens, making it possible to grow all the feed needed on a very small area around the house. Rabbits reproduce rapidly enough that any size project can be developed quickly from only a few animals. The project can be designed to fit whatever land is available to grow feed.

*MILK GOATS* are one of the most efficient feed converting livestock, are highly domesticated and are quite adaptable to climatic conditions. In Honduras there are many low income families that cannot afford to purchase milk for nourishment. Most of these families do not have sufficient land nor facilities for keeping a cow, but they can afford to keep and feed a goat. A good milk goat will

supply sufficient milk for the average family for 9 to 10 months of the year and can be kept where it would be impossible to keep a cow.

There is much rough and rocky land in Honduras that is not suitable for cultivation nor for grazing dairy cattle, but could support goats. Milk goats could fit into many places where the cow is too large an animal unit or where grazing is difficult for cattle. There were about 37,000 goats reported in the 1952 census, mostly in Valle, Olancho and Yoro Departments. These native goats produce very little milk but could be the basis for cross breeding and improvement.

### METEROLOGICAL STATIONS IN HONDURAS

These are the meterological stations which supplemented the information to calculate the graphs shown on the map.

The numbers on the list correspond to the numbers on the map, facing page 10.

- |                         |                      |
|-------------------------|----------------------|
| 1. Agua Caliente        | 20. Farm N° 17       |
| 2. Agua Azul            | 21. Gracias          |
| 3. Amapa                | 22. Guacerique       |
| 4. Amapala              | 23. Guanacastal      |
| 5. Catacamas            | 24. Guanaja          |
| 6. Cayetano             | 25. Guarumas         |
| 7. Colorado             | 26. Guayabillas      |
| 8. Comayagua            | 27. Guaymas          |
| 9. Coyoles              | 28. Hacienda Archaga |
| 10. Choluteca           | 29. Juticalpa        |
| 11. Chumbagua           | 30. La Ceiba         |
| 12. Danlí               | 31. La Esperanza     |
| 13. Dulce Nombre, Copán | 32. La Gloria        |
| 14. El Jaral            | 33. La Labor         |
| 15. El Mochito          | 34. La Lima          |
| 16. El Obispo           | 35. La Lima District |
| 17. El Rosario          | 36. Lamaní           |
| 18. El Sauce, F. M.     | 37. La Paz           |
| 19. El Sauce, S. B.     | 38. La Venta         |

39. Lancetilla
40. Los Planes
41. Manacal
42. Marcala
43. Morocelí
44. Nacaome
45. Nueva Ocotepeque
46. Olanchito
47. Pantano
48. Peña Blanca
49. Pespire
50. Progreso
51. Puerto Castilla
52. Puerto Cortés
53. Ruinas de Copán
54. Sabanagrande
55. San Antonio de Flores
56. San Esteban
57. San Lorenzo
58. San Marcos, Colón
59. S. Marcos, Ocotepeque
60. San Pedro Sula
61. Santa Bárbara
62. Santa Rosa, Copán
63. Sico-Iriona, Colón
64. Talanga
65. Tela
66. Telica
67. Toloa
68. Toncontín
69. Trujillo
70. Ulúa
71. Urraco
72. Veracruz, Copán
73. Villa de San Antonio
74. Yojoa
75. Yoro
76. Yuscarán
77. Zacapa, S. B.
78. Zambrano
79. Zamorano