A LAND-USE STUDY OF COMMERCIAL AGRICULTURE IN CHIAPAS, MEXICO

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ABSTRACT

A LAND-USE STUDY OF COMMERCIAL AGRICULTURE
IN CHIAPAS, MEXICO

By

Rosemary Louise Gunn

Agriculture is the economic way of life in Chiapas. Although subsistence cultivation has continued from pre-Columbian times through the centuries, it is now giving way to commercial agriculture based on tropical crops. Coffee, cacao, bananas, and cotton are representative of the many specialties presently cultivated in the state. Little published material is available for review; and, therefore, the research was directed toward field observations and interviews concerning the techniques of cultivation used by farmers. An analysis was to identify the techniques most useful for the further development of commercial agriculture and to predict the future of commercial agriculture in Chiapas.

Coffee, the most valuable export crop of the state, has been successfully grown for the past century. The methods used in its cultivation are notably primitive. Yet, because of the success to date, planters are reluctant to try new techniques. Cacao is the oldest commercial crop in the area and one of the least stable. Cacao planters will try new techniques, but are equally willing to

cease growing the crop. They are not willing to change the methods of processing, however, in part because they have no incentive to change. The market is controlled by the government, and the prices are fixed at a low level. Bananas are again under commercial cultivation after almost total destruction through plagues and hurricane damage. Banana planters are few in number, but are among the most progressive farmers of the state. Real expansion of the crop awaits a stable export market. Until then, banana production will be small in volume and limited to the Mexico City market. Cotton has expanded rapidly under government auspices. All the adjuncts of modern commercial agriculture are employed in its cultivation. However, as a high-cost crop its existence depends upon the availability of credit. Without it, cotton would soon fade from the scene. Other crops are commercially cultivated but, although valuable, do not dominate commercial agriculture as do the preceding four. Analysis suggests that the location and areal extent of the four leading crops will shift as the cultivation of other crops expands.

The findings of the study indicate a potential for rapid development of commercial agriculture, but a number of problems must yet be resolved:

1. As in many other tropical or developing areas, the transportation system of Chiapas is primitive. Existing roads and railroads need improvement, and new roads must be built.

2. The present land tenure system, although it has favored many small farmers, also encourages evasion of the law by large landholders. The ejido system operates satisfactorily at present in Chiapas, but is likely to promote excessive subdividing of land holdings in the future.

3. The knowledge of farm techniques and attitudes toward physical labor and personal management of farm property needs improvement.

4. Farmers alone can no longer change the character of an agricultural region. Rather, much of the direction must come from the government.

5. The most potent instrument for agricultural change is readily available and abundant credit. However, credit must be accompanied by wise planning on the part of the government and put into effect through well-trained agricultural experts.

6. Little research has been done in Chiapas; and, although published data are scant and unreliable, the area offers rewarding opportunities for further study.

A LAND-USE STUDY OF COMMERCIAL AGRICULTURE IN CHIAPAS, MEXICO

by

Rosemary Louise Gunn

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Geography

1976

DEDICATION

To my dearly loved mother

I sincerely dedicate this research

PREFACE

A chance remark made during a Latin America seminar at Michigan State University led to the subject of this research. Discussion was centered around the importance of Mexico's leading coffee region, in Veracruz State, and a passing reference was made to how little was known about the second most important coffee region in the state of Chiapas. With an abiding love for tropical areas and a regional interest in Latin America, that remark remained in my mind.

As a geographer, I am deeply interested in rural culture; and yet as a regionalist I have convictions of the necessity to learn about all aspects of a region. Here then was the opportunity to meld my various interests into one package. Coffee as an agricultural crop would lead me into the rural areas of the tropics, and I would be concerned with an economic study of human activities.

In the review of literature, Chiapas emerged as an unpolished and multi-faceted agricultural jewel; and the scope of the research began to broaden. Coffee was only one of several commercial crops. Finally, three more crops--cacao, cotton, and bananas--were added to the subject of research. But a purely economic study was not the aim. Instead, the underlying theme became a question of how much the agricultural methods used by farmers affect the development potential for commercial agriculture in a region.

My appreciation for aid and encouragement in this research extends to a host of people, of whom only a few can be mentioned here. First and foremost, my gratitude goes to Dr. Clarence W. Minkel, academic advisor and chairman of the Guidance Committee, for his advice and encouragement. The guidance and assistance of Drs. Robert N. Thomas, Daniel Jacobson, and Joseph Spielberg, all of Michigan State University, are gratefully acknowledged. My thanks also belong to the late Dr. Paul C. Morrison on whose death I lost a friend and a counselor. My very special thanks goes to Dr. Clarence Vinge who graciously agreed to join the committee because of Dr. Minkel's absence in Brazil.

In Chiapas many planters, exporters, government employees, and friends gave invaluable assistance. Ing. Manuel García E., of the Instituto Mexicano del Café, in Chiapas, provided much information and enlisted the aid of his field agents to help in the field. Sr. Socrates Castillo y Porrasco, of the Unión de Algondoneros, and each of the agricultural agents of the Secretaría de Agricultura y Ganadería gave willingly of their time and expertise. The many secretaries and office assistants likewise gave assistance with a smile and deserve my sincere appreciation.

Many finqueros, rancheros, ejiditarios, businessmen, and small farmers gave freely of their time and assistance in the field interviews. Among them Sr. Moises Müguerza, Sr. Hernando de la Torre, Sr. and Sra. Arthur Gehrke, and Sra. Carlos Bernstoff became personal friends as well as interviewees.

Among the many friends met in Chiapas, I offer my appreciation to Ing. Carlos Albores García, who spent many long days accompanying

me and assisting with my interviews. Sr. and Sra. Juan Sanchez, in whose home I resided during my stay in Chiapas, became a second family to me and my mother.

To my best friend, Dr. Betty Schroeder, whose encouragement has sustained me through many difficult moments and who has promised a perfectly typed final manuscript, I offer an imperfectly expressed but very special thank you. To Jean Hirschy who typed and retyped my scribbled draft copies, I also give thanks. Finally, to my mother, who not only accompanied me to Mexico but who also constantly encouraged and assisted me, I give my wholehearted gratitude.

R. L. G.

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CHAPTER I

INTRODUCTION

Since World War II the drive toward economic development for all nations has grown very strong. Until recently such development was sought through an elaboration of an industrial base, but experience has suggested that continuous industrial growth requires a similar growth in agriculture. In Mexico growth in the industrial sector was accompanied by agricultural change. Because "Land and Liberty" was one of the unifying themes of the 1910 Revolution, the government was forced to begin some kind of agricultural program. Land was expropriated from large estates and given as ejidos (inalienable communal property) to villages or groups of laborers. Little attempt was made to evaluate the quality of the redistributed land; and often the ejiditarios found themselves with land that was, at best, marginal for cultivation. When most of the expropriated land had been distributed, many farmers were still without land and more was needed. As the central section of Mexico was heavily populated, the only large areas of unused or underused land lay on the periphery of the nation. The arid lands of the North required water to make them productive, and a program to irrigate them was begun. The Laguna Basin, the Río Bravo (Grande), and the southern part of the Colorado Delta became the foci of several irrigation projects. The development of these northern lands initiated

Mexico's agricultural "frontier" program, and today these same areas account for much of Mexico's large cotton production.

More ambitious plans to develop entire river basins, both industrially and agriculturally, have centered upon the frontier of the rainy tropics. The Papaloapan Basin became the first major tropical river basin selected for development. The industrial section of that program was not initially successful, and agricultural achievement was limited. The Papaloapan Project led to similar plans for smaller rivers in Veracruz, Tabasco, and Campeche. Now the Grijalva and the Usumacinta, two major basins in southeastern Mexico, are scheduled for development. Because the Usumacinta flows for part of its length along the border between Mexico and Guatemala, development of this river must await cooperative action by the two countries. But, work is already in progress on the Grijalva Basin. The first of four phases, the huge Netzahualcoyotl Dam at Malpaso, has been completed; and work on the second phase has begun. This project is aimed primarily toward the production of electricity for the nation. Locally it will benefit the state of Chiapas, another of Mexico's agricultural frontiers.

Comparable in size to the southern peninsula of Michigan, Chiapas is an agricultural state with little industry. Located between the Isthmus of Tehuantepec and Guatemala (Figure 1), Chiapas is mountainous and tropical. A southeast-northwest depression, the Grijalva Valley, cuts through the center of the state. To the south of the depression the mountains fronting the Pacific drop precipitously to the narrow coastal plain, the Soconusco. Descent from the mountains on the north side of the central valley is more gradual, and hilly uplands merge into the Caribbean coastal plain on the border between Chiapas and Tabasco.

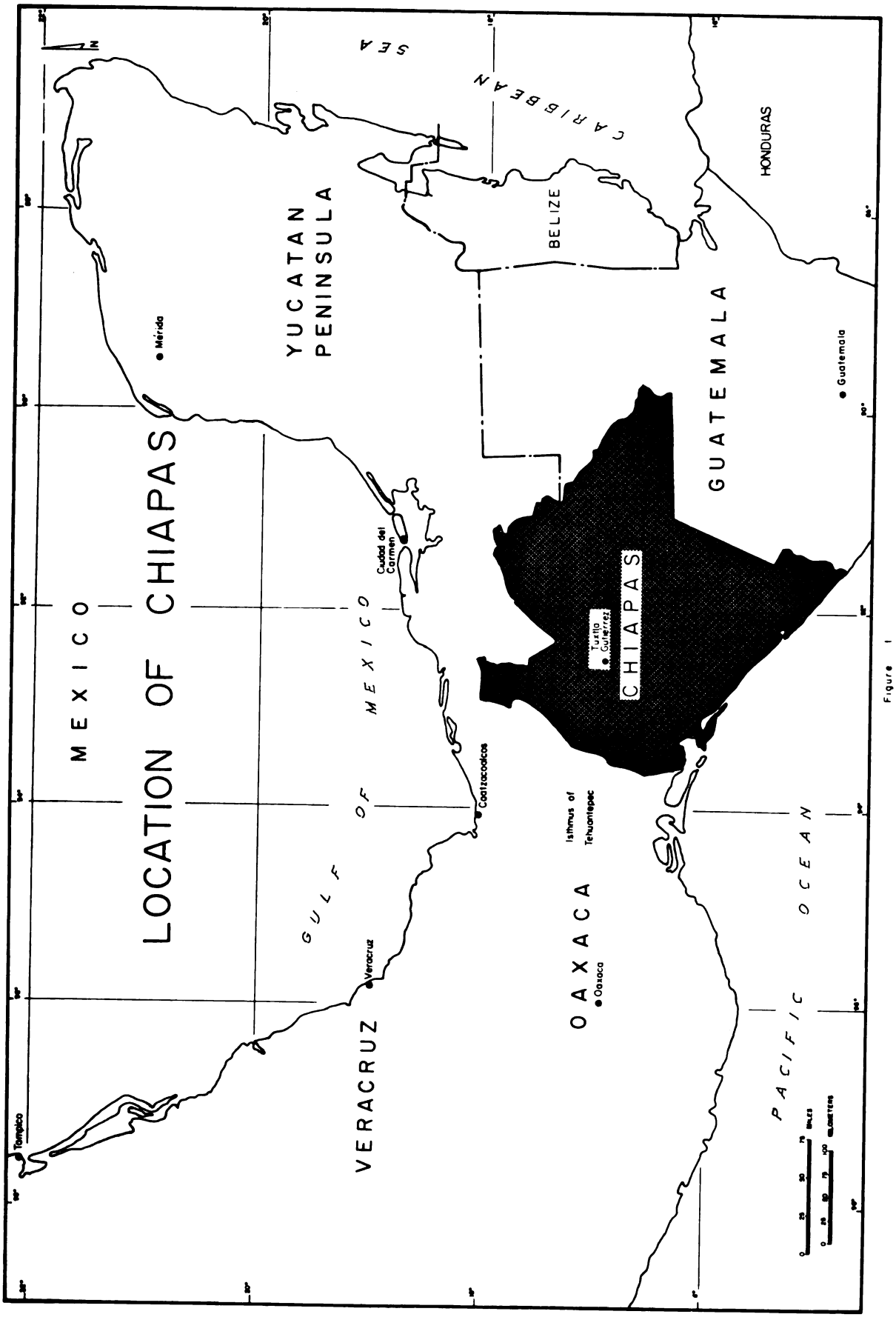
LOCATION OF CHIAPAS
MEXICO
YUCATAN PENINSULA
CARIBBEAN SEA
BELIZE
HONDURAS
GUATEMALA
Mérida
Ciudad del Carmen
Coatzacoalcos
Isthmus of Tehuantepec
Tuxtla Gutierrez
CHIAPAS
Guatemala
Veracruz
Tampico
Oaxaca
VERACRUZ
OAXACA
GULF OF MEXICO
PACIFIC OCEAN
N
MILES
KILOMETERS

Figure 1

The population growth averages about 3 percent per year. From 1950 to 1970 the number of people increased from 907,000 to 1,560,053, of whom more than 1,000,000 were rural. Chiapas has three large cities, which are growing at approximately the same rate as the state. The cities and most of the towns serve as markets or collecting centers for the state's agricultural products.

In the past Chiapas offered a nearly ideal situation for the development of commercial crops for export. Large tracts of unused land, suitable climate and soils, and a not-too-distant source of labor (the meseta) were available. Transportation was the principal handicap. The state lacked roads, railroads, and harbors. But, at the end of the 19th century the first step was taken to improve this situation. A railroad was built along the Pacific coastal plain.

In the 1950's, the Inter-American Highway was completed through the highland settlements in the center of the state to the Guatemalan border. And, in the 1960's a coastal branch of that road was added. Northern Chiapas is serviced by the road and railroad which connect the Yucatan Peninsula with Mexico City.

Specialized agriculture in Chiapas began before the 16th century when cacao was exported to central Mexico as tribute to the Aztec Empire. In the last half of the 19th century German planters, entering via Guatemala, began coffee cultivation near Tapachula. Banana cultivation followed coffee, and in the 1960's cotton became the newest major commercial crop. More than twelve other crops are of high value and, in time, could be produced in exportable quantities. Few other areas of the world can or do produce such a variety of crops within the confines of a single political subdivision.

The Problem

For many nations, especially those in tropical regions, concern is centered upon initiating commercial agriculture, assuming that once started such agriculture will gain momentum and maintain itself. Little attention has been given to the manner in which an already established tropical commercial agriculture develops more completely. It is reasonable to assume that within the internal structure of agricultural areas there are modes of operation which, having adjusted to the requirements of the region, aid in development. Therefore, a land-use study of commercial agriculture in Chiapas, Mexico, was proposed. As Chiapas has a partially developed commercial agriculture which includes a variety of crops, the research proceeded under the hypothesis that in Chiapas there are patterns of operation which are common to all of the crops grown in the commercial agriculture areas of the state and that these patterns have positive effects on both the way commercial agriculture develops and the chance of reaching maximum potential development. Under this hypothesis the purpose of the research was to identify the current patterns of operation and use them to predict the future development of the area.

For purposes of this study commercial agriculture was defined as that agriculture in which crops are grown for market and not to provide daily subsistence for the grower. The crops so produced are sold interregionally rather than in local markets and are not the occasional surplus of subsistence agriculture. As a further limit to the study, only those crops were studied which occupy the greatest share of land allocated to commercial production and provide a major share of the revenue earned. In 1969 the most important crops of Chiapas had a

value of $101,417,600. Of these coffee, cacao, cotton, and bananas were valued at $61,325,120 or approximately 60 percent of the total. Therefore, these four crops were selected for research.

The factors assumed to be most pertinent and those which affect the patterns of operation in Chiapas are 1) specific crops produced, 2) inputs such as fertilizers and pesticides, 3) techniques of farming, 4) labor, 5) markets and marketing procedures, 6) transportation, 7) land tenure systems, and 8) government activities such as taxation and technical assistance. Using these factors, the research attempted to answer the following questions:

1. What are the acreage and value of each major commercial crop?
2. What fertilizers and pesticides are used?
3. How do the forms of tenure affect commercial agriculture?
4. What techniques of production are used?
5. What amount and type of labor are used in commercial agriculture?
6. Where and how do the markets operate?
7. What are the marketing procedures?
8. Where and how is the labor obtained?
9. What forms of transportation are used?
10. What are the costs of transportation?
11. What are the forms of government interest in commercial agriculture?
12. What is the potential for the expansion of commercial agriculture?

Objectives

To analyze and predict the probable future development of commercial agriculture in Chiapas, these objectives were pursued: 1) delimitation of regions of commercial agriculture, 2) delineation of the areas of single crop specialization within the larger agricultural regions, and 3) determination of the patterns of operation common to all commercial agriculture and evaluation of those most conducive to furthering its growth.

Procedure

A bibliography was started prior to field work in Mexico, which was conducted from January, 1972, to January, 1973, and was continued there. The research plan was developed to include interviews with government officials and businessmen, plus a sampling of farmers engaged in commercial agriculture. A continuing step throughout the year was the gathering of statistical and general data, most of which were obtained through the office of the Secretaría de Agricultura y Ganadaría in Tuxtla Gutiérrez, Chiapas. Surprisingly few published or unpublished papers have been produced by that office. Rudimentary records of yearly production and hectares cultivated are kept, but little else. In addition to the collection of data, a search for base maps was made. The need for base maps in a geographical study is essential and is also a serious problem in Chiapas. All maps obtained from the government and private sources had some discrepancies in the boundaries of municipios. These are the smallest political units in Mexico and correspond somewhat to the meets and bounds counties of eastern United States. After consultation with agricultural agents, the base map selected was that obtained from the office of the Constitucional Delagado Federal de Agricultura. This map is used for official work by that office.

Interviews with agricultural agents and businessmen associated with commercial agriculture continued throughout the year. An attempt was made to contact all of the local agricultural agents of the Secretaría de Agricultura y Ganadaría, Instituto Mexicano del Café, and the government cacao buyers. Included among the businessmen contacted were the export coffee buyers, managers of government credit agencies, and representatives of the associations, both official and private, which assist farmers.

Before the interviews with farmers could be conducted, it was necessary to draw a sample. The 1960 census, which includes agricultural statistics, was used to locate the municipios in which appreciable quantities of coffee, cacao, cotton, and bananas are cultivated. Because of the impossibility of developing reasonably complete lists of names of cultivators, a stratified random sample could not be used. Therefore, a locational sample was chosen. There are 111 municipios in the state of Chiapas (Figure 2). Although variable in size and frequently with poorly defined boundaries, they are the units for which statistics are compiled. For this reason they were considered the best units for use in the research.

In the early stages of research it was impossible to stratify the sample either by crop or by size of farm. Therefore, the municipios which produce the crops were divided into quadrants, three square miles in size. Each quadrant was numbered, and quadrants were then selected randomly. From each quadrant selected, one farmer was interviewed. A list of questions for each crop was developed which corresponded to the twelve questions of the problem, varying only where crop requirements differed.

Because some locations could be reached only by trips of from one to three weeks by horseback, and/or farmers in that location speak only local Indian dialects, the services of the agricultural agents or the Indian bureau were employed for some interviews. However, whenever possible, the interviews were conducted personally. Field observations were made at the time of the interviews, and as many as possible of the other areas of the state not included in the samples were visited.

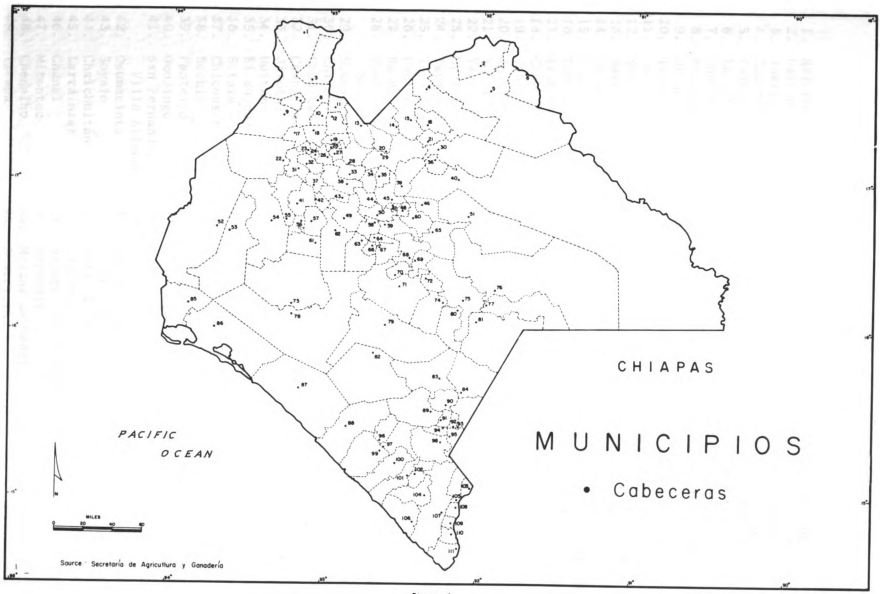
CHIAPAS
MUNICIPIOS
• Cabeceras
PACIFIC
OCEAN
MILES
Source: Secretaría de Agricultura y Ganadería

Figure 2

FIGURE 2 (Continued)

1. Reforma
2. Catazaja
3. Juárez
4. Salto de Agua
5. Palenque
6. La Libertad
7. Sunuapa
8. Pichucalco
9. Ostuacán
10. Ixtacomitán
11. Ixtapangajoya
12. Solosuchiapa
13. Amatán
14. Sabanilla
15. Tila
16. Tumbalá
17. Francisco León
18. Chapultenango
19. Ixhuatán
20. Juitiupán
21. Yajalón
22. Tecpatán
23. Ocotepec
24. Tapalapa
25. Tapilula
26. Pantepec
27. Rayón
28. Pueblo Nuevo Solistahuacán
29. Simojovel
30. Chilón
31. Copainalá
32. Coapilla
33. Jitotal
34. Huitán
35. El Bosque
36. Sitalá
37. Chicoasen
38. Bochil
39. Panteljó
40. Ocosingo
41. San Fernandez Villa Allende
42. Osumacinta
43. Soyalo
44. Chalchuitán
45. Larrainzar
46. Chanal
47. Mitontec
48. Chenalho
49. Ixtapa
50. Chamula
51. Altamirano
52. Cintalapa
53. Jiquipilas
54. Ocozocoautla
55. Berriozabal
56. Terán
57. Tuxtla Gutiérrez
58. Zinacantán
59. San Cristóbal de las Casas
60. Tenejapa
61. Suchiapa
62. Chiapa de Corzo
63. Acala
64. El Zapotal
65. Oxchuc
66. Chiapilla
67. Totolapa
68. Teopisca
69. Amatenango del Valle
70. Nicolas Ruiz
71. Venustiano Carranza
72. Villa las Rosas
73. Villa Flores
74. Socoltenango
75. Comitán
76. Las Margaritas
77. La Independencia
78. Villa Corzo
79. La Concordia
80. Tzimol
81. Trinitaria
82. Angel Albino Corzo
83. Chicomuselo
84. Frontera Comalapa
85. Arriaga
86. Tonalá
87. Pijijiapán
88. Mapastepec
89. Siltepec
90. Amatenango de la Frontera
91. Bella Vista
92. La Grandeza
93. Bejucal del Ocampo
94. Porvenir
95. Mazapa de Madero
96. Acacoyagua
97. Acapetahua
98. Motozintla
99. Escuintla
100. Pueblo Nuevo Comaltitlán
101. Huixtla
102. Tuzantán
103. Unión Juárez
104. Huehuetán
105. Cacahoatán
106. Mazatán
107. Tapachula
108. Tuxtla Chico
109. Metapa
110. Frontera Hidalgo
111. Suchiate

Limitations of the Data

In developing areas, such as Chiapas, the accuracy of data is difficult to assess. The Secretaría de Agricultura y Ganadaría receives an annual report from each municipio on the status of crops cultivated within the area. In some cases the report is made by local agricultural agents, but often it is submitted by the municipio president. These reports are partly the result of personal observation and in part estimates based upon conditions of the previous year, which in turn are partially estimated. The state of communications simply does not permit verification of estimates. However, one source of verification on the amounts sold interregionally does exist. Each municipio has a fiscal station at the boundary of its territory where trucks are inspected and taxed. Also, the government alone processes some crops, such as cacao and cotton, resulting in accurate records. When all sources are compared, the estimates can be adjusted to approximate reality.

Data on exported coffee from the Instituto Mexicano del Café are accurate, since the growers cannot export without a quota permit. But this does not include all coffee harvested, even of exportable quality, for quotas are assigned according to the average yield for a given area and not for the amount actually harvested. Quotas are needed only for coffee that is exported. The proximity of the Guatemalan border is another factor. Many thousands of pounds of Guatemalan coffee find their way into the Mexican market and add to the difficulty of compiling accurate statistics. Finally, Mexican land laws are strict and limit the amount of land one man may own. The common practice of concealing land in excess of the legal limit sometimes leads to the reporting of lesser amounts harvested than is the actual case or

reporting part as being from one municipio and part from another. The official reports, for these reasons, should be taken as reasonable estimates and not as exact figures.

Results of personal interviews must also be looked upon as estimates, because the Mexican farmer enjoys being interviewed but does not always give correct answers. Sometimes he fears that the answer will reveal illegal land holdings, and sometimes he simply does not know the answer. Rather than give no answer, he may give an incorrect one.

Related Literature

A review of the literature indicates that very few geographers have worked in Chiapas. Of those who have, only Philip B. Ellis studied agriculture.[1] He discussed the changes in agricultural land use that have occurred with improvements in technical knowledge, equipment, and communications and the effect of these changes on the development of the towns in the Pacific coastal region. In common with the anthropologists, American geographers have selected the highland Indian cultures for study.[2] In considering the impact of a new road to an isolated community, A. David Hill had to touch upon agriculture.

Today, as in the past, anthropologists are the most active researchers in Chiapas. Their work can be divided into two categories: 1) attempts to record all the important traits of a single culture before they are lost, and 2) analyses of changes that come with

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[1]Philip B. Ellis, "Changes in Agriculture and Settlement in Coastal Chiapas, Southern Mexico," Institute of Latin American Studies, Occasional Papers Number 2 (University of Glasgow, 1971).

[2]Philip Wagner, "Indian Economic Life in Chiapas," Economic Geography, Volume 39, Number 2 (April, 1963), pp. 156-164; and A. David Hill, The Changing Landscape of a Mexican Municipio: Villa Las Rosas, Chiapas (Chicago: Department of Geography, 1964), Research Paper 91.

cultural conflict.[3] To the anthropologist the most constant and disrupting conflict for Indian cultures is that of contact with ladino and modern technology.[4]

Mexican writers have published only a few books and articles on Chiapas. Most of these concern the entire state in a general study of history, geography, or economics. Two of the most useful are economic studies. Chiapas económico is a rather encyclopedic work covering every phase of economic activity in the state from the 1800's to the middle of the 1900's, with emphasis upon the 1940's.[5] One of the four volumes is a survey of agriculture. Similar, but less extensive, is the economic survey by Vivó Escoto using the 1950 census data.[6] Both works are more than ten years old and, therefore, do not present the current situation in Chiapanecan agriculture.

Two regional geographies by Karl M. Helbig are particularly valuable in the description of coffee plantations and their operation in the Soconusco coastal area and central zone of the state.[7]

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[3]Robert M. Laughlin, "The Tzotzil," Handbook of Middle American Indians, Volume 7, ed. Evon Z. Vogt (Austin: University of Texas Press, 1969); Laura Nadar and Duane Metzger, "Conflict Resolution in Two Mexican Communities," American Anthropologist, Volume 65, Number 5, Part I (June, 1965); and Pierre Van den Berghe and Benjamin N. Colby, "Ladino-Indian Relations in the Highlands of Chiapas, Mexico," Social Forces, Volume 40, Number 1 (October, 1961).

[4]A ladino is a person of either mixed Indian-European ancestry or of pure Indian ancestry who has become Europeanized in dress, language, and outlook.

[5]Moises T. de la Peña, Chiapas económico, Volumes I-IV (Tuxtla Gutiérrez, Chiapas: Departmento de Prensa y Turismo Sección Autográfica, 1951).

[6]Jorge A. Vivó Escoto, "Estudio de geografía y demografía de Chiapas," Sociedad Mexicana de geografía y estadística, Volume 87 (January-June, 1959).

[7]Karl M. Helbig, La cuenca superior del Río Grijalva, trans. Felix Heyne; and El Soconusco y su zona cafetalera en Chiapas, trans. Augusto Muench (Tuxtla Gutiérrez, Chiapas, 1964).

Further agricultural information about Chiapas must be gleaned from the many government publications on Mexican agriculture. Specific facts about Chiapas are rare in these, but they assist in fitting Chiapas into the larger framework of Mexico. Many studies are concerned with the structural development of national agriculture and put particular emphasis upon government policies which apply to Chiapas as well as the rest of the nation.[8] Others are limited to smaller regions, especially those of the northern irrigation districts, and analyze one or more aspects of the structure.[9]

The vigorous pursuit of land reform in Mexico and the development of ejidos are unique and the cause of much interest.[10] Simpson's study, a classic, is one of the earliest evaluations of the ejidos.[11] Many problems which he found prevalent in the early years of the ejidos, such as poor quality of the land, too little land, and lack of trained leadership remain as problems in Chiapas. Michael Belshaw's research in a single village explains some of the social and economic problems of the communal farmers in all areas of Mexico.[12] His suggestion that

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[8]Eduardo Venezian and William K. Gamble, A Review of Mexican Agricultural Development 1950-65 (Ithaca: New York State College of Agriculture, 1966).

[9]Whitney W. Hicks, "Agricultural Development in Northern Mexico 1940-60," Land Economics, Volume 43, Number 3 (August, 1967).

[10]An ejido is agricultural land, given to a group of people, which can neither be sold nor rented. Title to the land resides in the community and not with the individuals living there.

[11]Eyler N. Simpson, The Ejido: Mexico's Way Out (Chapel Hill: The University of North Carolina Press, 1937).

[12]Michael Belshaw, A Village Economy: Land and People of Huecorio (New York: Columbia University Press, 1967).

the ejiditarios view the permanence of the ejido as something to be questioned was an unusual one, never touched upon by other writers.

World agricultural development has been the subject of many books and articles. Most are concerned with the application of modern technology to subsistence farming and the great need for education and research to improve the situation in developing nations. Emphasis is placed upon the social problems of the subsistence farmer and the development of an infrastructure.

Most closely allied to the theme of this research are the land-use studies. These seek the causal factors for the location of particular crops. Henshall and King found the physical characteristics of the land to be the only critical factors, but most others find their explanations of land-use patterns in a combination of physical characteristics and historical antecedents.[13]

Findings

In most tropical areas where coffee, cacao, cotton, or bananas are grown, these crops are cultivated for export. The selection of the four crops for study in Chiapas was made with the expectation that they were exported. This expectation was not confirmed. Only coffee is sold on the international market. Cacao, cotton, and bananas are sold primarily in Mexico and are rarely exported. Of these three crops, only cotton and a very small volume of bananas are cultivated under modern techniques. The government controls the production of cotton very rigidly, and permission to plant it is given only if the farmer

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[13]Janet Henshall and L. J. King, "Some Structural Characteristics of Peasant Agriculture in Barbados," Economic Geography, Volume 42, 1966.

uses machinery, fertilizers, and pesticides. The rapid expansion of this crop is the result of government demand and the availability of government credit.

Lack of credit and low prices are given as reasons for the decline of cacao production. Prices are too low for the farmer to use fertilizers or pesticides. Also, diseases cause heavy losses in the harvest. Only where farmers can obtain credit for cattle raising or cotton cultivation do they use any form of fertilizer or pesticide for cacao. None produce only cacao; all depend primarily on some other crop and may grow cacao as a secondary source of income.

Coffee is the most important commercial crop in Chiapas, but the cafetaleros as a group do not seek out improvements in cultivation techniques.[14] They seem to accept the methods of their fathers and grandfathers as the only good way to grow coffee. In Chiapas only one grower interviewed produces coffee without shade and uses chemical fertilizers and pesticides.

Concern for the future productivity of his land does not seem to be a characteristic of the average Chiapanecan farmer. When improvements are needed, the government is expected to make them. Of all the farmers interviewed (143), only the forty-eight commercial banana growers seemed concerned about the future. They are former cotton or cacao producers who turned to bananas as a more satisfactory crop since about 1966.

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[14] Cafetaleros are full-time large-scale coffee cultivators. In Chiapas the term implies considerable prestige.

CHAPTER II

THE STATE OF CHIAPAS

The state of Chiapas contains nearly 4 percent of the Mexican national territory. It ranks midway in size between the largest and smallest states. In a broad comparison, Chiapas resembles a miniature Mexico. From the northern border of Mexico to just south of Mexico City the important landforms are a high central plateau with rugged mountains on the eastern and western sides. With some differences, Chiapas also has a high central plateau with two mountain chains at the sides. As a part of the North American physiography, Mexican structures are oriented in a generally northwest-southeast direction. Chiapanecan landforms, as a part of the Central American features, have a similar orientation.

The long north-south extent of Mexico places it within several climatic zones, while the small size of Chiapas limits it to the tropics. Nevertheless, temperatures in both are controlled largely by elevation. The lowlands are known as tierra caliente (warm land). Areas of 2,000 to about 6,000 feet in elevation are called tierra templada (temperate land), and the cool higher lands are the tierra fria.

Even more important to agriculture than temperature is the amount of rainfall. Except for the Gulf Coast and Chiapas, most of Mexico is

deficient in rainfall. On the other hand, precipitation in Chiapas varies from sufficient to abundant; and a few small areas of northern Chiapas receive the heaviest rainfall in Mexico, over 200 inches. The heavy rainfall gives Chiapas more than one-third of the potential waterpower of Mexico, which when developed is expected to supply nearly 90 percent of the electricity available to the nation.

The comparison of Mexico and Chiapas cannot be extended to vegetation, for the tropical rainforests and wooded savannas of Chiapas are completely dissimilar to the desert and semiarid vegetation over much of the nation. However, in the higher elevations the forests of oak and pine in Chihuahua and Durango are similar to those of Chiapas.

Culturally, Chiapas is again a miniature Mexico. Both have large Indian populations, about 30 percent. These are settled in the least accessible areas and retain the native languages, dress, and many other cultural traits. Each has a small minority of people of unmixed European descent and a large mestizo population.[1] The latter two groups control the best lands and the economy of the state and of the nation.

Unlike the nation, Chiapas is more than 50 percent rural and is lacking in industry. While agriculture remains important to Mexico, the other sectors engage more people. In Chiapas agriculture is critical. Most of the state's revenue comes from it, and most of the people are farmers. Urban growth is limited. Although many people live in clusters large enough to be designated as urban, such communities have few qualities of urban life.

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[1] A mestizo is a person of mixed Indian and European ancestry.

Physical Characteristics

The Chiapanecan farmers are only beginning to learn modern techniques of cultivation, such as the use of chemical fertilizers and pesticides, mechanical equipment, and the application of soil conservation methods. They are consequently closely tied to the physical characteristics of the land.

As a result of the tropical location, between 14° and 18° north latitude, hot and humid conditions are constant throughout much of the state. Alternating high and low pressure cells over the land bring a six-month dry period from January to June and heavy rains in the summer. Only the northern municipios are located within a tropical littoral climate and have rain every month of the year. Temperatures average between 75° and 80°F, except in the mountains where temperature decreases with altitude.

Physiographically, Chiapas has two distinct mountain chains separated by a large structural depression and a high plateau. The mountains, plateau, and depression cross the state from northwest to southeast and divide it into seven bands or physiographic provinces (Figure 3). These provide useful categories for description, because many types of agriculture vary according to landform.

Pacific Coastal Plain

The Pacific Coastal Plain of Chiapas is but a small segment of the coastal plain which begins at the Isthmus of Tehuantepec and extends as far as Nicaragua. The Chiapanecan section is 180 miles long, but less than ten miles wide. Only near the city of Tapachula does it widen to more than twenty miles. This plain has a relatively

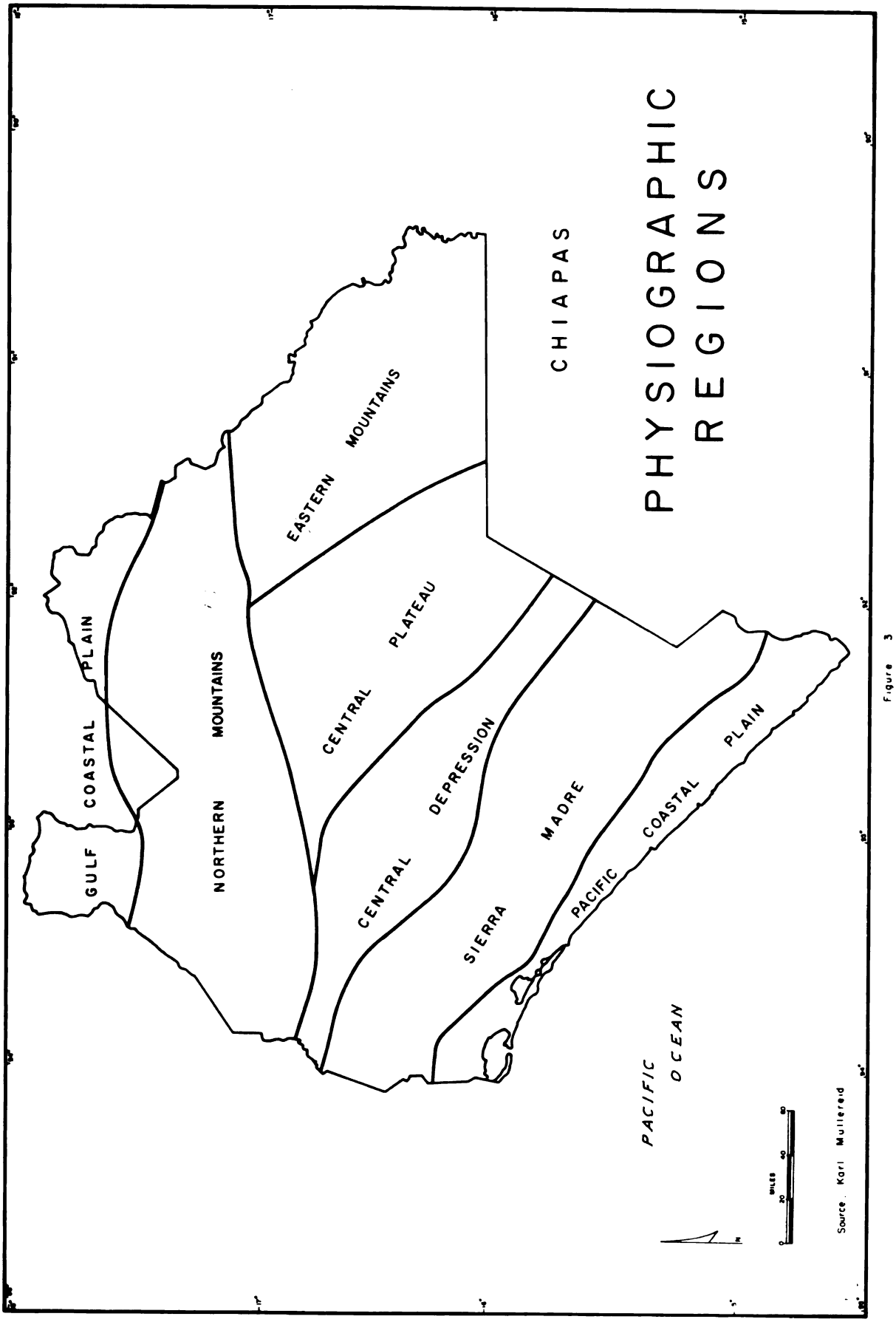
PHYSIOGRAPHIC REGIONS
CHIAPAS
EASTERN MOUNTAINS
CENTRAL PLATEAU
NORTHERN MOUNTAINS
GULF COASTAL PLAIN
CENTRAL DEPRESSION
SIERRA MADRE
PACIFIC COASTAL PLAIN
PACIFIC OCEAN
MILES
0 20 40 60
Source: Karl Mullereid

Figure 3

flat surface, which is interrupted occasionally by remnant igneous hills. It rises in a gentle gradient until it reaches 100 feet in elevation, then steepens on the large alluvial fans which have been built by the sixty-two rivers crossing the plain. Inland it terminates at the foot of the mountains at approximately 800 feet in elevation.

The coast line forms a smooth curve without indentations of any size, and there is no deep water close to shore. The lack of bays and deep water prevented the development of natural harbors, which according to the Chiapanecos is a serious problem for they must ship their products from either Salina Cruz in Oaxaca or Coatzacoalcos in Veracruz State. It is also an affront to their pride in the state.

Barrier bars and beaches line the entire coast. The shallow lagoons enclosed by the bars at the western end of the state provide the sites for small fishing ejidos. Drainage of the land surrounding the lagoons is poor, and cultivation is impossible in these areas. The government is aware of this and has planned improvements. A large drainage project from the city of Tapachula eastward to the Guatemalan border has been completed, and another near the town of Arriaga is planned for the near future.

Starting on the Pacific slopes of the Sierra Madre, a multitude of short rivers cross the plain. Turbulent in the mountains, these rivers drop their loads of silt upon entering the plain and flow directly to the sea. Their volume fluctuates with the season, and many are dry by the end of winter. Few are navigable, even by canoe. Many flood during the rainy season. Eventually these rivers are to be controlled and the excess water of the rainy season preserved for irrigation during the dry season, but such developments are many years away.

At present agriculture is geared to the wet and dry seasons. The rains begin in June and end in November. Planting begins with the end of the rains, and harvesting must be completed before they start again. Although the rains are seasonal, they are strongly influenced by the Sierra Madre. The mountains are highest at the eastern end of the state and, correspondingly, the eastern plain receives ten to twenty inches more rainfall than the west. The variation is greater, however, with changes in altitude. At sea level the rainfall is sixty-five inches, at 300 feet elevation it increases to 100 inches, and high on the slopes of Tacaná volcano it is over 150 inches.

To obtain exact climatic data for the entire Pacific coast of Chiapas is impossible for there are few recording stations. Those that exist are, in many cases, less than fifty years old. Most are clustered near the eastern end of the Sierra Madre and the piedmont. They are generally located on large coffee fincas and ejidos in the area.[2] The western coastal plain has very few recording stations, and most descriptions of the climate are based upon inferences drawn from observations of the vegetation. As the vegetation changes to a semi-arid type, a definite lessening of rainfall is indicated.

On uncultivated land in the southeastern coastal area, the vegetation is composed of dense, tropical, evergreen forests. West of the municipio of Acapetahua it changes to lightly wooded savannas and low xerophytic shrubs. A change also occurs in the soils. Eastern coastal soils are red and yellow laterites mixed with volcanic ash and are

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[2] Fincas are large, privately owned agricultural properties. Ejidos are communally owned agricultural lands.

comparatively fertile. To the west, soils are those which could form from a mixture of grass and forests, namely prairie podzols.

Land use also varies from west to east. Excluding small areas of subsistence crops, western coastal lands are uncultivated. Most of the land is in unimproved pastures of native grasses. In contrast, the eastern zone has some of the most valuable land in Chiapas. This zone is part of the ancient Xoconusco of the Aztecs. The old Xoconusco, or Soconusco, was much larger and included part of the Guatemalan coast. At the time of the Aztecs it was a land of flourishing cacao orchards. Today, although diminished in size, it is known for coffee and cotton as well as cacao.

Sierra Madre de Chiapas

The second physiographic province, the Sierra Madre de Chiapas, is a mountain chain which starts in western Chiapas near the Isthmus of Tehuantepec and continues through Guatemala, northeastern Honduras, and as a submarine ridge across the Caribbean, emerging again on the island of Jamaica. The Chiapanecan section began as a huge batholith which was later uplifted and faulted. The average height of the mountains is 4,500 feet in the west and 9,000 in the east. The highest point is the volcano Tacaná, on the border between Guatemala and Chiapas, which attains an elevation slightly over 12,000 feet.

This mountain province is about 170 miles long and eighteen to twenty miles wide. Its crest is a continental divide, and the rivers that tumble down the steep south-facing escarpment drain toward the Pacific. The escarpment, deeply incised by ravines, is a difficult barrier to communication. Descent on the northern slopes is more

gradual, and the rivers on the north side of the divide form part of two large drainage basins, the Grijalva and the Usumacinta. Scattered throughout this side of the mountains are several large, level valleys, known in Chiapas as llanos, which are fertile and highly prized for agriculture.

As in any tropical mountain range, temperatures are mild to chilly according to elevation, but no area has frost. Soils are forest podzols, gray-brown in color. Up to 3,500 feet elevation, particularly on the Pacific side, the forest podzols are so highly prized by the Chiapanecos that they are referred to as the coffee soils. Rainfall varies according to the direction of the slopes. Seaward or south-facing slopes receive much more rain during the summer season, as much as 250 inches in some areas, than do the northern slopes. The north slopes receive rain from winds which must cross Chiapas from the Gulf of Mexico and, because they lose moisture before reaching this mountain section, rainfall decreases to seventy or seventy-five inches. This difference in rainfall finds expression in the vegetation. Tropical selva blends into conifers on the higher slopes to the south, while on the northern slopes are savannas and xerophytic vegetation which changes to conifers at much higher elevations.

Central Depression

Similar to the coastal plain and the Sierra Madre de Chiapas, the Central Depression extends beyond the borders of Chiapas. In Guatemala it continues as the Motagua Depression and into the Caribbean as the Cayman Trench. In Chiapas it lies between the Sierra Madre and the Central Plateau. Its surface is about 2,100 feet in elevation at the

Guatemalan border and rises gently along its length toward the north and west to 2,700 feet. The valley of the upper Grijalva River occupies the western part of the depression, and the remainder has been carved into mesas, conical hills, and terraces by the many tributaries of the Grijalva.

In general, the depression is hot and dry, temperatures averaging 75°F. Rainfall decreases to forty inches in the east and thirty-two in the west. Vegetation is xerophytic bushes and shrubs, with trees only along the rivers. The rainfall is sufficient, however, to maintain a complete grass cover on the land. Soils in the plains and valleys are mostly chernozems or of lacustrine origin with volcanic conglomerates.

The level plains and valleys joined with the llanos of the Sierra Madre are commonly excellent farm lands and are sometimes called the "corn crib" of Mexico, for they produce a surplus which is sold to other areas of the country.[3]

The Grijalva River, which drains most of the depression, is the second largest river in Mexico. It flows from southeast to northwest against the rise of the land. The upper river flows through a broad valley and often, during the rainy season, floods parts of the central depression. Downstream it cuts through the northern mountains in a high narrow canyon seventeen miles long. The canyon, El Sumidero, is to be developed as a tourist attraction in the near future.

The volume of water fluctuates with the seasons, but the river is never dry and is presently being developed for hydroelectric power.

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[3]In Chiapas llanos refer specifically to level basins within the mountains.

When the project is completed, it also will provide water for irrigation of a few thousand acres in the Central Depression.

Meseta Central

The Meseta Central, the Eastern Mountains, and the Northern Mountains are of one geologic background. Because of differences in appearance and use, however, they are divided into three provinces. The mesa is large, relatively flat and high, and rises abruptly in a steep escarpment on the north side of the Central Depression. About forty-five miles wide, it extends for ninety-six miles to the Guatemalan border. Altitudes vary from 3,000 feet in the northwest to 6,000 in the center, and from 3,000 to 4,500 in the southeast. On the plateau itself are many minor mountain groups separating small basins which are the sites of Indian communities. Much of the plateau is capped with limestone, and karst landforms are common. This is especially true in the municipio of Comitán, where caves and lakes are numerous. The Comitán region has more than 100 lakes, which are noted for their many colors and beauty. Now a national park, the area is to be developed as a tourist attraction.

Because of the elevation, average annual temperatures in the Meseta Central are at least ten degrees lower than the eighty degrees of the Central Depression. Rainfall averages forty inches in the east, increasing to fifty inches in the west. Vegetation is a mixture of mountain grasses and broad-leaf evergreens, changing to conifers at the higher elevations. Soils are mainly lateritic reds and yellows. But, within the small basins soils are of alluvial origin mixed with volcanic ash. In early times these basins were moderately fertile and supported dense

populations. Today, the population remains, but the soil suffers from moderate to severe erosion. Agriculture on the plateau is limited primarily to subsistence cropping in the west and a combination of subsistence cultivation and livestock in the east, with a few areas of coffee in the south and west.

Eastern Mountains

Along the northern side of the Meseta Central is an extensive area of folded mountains lying in several parallel lines. These are the Northern and Eastern Mountains. The division into northern and eastern again arises from use, for the Eastern Mountains, more commonly called the Selva Lacandona, are the least known and least used area of Chiapas. The area is almost unsettled and is the home of the last remaining Lacandon Indians. The Eastern Mountains are low, but rough. Averaging 4,000 feet near the plateau, they drop to small hills of 300 feet near the Usumacinta River. Between the mountain folds run several parallel rivers, tributaries of the Usumacinta. The largest of these is the Jatate.

Little is known of the specific physical features. There are no weather stations. Temperatures apparently average 76° to 80°F, and soils are thought to be red and yellow latosols. It is a hot and humid region covered with dense selva which changes to wooded savannas in some areas. As on the plateau, there are many areas of karst landforms, particularly in the area of the Jatate River.

The Selva Lacandona is to the Chiapanecos a semi-mythical place that sometime in the future will be an agricultural paradise, if they ever want to develop it.

Northern Mountains

The Northern Mountains, as can be surmised, lie directly north of the plateau and the Eastern Mountains. They extend for 150 miles in an east-west direction and are about forty miles wide. From 4,500 feet in elevation near the central mesa, they decrease in altitude toward the north until they become low mountains of 1,500 feet near the town of Pichucalco. Between the parallel folds of the mountains lie many small valleys, level plains, and cuesta-like horsts. Wherever limestone bedrock is found, there is another development of karst landforms.

Because this northern area of Chiapas lies within the boundaries of the tropical littoral climate, temperatures and humidity are always high. Rainfall is heavy, sixty to eighty inches, and distributed throughout the year. No month is without rain, but the amount diminishes during the winter. Tropical rainforest or selva covers the land up to 3,000 feet elevation. Above that, forests change to pine and cedar. Soils are red and yellow laterites underlain by gley of particular stickiness, which is difficult to manage when cultivated.

Almost every available level or gently sloped hectare is under subsistence cultivation or cattle raising. However, the area is also noted for its good quality coffee and cacao. It is less developed than the Soconusco, yet accounts for most of the cacao and a large share of the export coffee grown in Chiapas.

Gulf Coastal Plain

The seventh province is the smallest in size. It is a thirty-mile extension of the Gulf Coastal Plain within the confines of Chiapas. Like the Tabascan plain, the area is extremely hot and humid. Rains

occur throughout the year, some areas receiving more than 125 inches. Covering the uncultivated sections of the western area is a dense tropical rainforest. In the lake area of the eastern section, selva shades into tropical man-made savannas for the pasturing of cattle, the leading economic activity of the region. Cultivation of the red lateritic soils is limited almost exclusively to subsistence agriculture.

The Gulf Coastal Plain is rather isolated from the main centers of Chiapanecan life, and the economy is primarily oriented toward Tabasco. This disturbs the government in Tuxtla Gutiérrez. Officials of the state government are trying to alter this situation by constructing new roads which lead toward the capital.

Social and Economic Characteristics

Most of the social and economic characteristics of Chiapas reflect its agricultural nature. The steady, but unspectacular population growth, without major fluctuations from in or out migrations, and the settlement pattern of small rural villages and limited urban development are common to many agricultural areas in the world. The limited non-agricultural segment of the population is engaged in small business, government, and the few minor food-processing industries of the state.

About 70 percent of the population is ladino, with a few people of unmixed Indian ancestry. The Indians, clinging to the old culture most noticeably in dress and language, live in the less accessible areas of the state where the pressure of change is less strong. The Central Plateau, the Eastern Mountains, and the Northern Mountains are the Indian stronghold, but even in these places Indian life is not

untouched. Often the Indian exists side by side with the ladino rancher. Sometimes the distinctive dress is lost and the only outward indication of Indian culture is the continued use of native language in the area. Indian lands are entirely in ejidos, and today the typical Indian is a subsistence farmer in a transitional state. While most of the crops are for the Indian's own use, some part of the land is devoted to cash crops, which vary from area to area. In some places the cash crop is coffee, in others cacao, and in still others truck crops for nearby regional markets.

The ladinos and the whites in Chiapas control the more desirable areas, especially in the Central Depression and the Pacific Coastal Plain, but in lesser numbers they also own most of the land in the northern section of the state. They, almost exclusively, are the commercial farmers specializing in coffee, cacao, cotton, bananas, and other commercial crops.

With agriculture of overwhelming importance in the state, Mexican land tenure laws are particularly important. One of the best known effects of the Revolution of 1910 was the breakup of the large estates or haciendas throughout Mexico, and the presentation of land to the landless farmer in the form of communal ejido property. Ownership of small properties was not forbidden, but the size of the property was strictly regulated. The amount of land permitted one owner depends upon the quality. Land of prime quality, whether irrigated or with sufficient rainfall for cropping, is limited to 100 hectares, or 240 acres. Decreasing quality of the land increases the amount allowed, and exceptions are made for specific crops. Owners of coffee or cacao land may have 300 hectares (720 acres), and cattle ranchers may have

enough land to graze 500 head of cattle. In Chiapas the accepted need is one hectare per cow.

The ejido is the only form of land tenure without restriction as to size. Each should be large enough to allot ten hectares to every man. However, many ejidos have less land and others have more. Ejidos were, and are, formed from expropriated hacienda lands or government-owned vacant land. They were given to groups of ten or more farm laborers. Such lands can neither be sold nor rented. Each ejiditario must cultivate the allotted land to the satisfaction of the ejido council or chance losing it. Although the land is communally owned, the operation of the ejido depends upon the wishes of the majority. It can be operated as a single large co-operative, the government preferred method, or more commonly as individual small plots. In addition to the arable land, each ejido is entitled to wooded areas which provide firewood for the homes.

As in many countries where undeveloped government lands exist, Chiapas has land which is not set aside for specific development. This land can be claimed by squatters. After they have cleared and cultivated the land for at least five years, it becomes theirs. However, they may or may not receive title to the land.

Settlement patterns in Chiapas are a heritage of the past, reinforced by the government. Early agriculturalists lived in small villages both as a means of defense and from mutual needs in cultivating the land. This practice was encouraged by the Spaniards who could more easily control the farm labor if that labor lived in settled places. Later the formation of haciendas included such villages to ensure the permanence of the labor supply. Although

the revolution freed farm workers by destruction of the great estates, the laborers remained in the villages as required by ejido law. At first only the villagers or former workers on the haciendas were entitled to ejido land, but later the law was amplified and allowed any group of landless men to acquire ejido land. Single individuals, however, cannot form ejidos.

Only the crops to be grown and the manner in which they are cultivated were left to the ejiditarios. The social organization was very specific. Each man was entitled to a plot of land, the size depending upon the size of his family and the amount of land available. In addition he received a house site in the urbanized area. Although called urbanized, such an area simply meant a village. This prevented building homes on the individual lots of land and dissolution of the ejido. The original purpose was to control the populace, for in the early days the threat of revolt was always in the minds of government officials. Today, the agglomerated nature of the ejidos simplifies the attempts by the government to provide schools, medical facilities, potable water, electricity, telephones, and telegraph service. The cost of these would be prohibitive if done on an individual basis but is within means of the government when done for an entire village.

The ejido is operated as is any town. It has a president and council who act for the inhabitants. The council is responsible for assigning the land and overseeing its care. The important rule is that the land may not be rented or remain uncultivated. Living on the ejido is not restricted to farmers. Many, who cannot claim land for cultivation, can rent a house site in the urban area. Such individuals usually operate the stores, transportation facilities, and

other services. Ejiditarios, themselves, are not confined to the ejido. If sufficiently enterprising, they may buy other land for cultivation without losing their ejido rights.

Owners of private lands must provide their own necessities such as roads, electricity, and water. Usually, owners have small houses on their property but do not live there permanently. Instead, they reside in the nearest town and go daily to their land, remaining overnight only during the busy seasons. The combination of ejido villages and land owners living in the nearest towns gives rise to strong village development. Some villages have grown almost to the stature of towns, especially where the ejidos are located in favorable agricultural areas. On some ejidos the number of the non-ejiditarios is larger than that of the ejiditarios. Usually the largest town in the municipio serves as the cabecera or capital of the municipio, and frequently in the past a municipio was formed around the largest village.

Few ejido villages have the characteristics of urban life. While the government is rapidly improving services, such as potable water supply and electricity, the streets are unpaved, medical facilities are lacking, and except for food stores, the dwellers must either patronize the weekly or semi-monthly markets for clothing, tools, and other needs. Often, they must travel to the nearest large town for such purchases. Chiapas has only three real cities: Tuxtla Gutiérrez, Tapachula, and San Cristóbal de las Casas. Tuxtla is the governmental and financial center of the state, Tapachula is the agricultural market center for the Soconusco, and San Cristóbal de las Casas is the Indian market town.

The social and economic divisions of the state follow the physiographic divisions, with one exception. The Sierra Madre de Chiapas lacks cohesiveness. The people live in the valleys and lower slopes, separated from one another by intervening mountains. They consequently may have less contact with other valleys than they have with the coastal plain or the Central Depression. According to the road and market orientation, a given valley becomes a part of the Pacific coast or Central Depression as an economic unit. The Sierra Madre de Chiapas likewise does not exist as a separate population division.

Pacific Coastal Plain and South Slope of the Sierra Madre

The Pacific Coastal Plain has been a favored site for settlement by farmers for many centuries. The greater fertility of the eastern half, the Soconusco, supported dense settlement, but the western segment was well populated also. After agriculture was firmly established, still in prehistoric times, the first known cultivators were the Mames, forerunners of the present Mames of Guatemala. Although not indigenous, one of their crops, cacao, became extremely valuable. It was used as money and as a beverage. Chiapas is near the northern limit of cultivation for the tree, but cacao of the area has a good flavor and yields well. It was a lure to the Nahua Indians of the Mexican plateau who invaded and conquered the area. The Nahuas did not attempt to colonize, but they established garrison towns to ensure the annual payment of tribute.

Unlike the Nahuas, the Spaniards came, conquered, and remained to colonize the area. Spanish became the predominant language and Indian culture disappeared. During the years of Spanish control little was

done to change the land with the exception of adding domesticated animals, particularly cattle, to the scene. Although the Spaniards replaced the Indians as owners of the land, cacao cultivation continued as before. After chocolate was taken to the court of Spain and became popular as a drink, cacao grew in importance and trade. All cacao traffic from Central America was funneled through the Soconusco to Veracruz for shipment to Spain. Several attempts were made to establish a monopoly of the trade at Tapachula, but none were successful.

The Pacific slopes of the Sierra Madre were sparsely settled throughout the colonial period and the early days of independence. It was not until the development of coffee plantations in the nineteenth century that land on the higher slopes became valuable. During these periods most of the coastal plains were scrub lands, used in a few places for pasture. Settlement was concentrated on the piedmont, where cacao was king. In the latter half of the nineteenth century coffee cultivation began to spread along the lower slopes of the Sierra Madre. Large plantations, or fincas, were carved from the virgin forests. Later these fincas were broken up by expropriation of the land and diminished in size or were converted to ejidos. Many of the original sites for the workers' homes remained after the fincas disappeared and have grown to small-sized towns.

Most of the important towns of this zone are located at the junction of the piedmont and the coastal plain, at the point where a river emerges from the mountains and crosses the plain (Figure 4). These towns were settled in pre-Columbian times but, because of their excellent sites, serve present needs equally well. In the past much of the travel was by canoe along the rivers. The railroad, completed

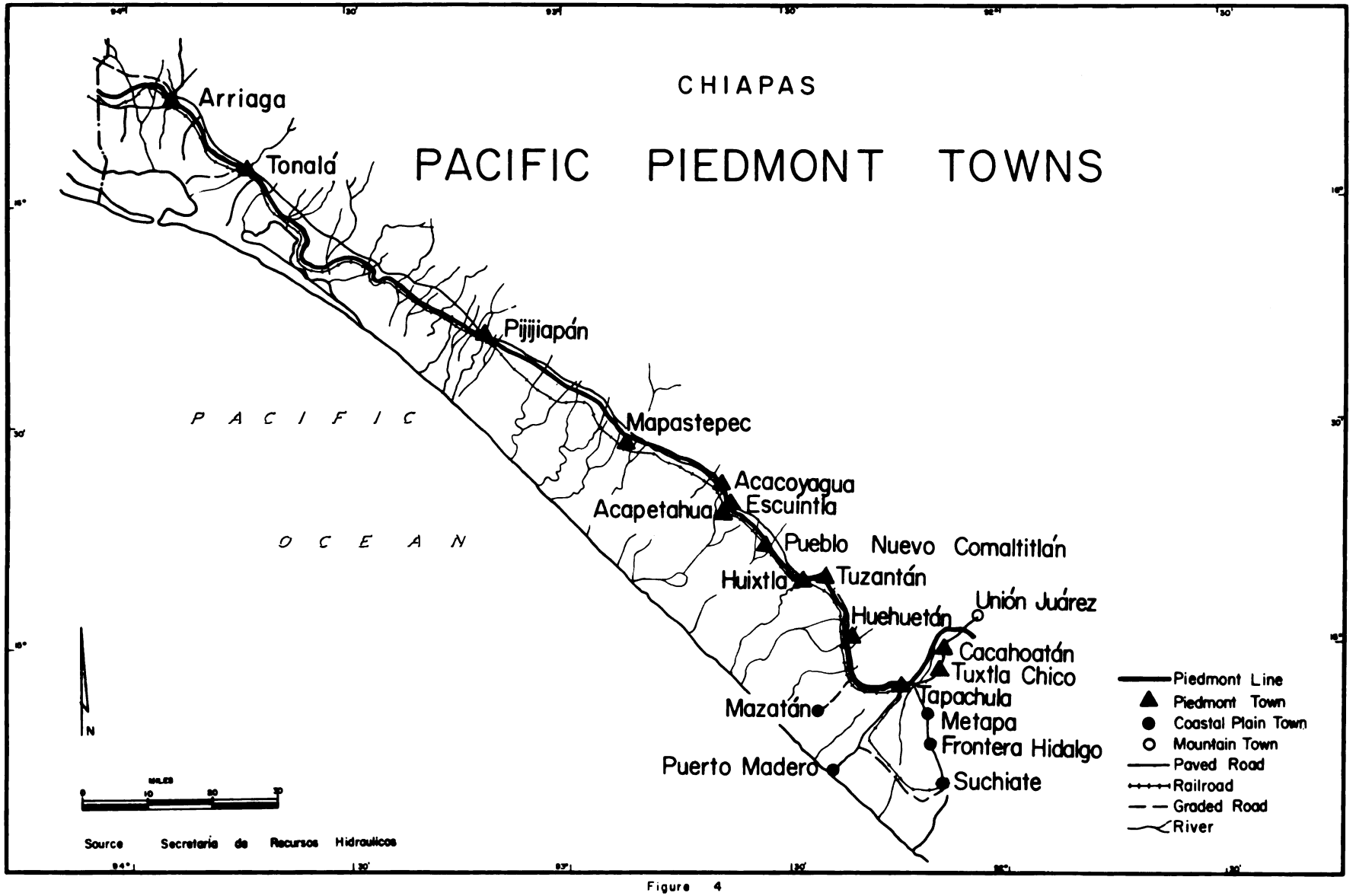
CHIAPAS
PACIFIC PIEDMONT TOWNS
Arriaga
Tonalá
Pijijiapán
Mapastepec
Acacoyagua
Escuintla
Acapetahua
Pueblo Nuevo Comaltitlán
Huixtla
Tuzantán
Unión Juárez
Huehuetán
Cacahoatán
Tuxtla Chico
Tapachula
Metapa
Frontera Hidalgo
Suchiate
Mazatán
Puerto Madero
P A C I F I C
O C E A N
N
Source Secretaría de Recursos Hidraulicos
Piedmont Line
Piedmont Town
Coastal Plain Town
Mountain Town
Paved Road
Railroad
Graded Road
River

Figure 4

in 1907, followed the inner coastal plain along the edge of the piedmont and connected the towns of the area like beads on a string. Increased trade because of the railroad gave these towns the first impetus to growth. Tapachula and Arriaga became the eastern and western terminals in Chiapas. Today, although the coastal branch of the Inter-American Highway has largely replaced the railroad, the towns continue to grow. Arriaga, along with nearby Tonalá, has become the market center for cattle of the western coastal area as well as a fish processing center. A food industry is growing in the towns, based upon beds of large shrimp recently found in the nearby coastal waters. Tapachula has grown more rapidly and serves both as the main market for coffee of the Soconusco and processing center for cotton of the area. Seven new cotton ginning and storage plants have been built on the outskirts of the city. Tapachula is becoming the leading city in Chiapas and, as manufacturing increases, will be the leading industrial center. It is already the fastest growing city in the state. Most of the new population has come from surrounding municipios which have the least opportunities for agricultural growth.

A further stimulus to Tapachula is expected with the completion of a deep water port less than twenty miles from the city. The new port is designed to serve the agricultural export business, but it is hoped that it will stimulate the development of light manufacturing as well.

Central Depression and North Slope of the Sierra Madre

The Pacific Coastal Plain, Sierra Madre and Central Depression have many social and economic similarities. They are the home of the

ladino, or modern Mexican, and are most developed in commercial agriculture. With few exceptions, the crops cultivated are the same. The crest of the Sierra Madre acts as a boundary between the Pacific Coastal Zone and the Central Depression. The high mountains are rugged and only recently have they been crossed by one paved road, at the extreme western end of the sierra through the lowest pass. Other passes are only footpaths, and no attempt has been made to construct roads through them. Communications on the north slope of the mountains and the Central Depression lead to the city of Tuxtla Gutiérrez, which serves as the major collecting and marketing center.

In a few valleys small groups of Indians have partially maintained their identity, although they have lost most of their cultural traits. They are now passing into the ladino segment of the population. The Chiapanecos of this region, for no discernible reason, convey the aura of the old American West. They give the impression that they are the men, more than those of the coastal plain, who are concerned with the present and alert to the future development of the state. This attitude is somewhat in evidence on the coastal plain but not as pronounced. On the coastal plain, men seem to feel that the land is so good that development will happen with very little effort on their part, while the men of the central zone are aware that they can bring about such development only by their own efforts. Such awareness may be the result of connections with Tuxtla Gutiérrez, the capital, where government officials are very much alert to, and striving toward, the economic development of the state.

Agriculture is the way of life in this zone, and minor food processing is confined to the capital. Unlike those of the Pacific

zone, few farmers in the Central Depression are limited to one crop. Instead, they specialize in mixed crop commercial farming. Also in contrast with the Pacific zone, the better lands of the depression are in the west and center. The eastern third is less desirable. Rainfall is scanty and soils less fertile. Consequently, more land is devoted to cattle than to crop cultivation, and the road system reflects this change. Eastern roads are few and poor, while the Inter-American Highway serving the west was the first paved highway in Chiapas.

The settlement pattern in the west is somewhat similar to that of the Pacific Coastal Zone, the towns which are growing are located along the Inter-American Highway. However, all of these towns are much older than the highway. Generally they are located in high valleys that open on to one another, separated only by a low ridge of hills which are easily crossed. On the other hand, in the center and east the pockets of level land, especially the mountain llanos, are more isolated and are separated by broader bands of hills. In the western sector lies the city of Tuxtla Gutierrez, the capital. This city, while it has many reminders of the colonial period, such as the plaza and homes of the colonial era, is a rather bustling and modern city with emphasis on business. Here are all the government and financial offices which employ a large percentage of the city's population, all of the major markets of the state, and a few small food-processing industries.

A major electrical project which is important to the entire nation is under construction in the Central Depression. When completed, it will be one of the largest of its kind in the world. Five hydroelectric dams are to be built along the Grijalva River. The first of the two large dams, in the Northern Mountains near Malpaso,

is already in service. The second, and largest of the five, is under construction at Angostura in the municipio of La Concordia, in the middle of the Central Depression and almost in the heart of the state. Angostura is scheduled for completion in 1974 and when finished will, in addition to providing electric power, safeguard some of the small communities in the Central Depression from flooding such as they have suffered in the past. When the Angostura dam is completed, the final stage (three small holding dams) will be started. Two small dams will be located between Malpaso and Angostura, and another will be just downstream from Malpaso. When finished, the project will supply electric power for central Mexico, and surplus power will be sold to some of the Central American countries. Unfortunately, since hydro-electric power is the main object of the project, only a few thousand acres of land will be irrigated from the Angostura Lake. Most of the valley in the municipio of La Concordia will be submerged, and the town of La Concordia will be destroyed. Owners of land involved in the project will either be moved to the four new villages which will replace the capital of the municipio or have already sold their land to the government and have relocated themselves. Those who have sold their land for the project have become fairly wealthy men by Chiapanecan standards because the government paid top money for it. Chiapanecos welcome the project as it is expected that many of the construction workers will eventually become permanent residents of the state. Yet, they are a little disgusted because none of the electric power produced in these projects is expected to benefit Chiapas. Chiapas, as is common in Mexico, has electricity available, but the service is poor and often fails in the dry season. Moreover, it is subject to brown

outs at other times of the year, i.e. the power fluctuates and sudden surges of power often burn out or at least damage much of the electrical equipment in the towns.

Central Plateau

Immediately east of the Grijalva River, as it makes a great bend to the north, the steep face of an escarpment signals the beginning of the Central Plateau. To climb the escarpment to the plateau is to enter a different world, an Indian world. Nearly two-thirds of the 280,000 Indians in Chiapas live on the plateau. Here, partially sheltered from modern Chiapas, they have been able to maintain most of their customs and beliefs. The rugged nature of the plateau separates the living space into numerous small valleys and basins, each the home of small groups of Indians. The isolation of one small group from another has fostered individualism in dialect, dress, and other customs.

Despite superficial differences between the Indian groups, most belong to two major tribes, the Tzeltals and the Tzotzils, which have essentially the same basic way of life. They are an off-shoot of the Mayan family and were in close contact with the Mayas of Yucatan and Guatemala in past centuries. The pre-Columbian Tzeltals and Tzotzils never constructed major stone ceremonial centers such as Tikal and Chichén Itzá, but they did have smaller, less pretentious centers where they conducted religious ceremonies. These centers were unlived in except for the few officials elected each year to religious office. The majority of people lived in semi-permanent villages within easy reach of the centers. Because they were shifting cultivators, their village sites were moved when the cultivated fields were changed to

more distant areas. Today, this same pattern of vacant towns surrounded by several hamlets remains, but it is undergoing modification. On the plateau a single very small municipio enclosed each group, and the so-called vacant town became the cabacera. All of the Indian lands were "ejidoized," with the usual urban area requirements of an ejido. Partially through the influence of agricultural agents working to improve farming in nearby areas, the hamlets have become more or less fixed. Sometimes, however, the Indians have moved and now live in previously vacant towns.

A number of factors have combined to alter the major economic activity in agriculture. Increasing population pressure has decreased the amount of land available for shifting cultivation, and government attempts to bring services to the villages have decreased the urge to move. The money economy under which nearly all Mexicans live has transformed the Indians into transitional subsistence farmers. They must have cash for taxes and for the material needs they no longer supply for themselves. While the traditional corn and bean fields remain on the mountains and hillsides and are to some extent shifted as needed, the fields close to the houses, previously known as kitchen gardens, have become more important. Located in the floor of the basins, these fields are now used to produce crops such as tomatoes, onions, and fruit which are sold in the regional markets. In a few areas where lands are available at moderate elevation, coffee is now grown. Some Indian farmers who live close enough may own or rent lands in the Central Depression, where sugar cane is their major money crop. In sections near San Cristóbal de las Casas the agricultural agents have been particularly active and have encouraged terracing of the

sides of the basins. That land is now permanently cultivated. Descent from the plateau is in steps, and perched springs are common. Although these have been used for centuries for primitive irrigation, the government is now sponsoring a series of projects to develop and increase their use for modern forms of irrigation.

Since 1524 when the town of San Cristóbal de las Casas was founded, it has been the administrative center and major market for the Indians. It is also a meeting place for the Indian and non-Indian. Whereas Tuxtla Gutiérrez is the governmental center and, with Tapachula, one of the economic centers of the state, San Cristóbal de las Casas is looked upon as the cultural center. While businesses are in the hands of the non-Indian, the color provided by Indians who frequent the daily markets is the major lure to the tourist. Hence, San Cristóbal de las Casas is the tourist center of the state. Although the third city in size, with 40,000 inhabitants, las Casas remains poorly developed and possesses a distinctively small-town atmosphere. Other than the tourist business and a commercial sector composed mostly of small shops, it has only one small factory and a textile mill.

Only one other town, Comitán, at the eastern edge of the plateau, is of any importance. Comitán acts as a collecting center for the eastern end of the state, except the Soconusco. Coffee and cattle are of principal concern. Comitán has a noticeable flavor of "business comes first." Although it has never grown to the stature of a city, Comitán has maintained a regional prominence ever since it was established by the Spaniards.

The eastern end of the plateau is unlike the western, since the Indian no longer dominates. Ladinos are more numerous here and occupy

the many ejidos, which are generally small and very poor. Privately owned ranches are the most numerous. Karst landforms are prominent, and the landscape favors cattle grazing over crop cultivation.

One other source of wealth exists, scattered throughout the plateau. The ridge sides which separate the numerous basins are too steep and high for practical cultivation but are covered with dense forests of conifers. An infant lumber industry produces nearly $4,500,000 worth of pine lumber from these and similar forests in the Northern Mountains each year.

Eastern Mountains

To the Chiapanecos all the mystique of a fabled land is attached to La Selva Lacandona, or Eastern Mountains. Its mystique lies both in the past and the future, but not in the present. As part of the Mayan Empire the Eastern Mountains supported a population that had the ability and resources to build at least eight stone cities. Unlike the Mayan cities of the Yucatan Peninsula, these were located near the many rivers of the province and did not have the water problems of their peninsular sister cities.

The realization of the richness of its past is the base upon which dreams of a flourishing future for this land are built, but that future is distant. Today, the land is a wilderness devoid of people except for a few scattered ranchers and about 200 Lacandones. The Lacandones are the most primitive of all the Indians living in Chiapas. They have a tremendous amount of land in which to support themselves by shifting cultivation. As much as possible, they maintain old customs and beliefs, but contact with modern cultures has decimated their numbers,

destroyed much of the old religion, and taught them to want some of the material goods of modern life. As contact with outsiders increases, the loss of cultural identity will become nearly total and the remaining Lacandones will be absorbed into the ladino population.

One of the major barriers to development of the Eastern Mountains is the almost total lack of ground communication. The area is without roads, and all movement is confined to foot or horseback travel except for occasional rudimentary airstrips near the archeological sites. Roads are needed, if the area is to be developed.

Northern Mountains

The Northern Mountain Zone is less a cohesive unit than are the other provinces. Here the Indian, ladino, and modern Mexican worlds intertwine. In the southern sectors the Indians on ejidos preserve their old life style, but northward and northeastward along the few existing roads the Indian fades into the ladino world where the native dress and most customs, except language, are lost. Away from the major roads the Indian is less subject to contacts and is more likely to remain Indian. However, the transitional state is most common.

Throughout the Northern Mountains ejidos exist side by side with private properties. However, the more "ladinoized" the area the fewer the ejidos. In the Indian sections close to the central plateau there are more ejidos, but toward the northwest ejidos are few and private properties are more common. Also in this region, surrounding the Netzahualcoyotl Dam, there is a considerable amount of government-owned land which squatters are permitted to claim. Built during construction of the Malpaso dam are access roads to the site which

pass through government land, and many squatters have been able to enter the area. Today, much of this land has been claimed for coffee cultivation in small parcels of five to twenty-five acres.

Settlement patterns are the same as in the rest of Chiapas. Few men, except the ejiditarios, live permanently on the land. Instead, they usually have homes in nearby settlements. The richer they are, the less time they spend on their land and the farther away are their permanent homes.

The small towns and ejidos are located in the valleys, separated from each other by mountain ridges. The road system is poor, because the rugged terrain makes roads difficult to construct and expensive to maintain. Consequently, a few of the towns that are situated along the roads have developed into regional service centers. In most cases these centers are little larger than other towns of the region, but they are the first to receive electricity, water, telephones, and schools, which attract people. More important to the region is the function of the town as a buying and collecting center for agricultural products. Economic activity in the area is based upon cattle, coffee, and some cacao. Although all farmers here are interested in some form of commercial agriculture, few, if any, are single crop specialists. Most raise cattle plus one crop, which is usually coffee. The ejiditarios are primarily subsistence farmers, except for one cash crop. Coffee is most common, but at lower altitudes this changes to cacao. Few of the ejiditarios raise cattle commercially. They do, however, have a few small animals for their own meat supply.

The Northern Mountain area is far less developed agriculturally than either the Pacific Coast or the Central Depression and is also

less densely populated. There is more unused land than in any other area, except for the Eastern Mountains. But, in general, agricultural agents consider this region somewhat more difficult to manage, hence less promising for crops and at present most suitable for cattle grazing.

Gulf Coastal Plain

The two horns of northern Chiapas extend into the Gulf Coastal Plain. These level lands are occupied mainly by small subsistence farmers and cattle ranchers. Somewhat cut off from the rest of Chiapas by lack of roads, this province is oriented toward neighboring Tabasco. The ladino population lives in the capitals of the municipios, for there are few other villages. Farmers of the western horn are cacao growers, but low prices are turning them toward cattle. The agricultural agents believe this area could be devoted to productive truck farms, but due to the lack of roads little has been done to test this hypothesis.

Recently, oil has been discovered in the region, and two fields have been brought into production. These deliver between 2,000 and 3,000 barrels of oil per day. Additional proven fields are to be developed soon. While oil extraction does not provide employment for many people, it does bring money to the district and usually considerable improvement in roads, thus opening the area to more prosperous forms of agriculture.

The eastern horn of the province is a land of savannas and lakes. Cattle ranching has been successful here, and the land use is unlikely to change within the near future. Unlike the western horn, this sector has no known minerals. However, it does include a tourist attraction,

the archeological site of Palenque. Now that the new road to Yucatan passes within five miles of the site and the small town of the same name, the area is readily accessible to the tourist. As the site was once an important Mayan town, it could prove to be a popular attraction. In addition, the large lakes of Catazaha Municipio offer possibilities of recreational development in conjunction with Palenque.

CHAPTER III

COMMERCIAL CROP REGIONS

Although on a world-wide basis agriculture in Chiapas is classified as tropical, the state is actually a mosaic of tropical and mid-latitude crops. The many valleys and plains at different elevations compel the development of micro crop regions. But few areas are truly characterized by commercial crops, as the state has long been devoted primarily to subsistence farming with the minority of commercial farmers located in the most fertile areas. With the recent government interest in agriculture, the subsistence farmers have entered a transitional stage between subsistence and cash cropping. Although the crops produced by true commercial methods are now limited in number and quantity, they should increase as more farmers with government assistance move further into commercial agriculture and away from subsistence methods of cultivation.

Some crops grown in Chiapas are obviously destined for market, whether produced by transitional subsistence farmers or full-time commercial ones. The following are important now, although some are produced in small volume:[1]

Cotton	274,210 tons	Yucca	23,600 tons
Bananas	150,000 tons	Cacao	11,000 tons
Coffee	76,000 tons	Sesame Seed	2,026 tons
Sugar Cane	28,750 tons	African Palm Oil	450 tons

[1]Data from Secretaría de Agricultura y Ganadería.

Except for bananas, all need some form of transformation before use and thus contribute to the beginning of an infant food-processing industry in Chiapas.

Regions of the Four Commercial Crops under Study

Coffee, cacao, and bananas are common tropical export crops, as is cotton, although cotton is not limited to the tropics. These four occupy some two-thirds of the cultivated land in Chiapas, but only one, cotton, is grown by strictly commercial farmers. The other three are cultivated by both commercial and subsistence farmers. For this reason the usual criteria for defining commercial crop regions are of little value, and these regions are constructed herein on the basis of the crops' presence in reasonable amounts. The regions are not mutually exclusive, as cacao, cotton, and bananas can be grown in the same general area and cultivation of any on a particular farm generally depends upon the preference of the individual farmer.

Coffee

Areas suitable for coffee cultivation are of limited extent in Mexico. Nevertheless, the bulk of Mexican coffee is grown in ten different states, among which Chiapas is the foremost. Forty percent of the coffee exports originate in Chiapas, while the state of Veracruz, formerly the most important, produces only three-fourths as much or 29 percent.[2]

Coffee is cultivated in two large areas in Chiapas which are separated by the lowlands of the Central Depression (Figure 5). The

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[2]Instituto Mexicano del Café, Secretaría de Agricultura, Estadísticas del Café, Number 12 (Mexico, D. F., May, 1970), p. 12.

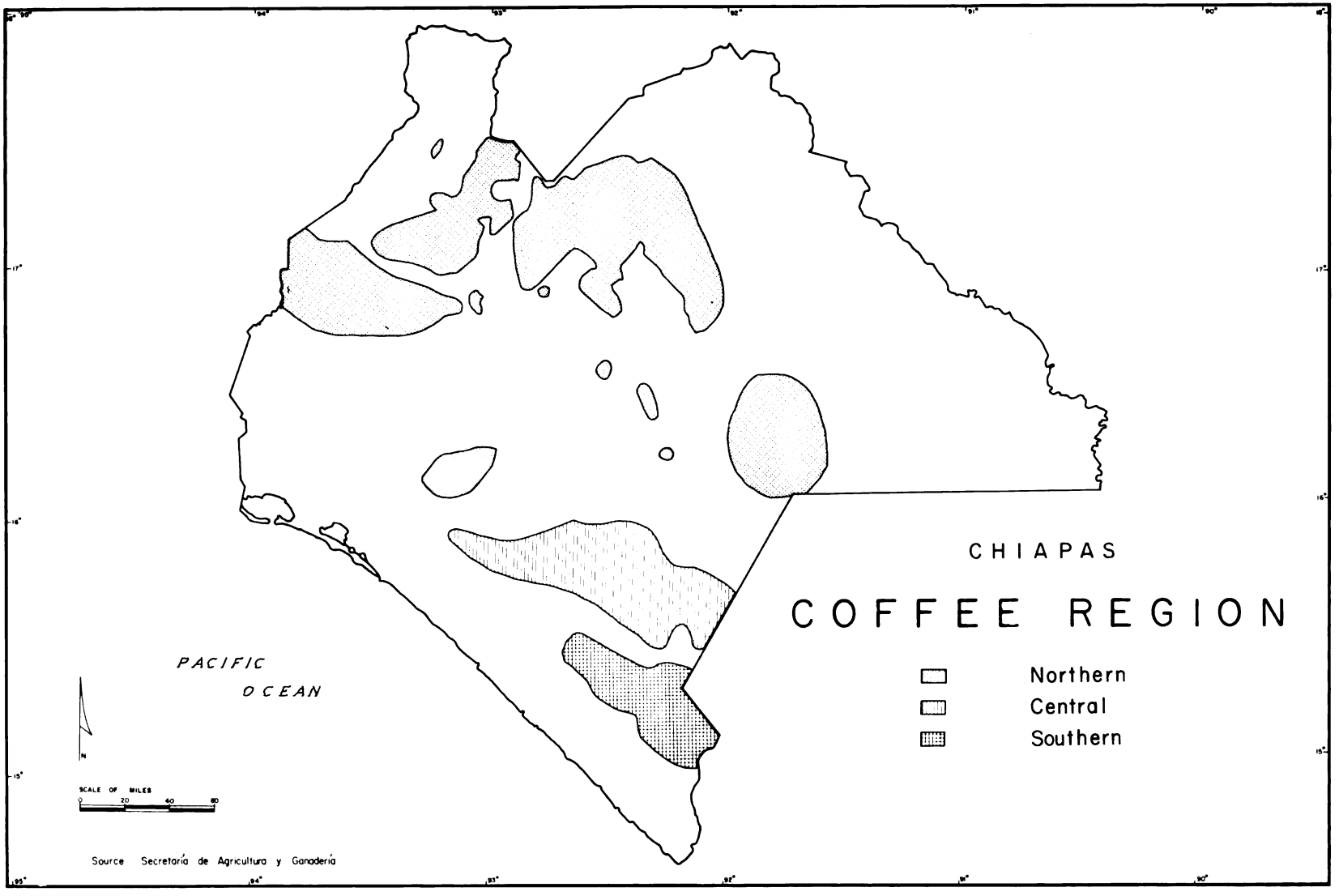
CHIAPAS
COFFEE REGION
Northern
Central
Southern
PACIFIC
OCEAN
SCALE OF MILES
0 20 40 60
Source Secretaría de Agricultura y Ganadería

Figure 5

southern region is divided into two distinct regions by the crest of the Sierra Madre de Chiapas. On the Pacific coastal slopes of the mountains is the Soconusco, including the oldest and most intensively cultivated coffee lands in Chiapas. It is a long, narrow region which extends almost the entire length of the Sierra Madre de Chiapas from the Guatemalan border, fading out in the west as the soil and rainfall requirements of coffee cultivation are no longer met. The second region, the central, is located on the inner or north-facing slopes of the same mountain range. This region is much less desirable. Rainfall is generally marginal for coffee, and therefore the area devoted to coffee is much smaller, 42,000 acres, as compared with the 85,000 of the Soconusco.

With 161,000 acres under cultivation, the northern coffee region is the largest and most dispersed. Land that meets the altitude, rainfall, and soil requirements of good coffee occurs in scattered parcels throughout the area. The lack of continguity magnifies the labor and transportation problems of the region.

According to Moises de la Peña, the first coffee trees were brought to Chiapas from Guatemala in 1821, but the first true coffee finca or plantation (El Chichara) was not started until 1849.[3] Others followed soon after. The preferred location for the early fincas was on the slopes of Tacaná, a volcano on the southeastern border of Chiapas. After the rich volcanic soils of Tacaná were claimed, coffee cultivation spread westward along the south-facing slopes of the Sierra Madre de Chiapas, ceasing near Huixtla, a little over twenty miles from Tapachula. At that time all coffee was exported from

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[3]Moises de la Peña, Chiapas económico (México, D. F.: Imprenta Mexicana, 1949), p. 825.

Chiapas by ships which loaded at a fishing site, now Puerto Madero. Transportation to Puerto Madero from farther than Huixtla, even though by horse and muleback, presented many difficulties and reduced profits to the vanishing point. Therefore, coffee fincas west of Huixtla were uncommon until completion of the railroad in 1907.[4]

The first fincas were literally carved out of virgin forests. The prospective finquero made his way, usually on foot or horseback, into the rainforests seeking out land centered upon a ravine which held a year-around stream. Running water was a necessity as all of the early fincas processed their own coffee and powered the crude machinery by water. The first finqueros were Mexican. Foreigners hesitated to settle in the Soconusco until the nationality of the territory was established. In 1882 a treaty between Mexico and Guatemala fixed the border along the Suchiate River. The uncertainty of tenure for Soconuscan owners was ended, and this attracted foreign nationals to the region. In the following decades, although Americans, English, and Scots were numbered among the foreign entrepreneurs, the Germans were most numerous. Within a few years they controlled the largest and most prosperous coffee fincas of the Soconusco, and they retain that position to the present day.

Until after the Revolution of 1910 no limits were put on the size of the fincas. Many farmers owned 5,000 or more acres, but not all the land was necessarily in coffee. Often as much as one-half the acreage was left forested and held in reserve for the future. In the Soconusco, coffee became a way of life. Each planter managed the entire

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[4]J. Mário de García de Soto, Geografía general de Chiapas (México, D. F.: Imprenta Mexicana, 1969), p. 94.

business. The coffee was grown and processed on the plantation. A buyer had to be found and the coffee exported to him. Coffee cultivation became almost a cult, and few were granted admission. Coffee brought great wealth and prestige to the growers, and many of them became important businessmen in Mexico City.

In the search for more coffee lands, new plantations were started on the north-facing slopes of the Sierra Madre in 1908. These inland slopes are now the central coffee region. Except in a few very favored locations, this zone is less humid and more subject to harmful drying winds. As a consequence, it is less desirable for coffee cultivation and lacks the potential of the Soconusco. Early cafetaleros made their land into true coffee fincas, but later arrivals did not. The latter usually combined coffee with cattle. The coffee-cattle combination prevails today. Because of its marginal nature, the zone is decreasing in extent of coffee growing. Many farmers, particularly the smallest producers, are converting entirely to cattle.

Development of the northern region began about the same time as that of the central zone but proceeded very slowly. In the Soconusco, plantations are old and it is rare to find men who started coffee cultivation on new land. In the northern region, however, it is common for the present owner, or his father, to have started coffee cultivation on the land he now owns. No true coffee finca exists in this region. All coffee growers have some or most of their land devoted to other uses. Most frequently they are cattlemen who cultivate from one to 100 acres of coffee in addition to raising cattle. In the entire northern region the largest plantation of coffee is 500 acres. Five men have this amount, but most have fewer than 100 acres.

The transportation of coffee is a very difficult problem in the north. The whole of Chiapas suffers from a poorly developed secondary, and even primary, road system, but the northern area most of all. Perhaps to compensate for this, several subsidiary market centers have developed. Major buyers, including the government, have regional offices in each of these centers where they purchase the sun-dried or partially processed coffee. Sometimes the coffee is finished there, but just as often it is shipped to Tuxtla Gutiérrez before the final processing. Even with the regional centers to shorten the distance to market, it is sometimes necessary for the producer to fly his coffee to the center and for the buyer to fly it to his warehouse.

Cacao

The cacao lands of Chiapas are divided into two distinct regions through 1) location, 2) form of tenure for the majority of growers, and 3) techniques of cultivation. The two regions are located almost as far apart as the state boundaries permit (Figure 6). Despite the distance between them, they have a similar profile. In each, most of the cacao is located on the gentle rolling hills of the piedmont with the level coastal plain as a secondary site. The oldest region is the southeast, or Soconusco. All of the piedmont and most of the coastal plain is suitable for cacao, but other crops compete for available growing space. Therefore, in this region only 22,000 acres of cacao are grown and that in scattered locations throughout the Soconusco. In the northwest the 77,000 acres of cacao are confined to a single large region.

In the Soconusco piedmont the majority of cacao growers are ejiditarios. In pre-revolutionary days a number of large cacao

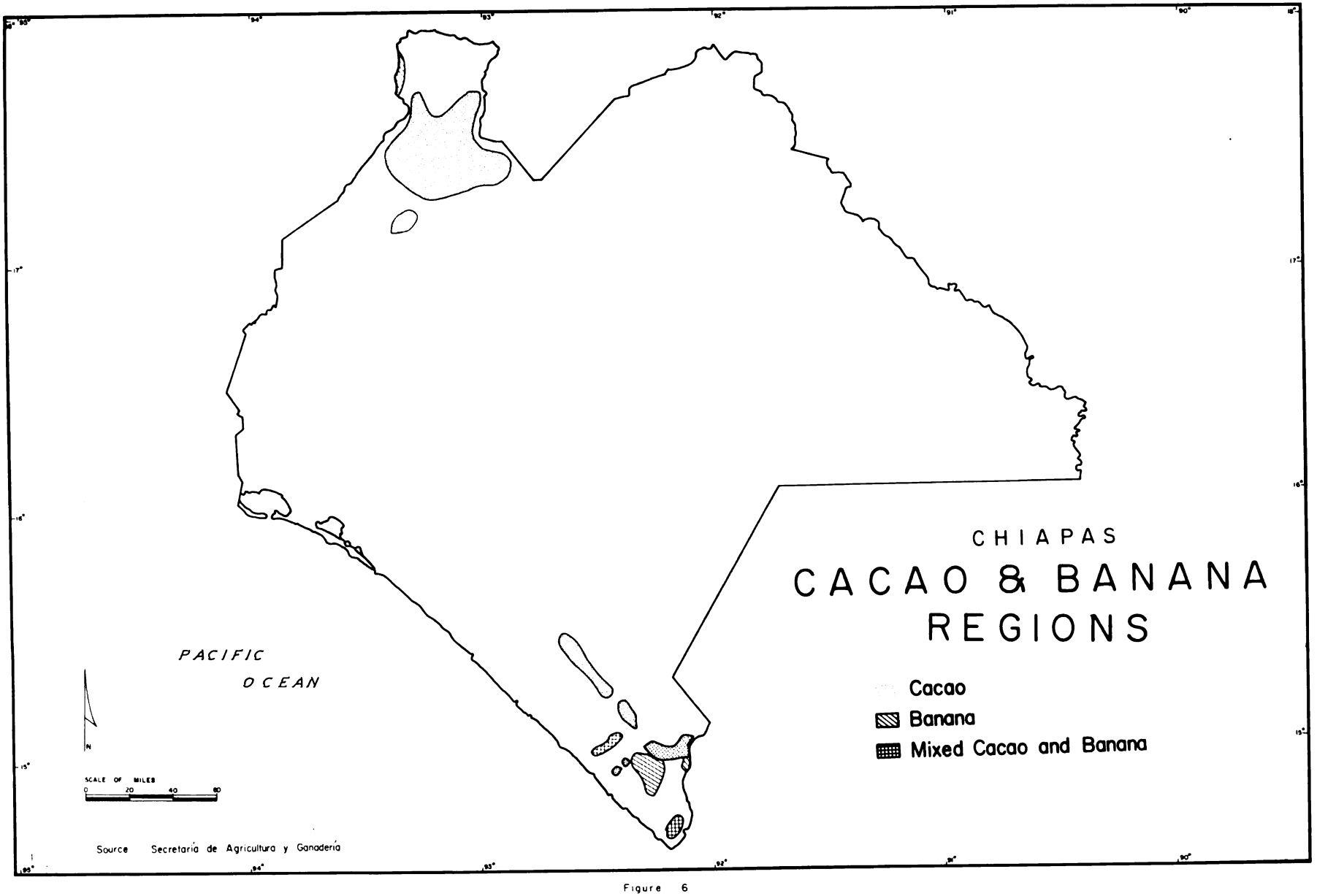
CHIAPAS
CACAO & BANANA
REGIONS
Cacao
Banana
Mixed Cacao and Banana
PACIFIC
OCEAN
N
SCALE OF MILES
0 20 40 60
Source Secretaría de Agricultura y Ganadería

Figure 6

plantations existed. In the reorganization of the land ownership which followed the revolution all but one of the plantation owners either lost their land or ceased to grow cacao. The plantations were then changed to ejidos. As the orchards were already in production, the ejiditarios have continued to harvest them. Lacking needed credit for improvements, the ejiditarios are unable to fertilize or protect their crops from disease or infestation. Consequently yields are low. With exception of the single large plantation, only a few hundred acres of piedmont cacao orchards are in the hands of private owners. These owners follow the same cultivation techniques as the ejiditarios with exactly the same results. On the other hand, the cacao grown on the coastal plain is in the hands of private owners who do have the necessary financial resources to improve their crops. As the owners have chosen cacao in preference to other crops, these orchards are the most carefully tended and productive in the region.

In contrast to the Soconusco, the northwest region has only four or five ejidos involved in cacao cultivation. Most cacao producers are ranchers who, in addition to owning cattle, also grow from ten to fifty acres of cacao. Because cacao is well adapted to the physical conditions of heavy rainfall through most of the year and difficult-to-manage tenacious clay soils, no other crop competes with cacao in this area.

As cattle ranching is a profitable business in Chiapas, two contrasting results have occurred: 1) Many ranchers have begun to destroy their cacao trees in favor of more cattle, and 2) those who wish to continue cultivating cacao have sufficient credit to enable them to apply fertilizers and pesticides and thus improve the yield.

Therefore, these cacao growing ranchers are comparable with the private growers of the Soconusco in their ownership of well-tended high-yield cacao orchards.

Used for a beverage and as money, cacao was prized by the Indians of Middle America long before the arrival of the Spaniards. Although probably native to the Amazon or Orinoco Valleys, cacao was brought under cultivation throughout northern South America, Central America, and Mexico long before the European conquest. From earliest times cacao had two distinct varieties, forastero or cacao amargo (bitter) and criollo or cacao dulce (sweet). The latter was preferred by the Indians of Middle America and was cultivated in an extensive region along the piedmont facing the Pacific Ocean. As this cultivation expanded, it reached the Soconusco area of Chiapas no later than the 14th century. According to John F. Bergmann, cacao cultivation was less developed in Chiapas than further south in Guatemala. He believes production was obtained from one or two trees planted in each kitchen garden, and no true orchard existed in the area.[5] While not contesting the degree of development compared with more southerly areas, other writers disagree with the manner of development. They have taken the Spanish word huerta, or garden, in the conquerors' descriptions of cultivation on the Mexican Plateau to have the same meaning in their descriptions of Chiapas. In these writings huerta always refers to the irrigated sections of agricultural land. The word then suggests

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[5]John F. Bergmann, "The Distribution of Cacao Cultivation in Pre-Columbian America," Annals of the Association of American Geographers, Volume 59, Number 1 (March, 1969), p. 37.

that Chiapanecan cacao was irrigated and, if so, it is probable that true orchards existed.[6]

During the pre-Columbian era the northern demands for cacao led to attempts to control the trade. The Pacific coast of Chiapas was invaded by the empires of the Mexican plateau, and garrison towns were established to ensure the semi-annual tribute of 200 cargas of cacao beans.[7] One carga equaled about sixty pounds.[8] Because the demand for cacao was strong, cultivation was initiated on the Caribbean littoral of Tabasco by the Aztecs.

Under the Spanish rule cacao was taken to the court in Madrid and grew in popularity as a beverage. Cacao thus became a valuable commodity to the encomienderos. They did little to increase the area under cultivation in the Soconusco, but certainly none of the cacao lands were left unclaimed. Occasionally one or another of the Spaniards, using Tapachula as a base, would try to control the cacao commerce, but none succeeded for long.[9] Throughout the colonial period cacao of the Soconusco rated high in quality, but its actual importance in trade declined and was overshadowed by the volume obtained from the Tabascan lowlands. Toward the end of the 18th century less attention was given to its cultivation in the Soconusco because of declining yields, but

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[6]Pedro Armillas, "Land Use in Pre-Columbian America," History of Land Use in Arid Regions, ed. Julian Steward, United Nations Social Science Monographs II, p. 265.

[7]R. H. Barlow, "The Extent of the Empire of Culhua Mexico," Ibero-Americana, Volume 28, p. 98.

[8]Bergmann, "The Distribution of Cacao Cultivation in Pre-Columbian America," p. 39.

[9]Moises de la Peña, Chiapas económico, p. 210.

there was some expansion in the northwestern region. Conditions improved gradually in the Soconusco as the demand for cacao increased following the Mexican Revolution of 1910. In the 1930's and 1940's demand increased sharply. Due to unsettled world conditions, the proximity of the Mexican cacao regions attracted American buyers to the extent that in the Soconusco, particularly, it was not uncommon to have the crop purchased while still on the trees.[10] Today a government agency holds a monopoly on the purchase of cacao, and the prices are strictly regulated. In Chiapas these prices are low, $5.00 (pesos) per kilogram, or approximately U. S. 29 cents per pound. This scarcely repays the cost of production and provides little incentive to improve or increase the acreage of cacao.

Bananas

Like cacao, bananas are grown in many tropical lowlands. Having much the same climatic requirements, the two crops are grown within the same general areas in Chiapas (Figure 6, page 56). However, commercial types of bananas do not tolerate much altitude and in Chiapas are confined to well-drained alluvial soils of the coastal plain. Actual commercial banana cultivation is limited to less than one quarter of the suitable land.

The northwestern region is composed of a single municipio, Pichucalco. Most of the fruit in this area is produced by very small farmers and is sold to jobbers who transport the crop to the Mexico City market. A lack of roads hinders development of the area. The road between Coatzacoalcos in Veracruz State and Villahermosa in

[10]Interview with Moises Mugüerza, April 30, 1972.

Tabasco is the only all-weather route serving the area, but this means of transportation is supplemented by use of gasoline launches on the many rivers. Cultivation of bananas for export is limited to 2,400 acres, and no one operates plantations of more than 700 acres. Subsistence farmers who cultivate some of the banana acreage usually grow several varieties and particularly the plantain, or cooking banana, which is welcomed by the city dwellers.

In the second region, the Soconusco, banana cultivation is much less viable. The long dry season is especially detrimental to yields. This, combined with low prices, has caused many to either abandon the crop altogether or cease careful cultivation and simply cut and sell to jobbers whenever the opportunity arises. The few serious cultivators have put in the type of bananas which produce a quality acceptable on the international market, although at present few manage to sell their crops outside the national territory.

During the past eight years there has been a revival of export-quality banana cultivation. The Soconusco now has a government-constructed drainage and irrigation project, and the farmers therefore have water available throughout the dry season. About fifty men have re-established bananas on land that had been used for the cultivation of other crops. Most of them use modern techniques and plant the best varieties. Although the producers are too few in number to ensure the huge tonnage required for foreign markets, they do receive the best prices in Mexico City. As a result, they are cautiously optimistic about their future in the banana business.

As an international commodity, bananas have a very short history. Cultivation did not begin until the turn of this century in the West

Indies and Central America and was initiated even later in Mexico. By the 1920's, when banana cultivation began in Mexico, the international trade was controlled by huge companies such as United Fruit. But in Mexico the land laws and government prevented these companies from obtaining control over production. Selling cooperatives, government sponsored as well as private, assisted the growers in obtaining good prices for their crops.

The first banana plantations in Chiapas were established in the northwestern sector of the state along the many rivers. Facilities for rapid transport were necessary for this production and, since roads were lacking, the rivers provided the best means of shipment. Banana cultivation spread quickly to the Soconusco where transport facilities were better. By 1937 the two areas exported 65,000 tons of bananas. In the next year the Sigatoka disease attacked most of the banana lands of Latin America. Northwest Chiapas suffered with the rest, but the Soconusco was spared. There production was intensified, and by 1942 the Soconusco became the principal supplier to the United States. Unfortunately, the Soconusco is not an optimum site for banana cultivation. It is subject to desiccating winds and a long dry season, which reduce the yield and make irrigation mandatory. A greater problem are the occasional hurricane-strength winds, which at about five-year intervals have destroyed the trees as well as the crop. But, the most permanent disaster for the Soconusco was the Panama Disease. Many plantations were abandoned and production nearly ceased. The last half of the 1960's has seen a renewal of cultivation but, as yet, on a much reduced scale. Of the fifty men involved in the revival of bananas, few can be considered big producers. Most cultivate between

100 and 150 acres. The two largest producers have an assured foreign market in the United States, while the remainder produce only for the domestic market. The exporters predict a slow increase in acreage, but no great change without a major upswing in world demand which they consider is unlikely.

Cotton

The Central Depression and the coastal plain of the Soconusco are the two regions of cotton cultivation in Chiapas (Figure 7). At present, the Soconusco is the larger and more important area, but agricultural agents consider the central zone to have greater potential. The Soconusco area is compact and rather sharply defined, while cultivation in the Central Depression is scattered. Most of the land suitable for cotton in the coastal plain is already under cultivation, but only a minor part of the good cotton land of the Central Depression is now devoted to the crop.

As the government regulates strictly all cotton cultivation, differences in farming techniques between the regions are minor. Farmers in both regions by law must employ modern methods of cultivation, including the use of hybrid seed, machinery, insecticides, and fertilizers. As a result, yields vary little from farm to farm and region to region. After the harvest, cotton is ginned and sold to government agencies.

Despite the similarities in techniques of cultivation, farms in the two regions are different. In the Soconusco the land is designated as class 1, hence the farmers are limited to 240 acres. They plant only the one crop. Every available acre, except for house sites and

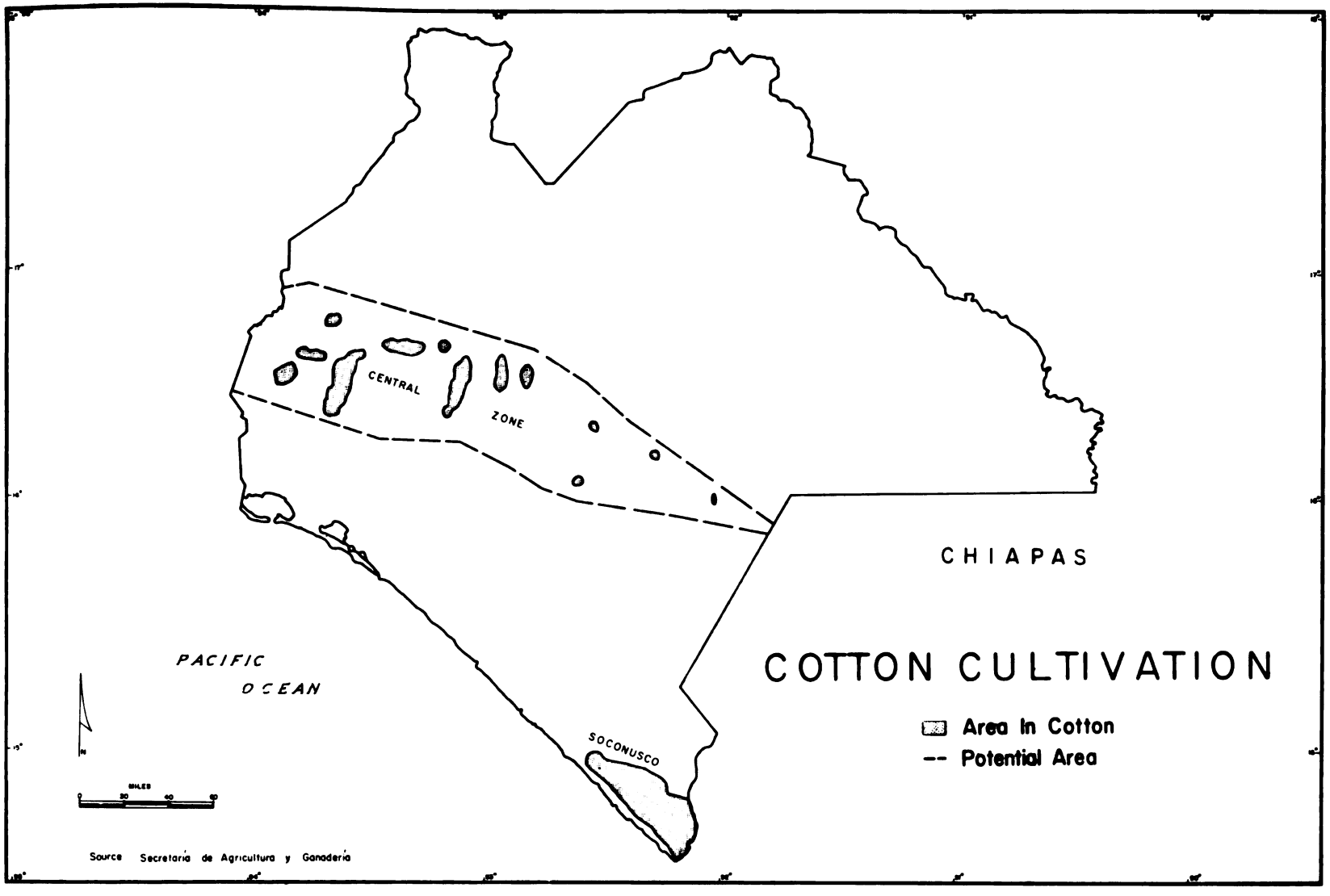
CENTRAL
ZONE
CHIAPAS
PACIFIC
OCEAN
SOCONUSCO
COTTON CULTIVATION
Area in Cotton
Potential Area
MILES
0 20 40 60
Source Secretaría de Agricultura y Ganadería

Figure 7

access roads, is in cotton. In the heart of the zone, cotton fields blanket the land. Only on the periphery do they become scattered and fewer farmers engage in the activity. In contrast, cotton is just one of several crops in the central zone. Not all of the land is class 1, and individuals may own more than 240 acres. Farm size varies from 100 to 2,000 acres. Cattle occupy most of the land, with corn and beans the important crops on arable land. Only in the past few years has cotton been added. From five to 240 acres per farm are allotted to cotton. At most this rarely exceeds one-half of the acreage on a farm and is usually much less. Ejiditarios of the central zone follow the same pattern as private farmers.

Climatic differences cause changes in the plants. In the central zone fields are at higher altitudes, rainfall is just marginally adequate, and humidity is lower. As a consequence, the cotton plant at maturity is two to three feet in height with a moderate amount of foliage. In contrast, on the coastal plain rainfall and humidity are almost excessive, causing fantastic growth. The plants are seldom less than six feet in height, with a growth of foliage that almost hides the cotton bolls.

Farmers in both areas express general satisfaction with cotton cultivation, but those of the central zone are more aware of the potential hazards and realize the situation may not always be so satisfactory. The ejiditarios of the central zone are somewhat distrustful of the crop, fearing the insect pests of cotton will infest their other crops. Nevertheless, in both zones ejiditarios and private owners expect to cultivate cotton for many years to come.

Commercial cotton cultivation has developed only recently in Chiapas, but wild cotton has grown there since prehistoric times in both the central and Pacific coastal zones. The year in which domesticated cotton was introduced is uncertain, but records indicate that in 1880 Chiapas produced 162 tons.[11] By 1908 a small seed extracting mill was operating in Tapachula, and another functioned at San Bartolomé in the central region. Sufficient cotton was grown and ginned to keep these gins in operation and to supply raw material for a small cloth factory at La Providencia in the central zone. Doubtless much of the cotton used in home looms was obtained from wild plants, but enough was cultivated to indicate its future promise as an important crop.

True commercial cultivation in Chiapas began in the 1960's after successful development of the cotton regions in northern Mexico. The government promoted the development through various agencies and now controls every step in the cultivation and processing of cotton. The project was started first on the coastal plain near Tapachula. No cotton can be planted without a government permit. To obtain the permit, farmers must agree to follow directions of the agricultural agents and use modern techniques, which include machinery, hybrid seeds, fertilizers, and insecticides. In return, the government provides the necessary credit and agrees to purchase the entire crop. Through the credit agencies seven ginning mills were built on the outskirts of Tapachula to purchase and process the cotton. In the first ten years the cultivated area expanded to 60,000 acres, despite the usual logistic problems which appear in such projects.

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[11]Moises de la Peña, Chiapas económico, p. 855.

In the late 1960's cultivation was expanded to include the central zone. As a result of earlier mistakes, expansion here has proceeded more slowly. Not every farmer or ejiditario can obtain a permit. Instead, the agricultural agents are selective, and the permits are granted only to those whose land appears particularly well suited to the crop. Nevertheless, slightly over 43,000 acres were under cotton by 1972. A single gin, on the outskirts of Tuxtla Gutiérrez, serves the entire central region. It receives more raw cotton than it can handle during the harvest season, and as the area expands further, other gins will be needed.

Other Crops and Livestock

Other crops could be commercially exploited in Chiapas. Most of these have been grown by subsistence farmers for many years and are still generally cultivated by primitive methods. Commercial farmers, in some instances, have cultivated the same crops but using modern techniques. Sometimes they also employ hand methods, but raise the crop with the intention of selling it. In any case, sufficient quantities are grown to furnish raw materials for infant industries in Chiapas.

Corn

Corn is grown everywhere in Mexico and is a basic staple in the Mexican diet. In recent years, with the help of imported seed, corn yields have increased substantially and Mexico now exports corn. Modern growers add to the surplus by reducing the former substantial loss from rodents and deterioration.

As in Mexico generally, nearly every farmer of Chiapas raises corn for domestic use. In addition, farmers of the Central Depression produce it for commercial purposes. The area surrounding the municipio of Villa Flores is sometimes affectionately called by the Chiapanecos the corn granary of Mexico (Figure 8). They mention with pride a contract they recently negotiated to export corn to the Soviet Union. The region is small, but could be expanded. However, these same farmers also grow cotton. In view of the increased corn production throughout Mexico and the alternate choice of land use for the area, it is unlikely the farmers will increase their acreage of corn.

Rice

Rice is cultivated in many areas of Chiapas in plots of only a few acres in size. The amount raised is merely sufficient for the needs of the state and is an important cash crop for many farmers. One area near the municipio of La Concordia is particularly noted for its production (Figure 8). Rice cultivated in Chiapas is dry or upland rice and, consequently, does not yield the tonnage common to wet or paddy rice. Nevertheless, production in the central zone is sufficient to supply a small rice polishing mill in Tuxtla Gutiérrez. Rice cultivation remains in the hands of the transitional farmers who still use hand tools. Although there has been no particular indication that the cultivation will expand in the near future, a demand for the crop does exist. Should improvements such as the application of fertilizers be made and the yields increase, the crop would become more popular and expansion occur.

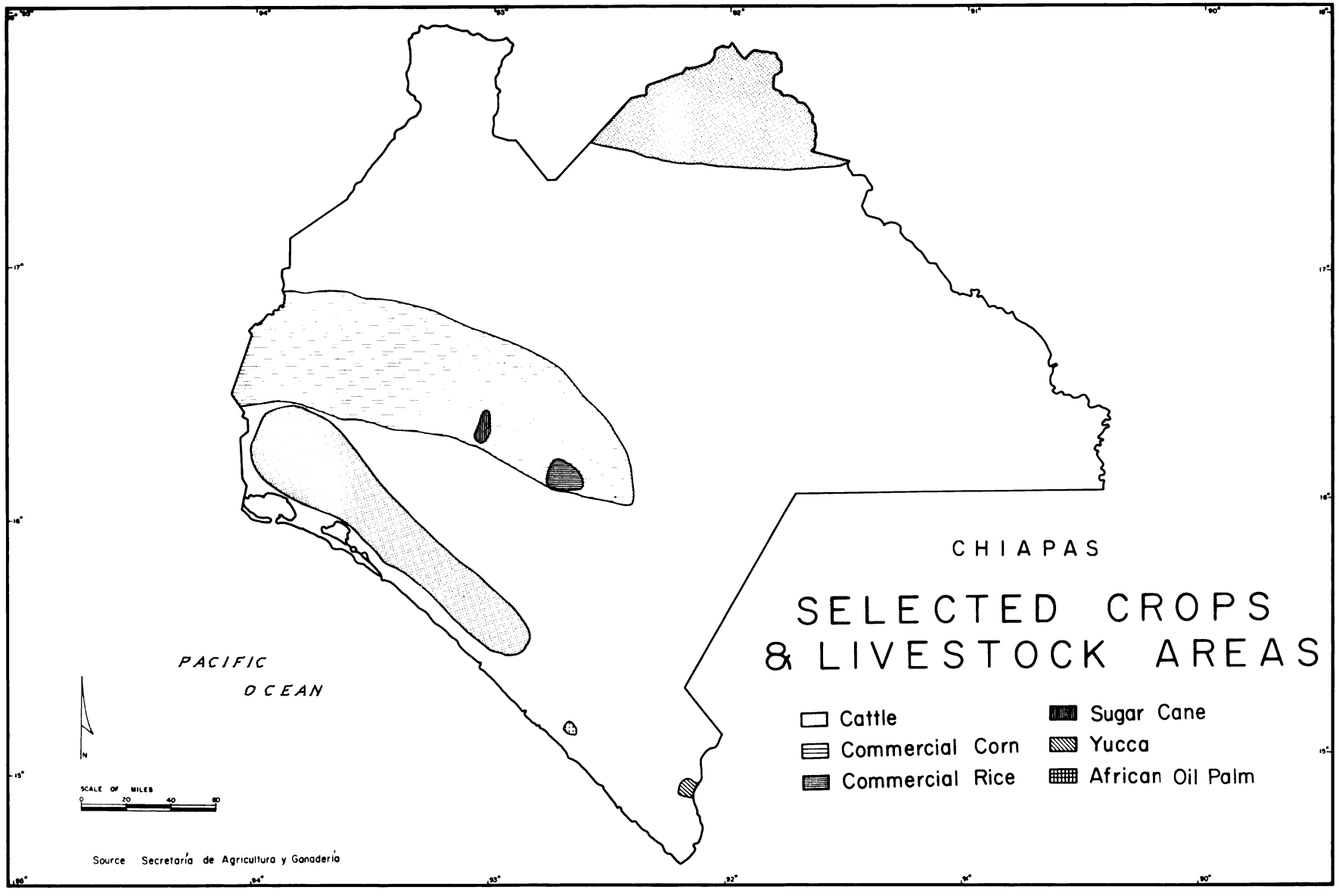
CHIAPAS
SELECTED CROPS
& LIVESTOCK AREAS
Cattle
Commercial Corn
Commercial Rice
Sugar Cane
Yucca
African Oil Palm
PACIFIC
OCEAN
N
SCALE OF MILES
0 20 40 60
Source Secretaría de Agricultura y Ganadería

Figure 8

African Palm Oil

In the past thirty years a new crop, African palm oil, has proved successful. As yet, it is confined to a single plantation on the Pacific coastal plain. The somewhat rigid requirements for successful growth of the palm are satisfied in this very small area of the coast. At present only 700 acres are under cultivation, but agricultural agents have estimated that an additional 24,000 acres are suitable. The oil is extracted on the plantation, and its purchase is a monopoly of the government.

Yucca

In the municipio of Metapa in the Soconusco region yucca has become the major crop. It is an annual plant which when harvested is sent to a small factory in the same municipio where the yucca is processed into a white glue. The farmers of the area grow the plant to the exclusion of any other crop. For this reason no cotton is cultivated in the municipio, although it lies within the cotton zone of the Soconusco.

Cattle

Cattle ranching is probably the most favored agricultural pursuit in Chiapas. Great personal prestige accrues to the rancher, and the government regards the occupation highly. It is one of the few agricultural activities for which credit, both governmental and private, is plentiful and easily obtained. Consequently, ranching is found in every part of Chiapas. If any area can be said to specialize in cattle, the northeastern and the southwestern section of Chiapas are these regions. Although in some instances the techniques of ranching

are not the best, the cattle frequently are. Ranchers are following the popular practice of crossing Brahman bulls with the old breeds brought by the Spaniards. Ranching is almost entirely limited to the small farmer and is rare among ejiditarios.

CHAPTER IV

PRODUCTION TECHNIQUES: COFFEE AND CACAO

Coffee and cacao are the oldest commercial crops in Chiapas and in the past growers learned the necessary techniques for their cultivation without help or interference. Many of these techniques were adapted to prevailing conditions when the crops were introduced to the area. Their continuance without modification is taken for granted by the growers as long as the crops remain profitable. But as conditions are never static and moreover as the government is anxious to add new commercial crops to those now produced, these techniques should be reviewed. Some have become outmoded and should be altered; many remain satisfactory and could be transferred as a nucleus of skills applied to new commercial crops. Among the techniques to be considered are: management of land and labor, chemical inputs, the use of machinery, transportation facilities, and marketing procedures.

Coffee

Coffee is the second most valuable crop in Chiapas, after cotton, and hundreds of Chiapanecos are engaged in its production. They vary from the big producer with 700 acres to the small farmer with one or two. All must apply the same general methods or production techniques. However, because of location, size of resource base or personal beliefs, the manner of application can vary.

Land and Labor

In Chiapas good quality coffee is grown at altitudes of between 2,500 and 5,000 feet. Above this height the coffee is considered too acid, and at lower elevations, both the size and flavor of the bean deteriorates. Coffee trees are well adapted to a wet and dry monsoonal climate. Although the trees maintain their foliage, the dry season provides a resting period. Fruiting starts with the rains; within two weeks of the onset blossoms appear on the trees. As most of the expense of coffee cultivation occurs during the harvest, a single rainy season is best. Two rainy seasons means two harvests. Coffee is not exacting in terms of soil requirements. The best is deep, well drained, fertile loam, preferably, but not necessarily, volcanic. This explains the heavy concentration of coffee fincas in the Soconusco region. Located at the northern terminus of the Pacific coast volcanic region of Central America, the Soconusco soils benefit, through deposits of ash, from volcanic activity.

In other countries, coffee plantations may cover a thousand or more acres, but in Mexico land laws forbid private holdings in excess of 750 acres. Coffee plantations form four classes by size: 1) ejidos with unlimited area, often more than 1,000 acres; 2) large fincas of 500 to 700 acres; 3) medium-sized fincas of fifty to 240 acres; and 4) small holdings of forty-nine acres or less. These categories arise from land tenure laws and related social conditions. Although the size of ejidos has no legal limit, some restriction has been imposed by the amount of land available at the time each was established. Today's large fincas were formerly immense, but expropriation has reduced them to their present size. In some cases the reduction is more apparent

than real as several neighboring fincas are often operated under the same management. Between the large and medium size holdings a hiatus of from 250 to 500 acres exists. It is possible that some holdings do correspond to this range, but none of the planters interviewed claim an acreage of this category. Nor do government records indicate any for Chiapas. In the medium-size category two types of plantations exist: 1) properties with all land in coffee, and 2) properties with more than half of the land reserved for other purposes. Fincas of 500 or fewer acres were purchased after the land reforms were instituted and are fractions or parts of former large fincas whose owners ceased cultivation. Holdings with fewer than fifty acres are usually small properties purchased by laborers from their employers, or government lands developed by squatters. It is a common practice for owners of large fincas to sell in small lots any land in excess of 700 acres. By surrounding themselves with many small growers, they prevent nearby ejidos from taking over more of their land.

To the exporter the type of coffee is as important as his land. Of four principal species, two are popular in Chiapas, Arabica and Canefora. The many varieties of Arabian coffees are preferred for flavor and are grown in Chiapas, but yields are moderate compared with that of Robusta, the major variety of Canefora. The latter specie was not discovered until the end of the last century. It has a greater content of caffeine and therefore, adds body when blended with Arabica. However, it is lacking in flavor and, by itself, is used only for soluble coffee.

The export planters grow varieties of Arabica coffee, usually Tipica, Bourbon, and Mondonova. Increasingly they are adding Caturra,

and in the north a new variety called Criollo. Only when questioned will a few farmers admit to growing Robusta, the common variety of Canefora. They rarely mention Robusta when describing their coffees as it carries no prestige. Only one planter specializes in Robusta and intends to replace most of his Arabica with it.

Usually coffee is grown in the shade of very tall tropical trees, such as the primavera and cedar. But in areas of new plantings, where shade is deficient or absent, the seedlings are shaded by fast-growing bananas that are planted beside each young tree for that purpose. Shading occurs because of the belief that the coffee tree does not live and bear well in strong tropical sunlight, and shading is also used to control the height of the trees for easier harvesting. In Chiapas coffee trees are planted an average of nine to twelve feet apart, but actual spacing is fitted to the terrain. Steep slopes permit planting as close as two feet. Although a coffee tree lives for more than fifty years, replacement is recommended after thirty years when yields begin decreasing. All of the farmers interviewed do remove trees as they die or become severely diseased, but none routinely replace old or low yield trees. Usually large owners operate their own nurseries, but small farmers obtain new stock from the coffee institute. Five seedlings are supplied without cost, but a small fee is required for more than five. The coffee institute, working with the agronomists of the agricultural experiment station, has developed improved varieties, notably Criollo which are adapted to altitudes around 5,000 feet. Criollo has proved particularly satisfactory for the ejidos of the northern region.

In the annual work cycle labor requirements fluctuate with the season and the owner's perception of his needs. The routine work consists of replanting, clearing undergrowth around young trees, watching for disease, fertilizing, tree trimming, and general maintenance. A permanent labor force lives on the plantation for this work. The Soconusco coffee farms and the large fincas of the central zone maintain approximately the same number of workers, usually one worker for five to fifteen acres (Table 1). In the northern region and on smaller fincas of the central zone there are no permanent laborers for the coffee. Local ranch hands or outside labor may be hired for specific jobs. At the conclusion of the tasks they are released or, in the case of the ranch hands, returned to their usual work. No permanent workers are hired on the ejidos. The ejiditario and his family perform all routine tasks.

The trend is toward fewer permanent employees even in the Soconusco, because welfare laws impose increasingly stringent standards. Some of these the finqueros have difficulty meeting.[1] The finquero must provide permanent housing, social security benefits, and health care. With thirty or more employees he must provide a school and a teacher. Teachers are difficult to find as most prefer to live in towns and receive the benefits attached to government jobs.

Labor requirements increase sharply during the harvest, which is done by hand. As green fruit must be left on the trees to ripen and only ripe berries are picked, the same trees must be picked over two to three times. Each laborer is assigned to all trees within a

[1]In Chiapas a finquero is an owner of a large plantation, usually 500 acres or more. Although the name is usually reserved for coffee growers, it may refer to any important farmer.

TABLE 1

LABOR FORCE ON CHIAPAN COFFEE PLANTATIONS, 1972

Coffee Regions	Size of Farm Hectareas	Permanent Labor Force	Temporary Labor Force
Soconusco	100-300	50-100	150-300+
	30-99	10-20	50
	<30	0-3	0-20
Central	100-300	50+	50-100
	<30-99	10-20	10-20
Northern	100-300	0-15	16-50
	30-99	0-10	15
	<30	0	0-14

specified area called a cuerdo. The cuerdo has no absolute size, but must include sufficient trees to allow one man to pick one quintal or 130 pounds of coffee berries each day. The cuerdo is adjusted to the terrain, the number of trees, the state of ripeness of the fruit, and the type of tree. Robusta trees are easier to pick and have more fruit than Arabica. An employee is not restricted to a single cuerdo. If he is a fast and thorough worker or if he has extra hands in the person of his wife or children, he will be assigned to as large an area as he can handle.

The numbers of temporary laborers hired follows the same general pattern as that of the permanent work force. Soconusco growers employ the greatest number, finqueros of the central zone the next largest, and northern growers the smallest. In the Soconusco owners prefer to have 150 to 300 additional men, or one man for every two to five acres. However, the owners of German descent do not find these numbers adequate, and instead employ 1,000 extra workers for picking. They also hire some of the women and children who accompany the laborers to hand grade the coffee beans after the drying machines have initially graded them. Non-German finqueros consider machine grading sufficient and have ceased hand grading.

In general, coffee harvests coincide with the period of least work on subsistence farms. Consequently, a readily available source of labor exists nearby. Over the years a routine has been established. Because Soconusco growers hire the largest numbers of seasonal laborers, the majority of laborers head for that district. Part of the temporary workers are acquired haphazardly. Men simply appear and request work. Most of these are illegal migrants from Guatemala. But the bulk of

the workers are hired from a contractor who also acts as a form of union leader, bargaining for improvements before he guarantees to supply specific numbers of laborers. The workers return to the same general area, sometimes the same finca, year after year and generation after generation. The eastern sector of the Soconusco draws on legal migrants from Guatemala and Indians of the Central Plateau for its workers (Figure 9). Central Soconusco obtains men from the Central Plateau and Comitán area. Comitán farmers and a few Indian groups from the Central Plateau go to the central coffee zone, where they are supplemented by local farmers. The northern coffee zone must depend upon local labor, plus a few workers from the Central Plateau. The limited number of temporary laborers who head toward the northern regions partially explains why the northern growers habitually use far fewer employees than those of the Soconusco. Having grown accustomed to the same picking localities and home areas, both the laborers and the finqueros speak disparagingly of other workers and other work areas.

Other Inputs

Among the hazards of farming, especially in the tropics, are loss of soil fertility and damage to crops from diseases and pests. Modern farmers combat both by use of various chemicals. Beyond the ability of the farmer to produce for himself, these are purchased off the farm and account for much of the costs of commercial agriculture. Use varies according to local conditions and farmers' ability to pay. Among inputs characteristic of modern commercial cultivation is substitution of machinery for labor. In some forms of tropical cultivation, machinery is of little importance; but in others, notably cotton,

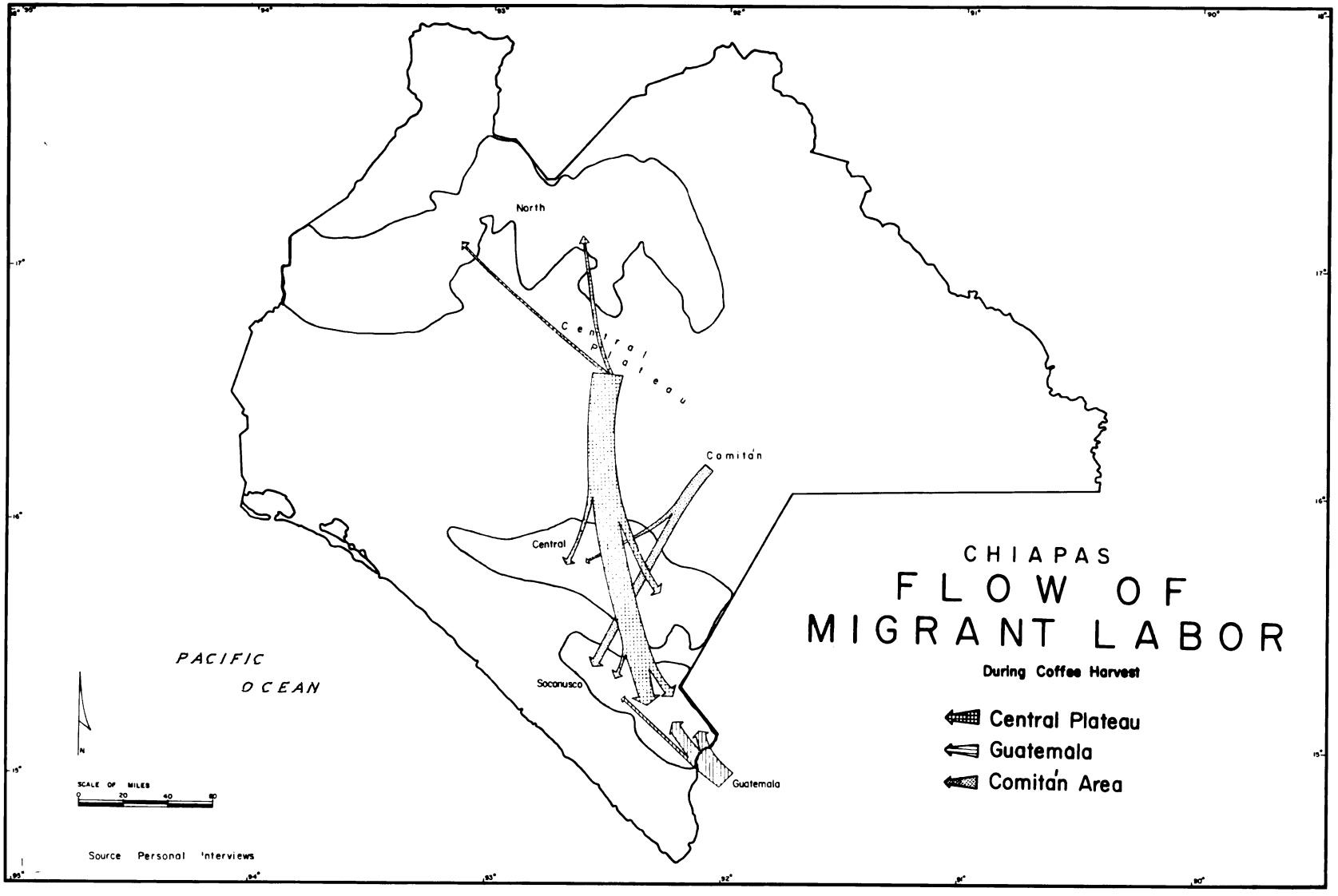
North
Central Plateau
Comitán
Central
Soconusco
Guatemala
PACIFIC
OCEAN
CHIAPAS
FLOW OF
MIGRANT LABOR
During Coffee Harvest
Central Plateau
Guatemala
Comitán Area
SCALE OF MILES
0 20 40 60
Source Personal Interviews

Figure 9

it has assisted a complete modernization of production. Usually considered as part of labor requirements, but with special importance in Latin American agriculture, is the time and effort expended by the owner. Most owners of large properties spend a minimum of time overseeing the operation. Sometimes this is compensated for by the presence of a full-time manager, but absentee landlordism is usually a factor in problems of low productivity and inefficient management.

Fertilizers, Insecticides, and Other Chemical Aids

Coffee cultivation in Chiapas is characterized by minimum applications of any form of chemical preparations to aid production. The primary use of chemicals is to maintain soil fertility. Heavy leaching of natural soil chemicals increases the need for replacement, but among the coffee growers interviewed only four have applied commercial fertilizers. All agree upon the necessity but have failed to do so. A routine practice is to use the pulp from the coffee fruit as fertilizer after the beans have been removed. One owner regularly applies commercial fertilizers. Three have applied guano and one has used urea, but at irregular intervals and generally in minimum amounts. Of the four who have made irregular use of off-farm fertilizers, one is an ejido manager and all are among the largest coffee growers in Chiapas.

A second need for chemicals is as herbicides. Undergrowth around young trees must be kept to a minimum. The same farmer who regularly uses chemical fertilizers also has made use of herbicides, but no others have. Most substitute hand labor. After five years the coffee trees themselves shade the ground sufficiently to reduce unwanted

undergrowth to a tolerable level, so the owners consider it more efficient to clear the growth by machete and prefer not to incur the additional expense of herbicides.[2] Most have simply never considered their use.

Chemicals are also used to control disease and pests. As in every tropical region, a large number of diseases and pests exist which affect the trees and for which individual chemical remedies are available. Again, all farmers agree upon the necessity of their use, and at the same time more than half of those interviewed said that they had never used them. They did not because they are too expensive. The remaining interviewees who have used insecticides do so sporadically. Three to eight years separates each application. Generally these preventatives have been for insect plagues, whereas only one farmer specifically mentioned fungacides. The common treatment for diseases which have no obvious vector is to remove the affected trees and replant.

Machinery

One of the most characteristic features of coffee cultivation in Chiapas is the use of men rather than machines. This situation is not entirely by choice of the growers. Coffee is often grown on slopes too steep for effective use of machines either to clear land or to cut undergrowth. The fertilizer most often used is pulp from the coffee cherry and is easily spread by hand. The greatest need for labor is in harvesting, and no machine has been invented to satisfactorily pick cherries as they ripen. Although none of the operations

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[2] A machete is a large, wide-bladed knife used for every conceivable task.

can be entirely mechanized, the amount of labor needed can be reduced for a few. A portable flame thrower is satisfactory to clear and reduce the undergrowth around young trees, and portable, back-packed sprayers can spread chemical herbicides, fertilizers, and insecticides. These are used routinely by one grower among those interviewed, and the sprayers occasionally have been employed by others in the rare application of chemical insecticides. Most often, however, insecticides are applied by hand. The most important use of machinery is in preparation of the coffee beans for market. Coffee processing is divided into two steps, wet and dry. Wet or humid processing begins with immediate washing of each day's harvest of coffee cherries. The fruit is then removed by grinding or pulping. To remove the remnants of pulp the beans are again washed and are placed in a fermenting tank for twenty-four hours. Following fermentation, the beans are spread out in thin layers on a drying floor or patio which is exposed to sunlight. Time needed for sun-drying varies with the moisture content of the coffee bean itself, the humidity of the air, and the directness of the sunlight; but it averages from twenty-four to thirty-six hours. Sun-drying removes some of the moisture from the bean, and all remaining fragments of the fruit clinging to the bean then dry and fall away. When this stage is complete, the beans are known as café pergamino.[3] The processing to the stage of café pergamino is called the wet or humid beneficio, and all coffee growers, except an occasional one who sells his coffee in the cherry, process their coffee this far. The difference between the large and the small growers is that the small

[3] Café pergamino is partially-dried coffee beans which still retain the outer skin or husk.

growers hand wash and depulp the coffee beans, while the others use power machinery.

Small growers usually sell their beans as café pergamino while the finqueros go beyond this to the final stage and sell their crops as café de oro.[4] To reach the final step, after sun drying on the patios, the coffee beans are placed in a drying machine. The dryer, a huge drum, revolves and tosses the beans as they dry. Although the mechanical dryer speeds the drying process and can be substituted entirely for the patio drying, the large growers of Chiapas habitually use a combination of the two forms. They believe that sun drying adds to the flavor of the finished coffee. Finally, the dried beans are placed in a blower which, by forcing air through long passages, removes the last of the thin skins around the beans and by lifting them to different heights sorts them by weight. The chaff blows off at the top, the lightest beans are lifted to the highest outlet, middle weights to the next highest and the heaviest beans only to the lowest outlet. The beans, then as café de oro, can be sacked ready for market. However, some growers, using female and child labor, go over each sack and remove broken or poor quality beans before marketing.

The depulpers, dryers, and blowers are the major machines of the finca. They are large and expensive, but usually last twenty to thirty years or more. All are powered by electricity, which the grower must produce for himself. Therefore, the final and most critical machine is the diesel-powered generator. If possible, the finquero will own two. Each is capable of producing sufficient power to run all

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[4] Café de oro needs only toasting and grinding before it can be used to make coffee.

machines. Their use is alternated, but the real purpose of having two is to have another available should one machine break down.

Marketing and Transportation

Coffee was an early success in Chiapas, because it did not deteriorate rapidly, could be transported over difficult terrain and was sufficiently valuable to withstand high transportation costs. Initially coffee growers located their own buyers outside of Mexico and transported their coffee to those buyers. Time and political events have altered the picture. The reduction in size of the great fincas and the entrance of the small farmer into coffee production have necessitated the development of an intermediate broker, the coffee company which buys from the grower and sells to the overseas market.

Transportation remains a problem. The state now has two all weather east-west routes connecting the capital and the Soconusco with Mexico City and Guatemala. The two primary roads serve the commercially developed areas of the state, but the secondary road systems remain rudimentary. Many outlying areas lack both primary and secondary roads. Although the government is placing great emphasis upon road construction, it will be many years before the transportation system can be considered adequate.

Markets

Almost the entire coffee production of Chiapas is exported to either the United States or Germany. Of the growers interviewed, only those who handle their own exporting are aware of the precise destination of their coffee. Germany purchases premium coffee, and those growers who sell to Germany gain prestige from this fact. As most of

the coffee exporting companies operate in more than one state, local managers are uncertain but calculate that 90 percent is sold to the United States.[5]

Since land tenure laws reduced the size of the fincas and the small farmer has entered the picture, the manner of marketing has changed. Some fifty companies buy from the farmer. At least half of these companies are very small and are comprised of coffee growers who prefer to export their own coffee. Ten or twelve companies buy second class coffee, i.e. broken or very small-size beans not acceptable for export. These they sell on the local market, or they buy lowland Robusta for the powdered coffee market. The remaining companies are firms which buy for export, but are not involved in coffee cultivation. Many operate in more than one coffee growing area of Mexico.

The finquero who forms a coffee export company is primarily concerned with his own production. However, he may also buy from nearby small growers. In times of poor harvests he buys from any available source to meet his assigned quota. Often, but not always, other members of the finquero's family own additional coffee land, and in effect the company sells coffee grown on two to four fincas.

Coffee planters who have 700 or fewer acres of coffee seldom consider it worthwhile to find overseas buyers and prefer to sell to the coffee companies. They sell their beans either in pergamino stage, or if they have drying machinery on their property, as café de oro. Only one farmer of those interviewed has found it profitable to sell in the cherry stage. He does this successfully because he is

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[5]Interview with two coffee company managers, December, 1972.

located within twelve miles of Tapachula and the road to his plantation is paved more than half of the way. Because of this and because his Robusta trees bring a large harvest, the company is willing to collect at the end of each day's picking.

Most of the small growers sell their coffee to Bemex (Beneficio Mexicano), the government agency. Although during harvest Bemex opens many temporary offices in various coffee growing municipios, the waiting lines of small growers are very long. These growers often have to wait a day or more before they can sell their coffee. Such delays generally make larger growers avoid Bemex, and they turn to private commercial companies. Because of the volume of coffee Bemex buys, it sets the price for all commercial buyers. Other buyers cannot put their prices much lower than the government prices, or even the large growers become willing to sell to the government.

In the north the small farmer whose harvest amounts to less than a few hundred pounds, and whose difficulty in reaching market would destroy his profits, resorts to another buyer -- the coyote. The latter is given this name because he is considered a scavenger. He takes advantage of farmers who cannot readily move their harvests to market by paying minimum prices. The coyote buyer is common in the north, less so in the central coffee zone, and almost unknown in the Soconusco. He thrives only in isolated areas.

Market Centers

Headquarters for the coffee companies are in Tapachula and Tuxtla Gutiérrez. Tapachula serves the Soconusco sufficiently well that only one or two extra collection and storage centers are needed in other

municipio capitals. Bemex is the exception, having a number of temporary branches which shift from week to week as harvests are completed. Tuxtla Gutiérrez serves the northern and central regions, but the city is not as conveniently located for the north as Tapachula is for the Soconusco. Nor is the road network as well developed as in the Soconusco. Therefore the major coffee buyers have established a number of regional centers. These are permanent, although active only during harvest season. In addition to buying coffee, these centers have facilities for processing. As few of the northern planters have machinery to completely process their coffee, they sell it at the café pergamino stage. The buyers must be able to complete the process.

The centers are located in capitals of several municipios. Although these are usually very small towns, their coffee buying function has given them a rather businesslike character unknown in other municipios. Tuxtla Gutiérrez is the main coffee center, but most of the coffee is exported directly from the regional centers. On the other hand, regional centers in the central zone ship the coffee to Tuxtla, as it is conveniently located to do the exporting for that zone.

Transportation from Farm to Market

Growers must take their coffee to market. The preferred method is by truck. As many farmers as can do so own their own trucks, for the trucks also substitute as family cars. Often ejidos collectively own one or more. Small farmers and the poorer ejidos can usually rent them from neighbors. Freighting by truck depends on the condition of

the roads. Because the Soconusco is the oldest and most concentrated of the coffee regions, the road network is the most nearly adequate. All of the coffee lands lie within a short distance of the paved coastal highway, but movement by secondary roads is often difficult. The first finqueros had to construct their own roads from the mountains to the coastal plain. These roads were made to serve pack animals, and they crossed streams and followed cliffsides. They were vulnerable to erosion by water and destruction by rock falls. The roads grew wider as more finqueros came to the region and joined together to improve accessibility. The early roads now form most of the secondary road system and, although the state now grades them periodically, they remain rudimentary.

The secondary road system of the central zone is completely inadequate. Coffee lands are more scattered and distances are longer. The Sierra Madre is extremely rugged, and only a few footpaths cross the mountains. Therefore, movement toward market is northward to the Central Depression and the capital, Tuxtla Gutiérrez. The central branch of the Inter-American Highway passes close to the eastern sector, and growers in the east are more fortunate than those elsewhere in the central region. Finqueros of the central and western areas who could afford to construct their own roads, and transport their coffee by truck, often take twenty-four to thirty-six hours to reach the Inter-American Highway, a distance of thirty to fifty miles. The small growers continue to bring their coffee to market by horse or mule-back and sometimes, in the case of the smallest growers, by donkey.

In the north conditions are similar to those of the central zone. Only the largest growers and those located near the few access roads

can make use of trucks. Most of the small producers, including the individual ejiditarios, use pack animals. For those living in the eastern part of this zone, transport to market can mean a journey of a week or more. Distances are a little longer and secondary roads are few. Many communities, ejidos, and private plantations have small primitive air strips where small one- and two-engine planes can land. Coffee is collected from local growers and flown to the nearest regional center. Air freighting is most common in the central and eastern sections of the northern zone.

Transportation from Market to Final Destination

At the beginning of coffee cultivation in Chiapas, all crops were shipped overseas and even to Mexico City via the shallow water port of San Benito (Puerto Madero). Cargo had to be lightered to ships waiting in deep water. In 1907 railroad transport replaced shipment via the inadequate port, and all coffee was subsequently sent by train across the Isthmus of Tehuantepec to Veracruz on the Gulf of Mexico. Today, the Inter-American Highway has largely replaced the railroad for coffee shipment. A few of the planters who export their own coffee continue to use the railroad, but generally not on a regular basis. All coffee brokers, including the government owned and operated Beneficio Mexicano ship cargo by large trucks. The saving of time, twenty-four hours as opposed to five to seven days or more, has motivated the conversion to trucks.

The port of embarkation has shifted from Veracruz to Coatzacoalcos, which is also in the State of Veracruz. Exporters usually do not select their point of shipment. This change, shortening the transport distance,

was instituted by the Mexican government. In conjunction with the planned development of a series of deep water ports, the government began to assign the use of specific ports to particular states. Chiapanecos now use Coatzacoalcos for most of their coffee, whereas Salina Cruz in Oaxaca is the departure point of coffee destined for Japan. However, only minimal amounts of Chiapanecan coffee is sold to Japan. Coffee always moves by ship when exported from Mexico. Although the United States imports more than 80 percent of all Mexican coffee, less than 1 percent travels overland by truck.[6]

Cacao

Despite a short revival of Chiapanecan cacao during and immediately after World War II, it has been of decreasing importance in the state since colonial times. Much of the responsibility for this situation lies with the cacao growers themselves. Mexican cacao is not popular on the international market, and until processing on the farm is improved cacao from Mexico will not be sold abroad.

Land and Labor

Cacao and coffee are both tree crops and have some similarity in physical requirements. Annual temperatures must be high and rainfall heavy for both, but conditions for cacao culture are more stringent. Cacao requires an annual temperature of 75°F and at least 1,250 millimeters of rainfall. A long dry season is harmful to cacao because the tree flowers and bears fruit throughout the year without a resting period. Dry periods decrease the amount of fruit the tree can produce.

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[6]Instituto Mexicano del Café, Estadísticas de Café (México, D. F.: Los Talleres Gráficos de la Nación, May, 1970), p. 2.

High atmospheric humidity and high moisture content of soils can alleviate some of the decrease in yield caused by a dry season. Although cacao flourishes at sea level, the size and flavor of the beans increase with altitude. The maximum altitude for satisfactory production is 2,000 feet, while 900 to 1,000 feet is preferred. Physical requirements are most exactly met in the northwestern, or Pichucalco, region of Chiapas. In the Soconusco high atmospheric and soil humidity alleviate the effects of the area's long dry season. Because of an acceptable climate and very fertile soils, cacao groves produce larger and more aromatic beans than those of Pichucalco.

Chiapanecan groves are a mixture of sweet and bitter cacao trees. Each has advantages and the ranchers prefer to grow both varieties, rather than specialize in one. Sweet cacao is preferred for its larger, more flavorful beans, but it is highly susceptible to disease. Yields are lower than from forastero or bitter cacao. Forastero beans are small, with a high content of bitter oils. Fermentation neutralizes the oils, but the flavor never equals that of the sweet cacao bean. When interviewed, the ranchers were reluctant to indicate their preference or estimate the number of trees of each variety, but later observations in the field revealed that forastero predominated in the northwest and sweet cacao in the Soconusco region. Yet, all growers have both bitter and sweet cacao in their orchards.

Cacao is a rapidly mutating specie, and sweet is more rapid than bitter. The farmers indicated this when interviewed by naming forastero and clonal as their most common cacao. Later, in the field, they gave names to the clonal such as "criollo" or "Coasta

Rica." Clonal is the manner by which they obtain new trees. Forastero may be grown from seed, but no seed of sweet cacao produces a tree with the exact characteristics of the parent tree. Therefore, to prevent mutations, slips or clones are taken from the parent and planted. Seeds of sweet cacao are never used to start new trees. Costa Rica is the most popular of sweet cacao because of its greater yield, but planters who have begun cacao cultivation in the past twenty years believe that Costa Rica has outlived its usefulness and a new variety would improve cacao cultivation in the area.

In the Soconusco the oldest cacao orchards were once private fincas but are now converted to ejidos. The one exception is that of an owner who continued to cultivate the 700 acres that remained to him after expropriation of more than half of his holdings. The ejidos and the orchard of this cacaotero are located on the piedmont. All other producing units are operated by cultivators who have entered the field within the past twenty years and are located on the coastal plain. Although the more recent growers may own several hundred acres, only a very small part is in cacao. None of those interviewed in this group cultivated more than forty acres of cacao and in most cases considerably less. The same situation exists in the northern cacao region. The north is cattle country and owners may hold 1,000 or more acres, but they seldom have more than 200 or 300 acres of cacao. Cacao occupies less than forty acres of each farm, and most of the land is used for cattle. No cacao growers, including the ejiditarios, consider cacao to be their most important crop.

Labor requirements for cacao are minimal. Among farmers interviewed the average number of their permanent workers was one man for

each six to seven acres. As harvesting is a continual process, the regular staff does the harvesting and there is no need for large numbers of temporary workers. The volume of the harvest does increase from September to December, and some farmers will employ a few extra workers at that time. Such laborers are usually hired from nearby ejidos. The lone Soconusco cacaotero routinely maintains twelve to sixteen permanent employees. Cacao ejidos are operated on an individual basis, each ejiditario caring for his own assigned acreage and selling his own cacao. Each ejiditario may have twenty or more acres assigned to him. Usually one-half or more is planted to subsistence crops and the remainder to cacao. None of the ejiditarios hire any labor. Such extra help as the ejiditario may need is obtained from his family. Permanent employees of cacao farms are usually drawn from the local area and do not live on the property. The owner is thereby relieved of the responsibility of housing them. Also, with so few employees, the cacao planters are not required to provide schools or health facilities.

Other Inputs

The success or failure of cacao cultivation is dependent upon the use of shade, fertilizers, and insecticides. Most growers of Chiapas neglect the use of the fertilizers and insecticides, but all use shade. Cacao requires heavy shade. Only 25 to 50 percent of the sunlight is allowed to penetrate to the cacao. Shading protects the pod from sunburning and reduces water evaporation, thus conserving needed moisture. Shading can be reduced as the trees mature and provide some self-shading, but thinning is seldom undertaken. Tall tropical woods are

preferred as they give maximum shade. Although shade trees provide valuable woods, such as cedar and primavera, no use is made of them for lumber and they generally outlive the cacao trees they protect.

In the use of chemical aids to cultivation, a sharp distinction exists between the ejiditarios and private owners. None of the ejiditarios apply fertilizer in any form, while small ranchers apply a little occasionally. Nitrogen is most needed and is used every three to eight years. As with coffee, the pulp or fruit is discarded and the seeds or beans are the valuable part. Unlike coffee, however, the unused residue from cacao is discarded and not used as compost.

The cacao tree is subject to many diseases and insect pests. With the best of techniques, and in a good year, as much as one-half of the potential production is lost to these causes. As with fertilizers, the ejiditarios do not apply chemical pesticides in any form, but the rancher does, usually as the diseases or pests appear. None are applied preventatively.

Machinery

Cacao is cultivated on fairly gentle slopes, but very little mechanization has occurred. Three of the ranchers interviewed in the Soconusco make use of a tractor in preparing the land for planting new trees and to clear the undergrowth. They also use back-packed sprayers when fumigating. Other than this, no use of machinery in any form was found. Almost the only tool employed is the machete. It is used for digging, clearing undergrowth, trimming trees, harvesting the fruit, and cutting open the mazorcas or outer shells to obtain the beans.

Irrigation

In the Soconusco, the single large grower on the piedmont and the small ranchers of the alluvial plain use irrigation during the dry season. They irrigate by small gravity flow channels and small motor pumps. Except the large cacaotero, however, none obtain all the water they need. Supplies are limited, and the government regulates the distribution. The cacaotero is most fortunate, as he is situated on the piedmont beside one of the largest year-around rivers of the region.

Harvesting

Harvesting is relatively simple. The mazorcas grow on the trunk and largest branches of the trees, and are cut off by machete as they ripen. Harvesting is conducted throughout the year, although it increases in volume between September and December. After the mazorca is cut, it is allowed to dry for forty-eight hours and is then split open. The beans, which are clustered in the center, are removed and put in a vat for washing. Then, they are spread out on a cement drying patio and sun dried for a day or two. After drying, they are placed in 130-pound sacks. When a sufficient amount is collected, they are sent to market. The average yield is little over a ton per acre.

It is during the harvest that much of the value of cacao is lost. The method of processing for market remains relatively unchanged since pre-Columbian times. In those days all cacao was the sweet or criollo cacao and needed no processing. Today, because of mutations, many varieties of sweet cacao are grown. Some of their characteristics

have changed and become similar to the forastero, or bitter cacao, except the old criollo varieties. A period of fermentation is necessary before drying to bring out flavor and increase sugar content. Varying periods of fermentation from two to eight days are needed, but all varieties can be fermented for the maximum period without harm to the beans. The growers do no fermentation. Rather, the fermentation is performed later by the chocolate processing factories, which does not give the best results. This failure on the part of the growers makes Mexican cacao undesirable on the international market, and the domestic market is therefore the only market available for Chiapanecan cacao.

Marketing and Transportation

Marketing cacao is very simple. There is only one buyer -- the government. Transporting the cacao to market is much the same as for coffee. Trucks are used when possible, but horses, mules, or donkeys are used when necessary.

Markets

The Unión de Cacaoteros is the only official purchaser of cacao. It is a federal government agency which operates several branch offices in each cacao region. The home office in Mexico City sets the prices, which vary by state. The states in which cacao cultivation is encouraged generally receive the highest prices. Chiapas is not a preferred state, and growers are not ordinarily permitted to go outside their own state to sell their crops. In fact, they are limited to a specific branch office. At least one of the growers of the Soconusco has found ways to avoid this rule. The cacaotero runs a small chocolate processing

factory where he processes his own cacao. In turn, however, the processed chocolate must be sold to the government and not to the candy or cocoa makers. He cannot sell the cakes directly to other processors, nor can he buy extra beans from local growers. Instead, he must purchase these from the local Unión office. One other cacao grower in the Soconusco pays the local Unión office a fee for each pound of beans, and he then is free to sell his cacao in Mexico City. As the fee and the shipping costs are included in his expenses, the price he receives in Mexico City must be higher than the state price of $.28 per pound so as to make the longer trip to market worth the effort.

A larger chocolate processing factory is located in the heart of the northwestern region, but the farmers here must also sell to the Unión, which in turn sells beans to the factory.

Transportation

Transportation of cacao is similar to that of coffee, differing only in amount. In the Soconusco a better road system exists, and the farmers therefore use trucks. In the northwestern region, roads of any kind are few, and only the most fortunately situated can use trucks. The bulk of the crop is transported by animals.

The Unión offices in the Soconusco and Pichucalco, at the eastern edge of the northwestern region, move cacao to market by road. Cacao going to the Unión office in the center of the northwestern region is carried by pack animals, as there are no roads. The Unión has no transportation difficulties, since it is connected to the factory. The factory processes the bulk of the crop in the northwest. It is

located beside the railroad and is without road service. Therefore the processed cacao is shipped by rail only. If road service is available in a given region, however, that is always the preferred method.

CHAPTER V

PRODUCTION TECHNIQUES: BANANAS AND COTTON

The last two crops of the study are bananas and cotton. Cotton is an annual plant and although not an annual, bananas grow rapidly. Consequently, both produce a crop the year they are planted. However, the crops differ in cultivation and marketing techniques. Cotton must be replanted each year, while bananas need not be replanted for three to five years. Bananas must be marketed immediately after picking; but cotton can be stored for months, if necessary, before marketing. As an industrial crop cotton is highly regarded by the government and receives much financial support. On the other hand, although an acceptable crop, bananas receive little or no financial encouragement from the government.

Bananas

Once an important export crop in Chiapas, bananas from the area have not been sold on the international market since the 1940's. At that time two diseases in epidemic proportions destroyed or severely injured the banana plants. Commercial cultivation in Chiapas ceased. A modest revival began in the early 1960's which is slowly renewing banana cultivation in Chiapas. Expansion of the banana region is expected when an export market is developed.

Land and Labor

Bananas are the most demanding of the four crops of the study in terms of physical requirements. A giant tropical lowland herb, rather than a tree, the banana plant cannot be grown commercially above 3,000 feet in altitude. Only the dwarf Cavendish is successful at that altitude. Annual rainfall should be at least forty inches and distributed fairly evenly throughout the entire year. In each producing region of Chiapas the bananas are grown at low altitudes, only 100 to 200 feet above sea level. Rainfall is more than adequate, but only in the northwest is it quite evenly distributed throughout the year. The Soconusco region has a long dry winter which reduces the yield of bananas. The dry season may be partly offset by irrigation. Soil requirements are more exacting. Bananas are shallow rooted, lacking even a single deep taproot, and cannot obtain minerals from below the horizon of leaching. Therefore, the surface soil must be extremely fertile. Thus, bananas grow best on alluvial soils of coastal and river flood plains. The two regions in Chiapas are both located on alluvial soils, but those of the Soconusco are the more fertile because they contain volcanic ash. The advantage of exceptionally good soil outweighs the hazards of the dry season and makes the Soconusco the preferred banana area. Strong winds are a major danger to the banana. Windbreaks are used to protect the bananas, for the large leaves are easily torn. This, in turn, reduces the fruit producing ability of the sepas.[1]

In northwestern Chiapas the use of citrus (lemons and tangerines) as windbreaks is common, but none are needed in the Soconusco. There,

[1]Sepas are equivalent in the banana herb to the trunks and branches of a tree.

winds strong enough to damage the bananas are rare, but hurricanes occasionally do occur. The most recent, in early 1960, devastated all banana groves in the Soconusco. Modern development of banana cultivation in the region has occurred since that hurricane.

Under the land tenure laws, proprietors of banana plantations may own as many as 720 acres. However, none of the men presently engaged in the cultivation have more than 600 acres. As commercial banana cultivation in the northwestern or Pichucalco region has never recovered from the destructive effects of the Panama disease, it has dwindled to 2,500 acres owned by subsistence growers. While producing far less than in the past, the Soconusco now has more than 12,000 acres in commercial production. The greater part of this acreage is controlled by forty-eight men. Of those interviewed, two have between 500 and 600 acres. All others average fewer than one hundred. At present, no ejiditarios are engaged in commercial production. Most plantations are small, and only owners with 500 or more acres are exclusively banana growers. Growers with smaller farms also cultivate cacao and cotton or raise cattle. All of the present banana land has been in bananas for more than eight years. Previously the land was in pastures, cacao, cotton, or scrub forests. Although theoretically land can remain in bananas for centuries, the average life of commercial plantations has been from five to twenty-five years. Due to soil depletion and the Panama disease, which is believed connected to loss of soil fertility, land in bananas has always shifted gradually to new sites.[2] But, now, both fertility and Panama disease can be controlled and migratory shifts are less likely to occur.

[2]N. W. Simmonds, Bananas (London: Longmans, Green and Co., Ltd., 1959), p. 191.

With the recent redevelopment of banana cultivation in the Soconusco, all of the producers there grow the Cavendish variety. Those of the Pichucalco region continue with Gros Michel but are changing to the Valery, one of the Cavendish varieties. The Cavendish banana has several advantages. It is immune to Panama disease and its shorter stature makes it less liable to wind damage. The fruit is sturdy and withstands packing and shipping. The hands or bunches of bananas are not as compact and are not as easy to pack as the old Gros Michel variety. Advantages outweigh disadvantages, however, and the Cavendish banana is the increasingly popular choice among world growers.

Banana cultivation starts by planting either suckers or corms.[3] In Chiapas corms are preferred as several trunks will emerge, but only one emerges from suckers. A few weeks after pieces of corms or rhizomes, taken from former sepas, are planted new shoots appear. These have grown horizontally out from the corm. As soon as they are clear of the parent corm, they grow vertically. Reaching the surface, the shoots form the new sepas or psuedo trunk. Several such shoots grow from single corms, giving rise to the cluster or clumps of banana sepas. Each psuedo trunk will bear a single stem of fruit, after which it dies and, in turn, another in the same clump produces a stem.

The work cycle of the banana plantation begins with preparation of land for planting. Formerly the land was plowed, but in the past two decades experiments have proved plowing unnecessary. Except for clearing undergrowth, no preparation is needed. However, in Chiapas

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[3]Suckers are small stems one to two feet in height. Corms are pieces of subterranean trunks or roots of former sepas.

all planters interviewed prepared their land by plowing. Many were faced with the necessity of first removing old cacao trees or pasture. Therefore, they considered plowing to be an absolute necessity. Before planting commences, the spacing of trees is decided. However, the decision can be made as effectively when thinning starts. Spacing has a decided effect on yields as the size of the banana and number on each stem declines with increasing density. Although stems have fewer and smaller bananas when closely planted, the total number of stems are increased and volume is actually larger. Good practice permits density to vary from 2 1/2 x 4 1/2 feet to 17 x 17 feet per cluster of sepas, according to soil and moisture conditions.[4] In the northwest, planting is somewhat haphazard and no specific spacing could be ascertained. But, in the Soconusco spacing is uniform. Bananas are sold by number and size of bananas on each stem, and consequently 81 square feet (9 x 9) is considered optimum spacing. One planter who exports to the United States has planted his newest fields more closely allowing 36 square feet (6 x 6) per clump of sepas. These fields were reaching the thinning stage at the time of this study, and he had not yet decided upon selling by numbers of stems or by banana weight.

After planting, the ground is kept clear by cutting the undergrowth, but no attempt is made to keep it free of weeds. Before the clusters of trees bear fruit, they must be thinned to allow each stem of fruit full room and light to grow. Fruiting begins ten to eleven months after planting, and the harvest begins in three more months. Each psuedo trunk will bear one stem and then die. These must then be cut away to allow another sepa to fruit.

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[4]Simmonds, Bananas, p. 158.

The work cycle is steady, without seasonal fluctuations. As a result, the people employed are permanent workers. No temporary labor is required. The farmers of the Soconusco estimate that one man can care for from two to five acres. According to the acreage in bananas, each planter employs from two to 100 men. The planters interviewed were reluctant to speak of precise numbers of employees. The workers are obtained locally and live on, or near, the plantation. They are experienced men, since the work requires considerable skill.

Other Inputs

As modern commercial cultivation of bananas occurs in the tropical lowlands, it is subject to rapid loss of soil fertility, weed control problems, and numerous diseases and pests. Planters combat these conditions with the heavy use of chemicals and other technological aids.

Fertilizers

Loss of soil fertility through leaching is a serious problem in banana cultivation because the banana plant is shallow rooted, without a tap root that can reach through the leached horizon to obtain minerals in the deeper soil. The required minerals must be replaced constantly by chemical fertilizers. All farmers interviewed agree that fertilizers are necessary, but only two apply them regularly. Nitrogen is the most commonly needed element and the one to which the plants respond most rapidly. Therefore, nitrogen, in the form of urea, is used most frequently and often exclusively. Although phosphate and potash are needed in most areas of banana cultivation, no use of these could be ascertained in the Soconusco.

No chemicals are used for weed control. In Chiapas, weeds are cut while the bananas are only a few months old and are left to cover the ground. Once the trees have grown to full stature, they shade the ground and reduce the growth of weeds. The sepas removed during thinning and after fruiting are also left on the ground to rot as fertilizer and as ground cover. Intercropping can be used as a form of ground cover and weed control without harm to the banana crop, but is not practiced in this region.

Insecticides

As in most tropical regions, disease and insects are a problem in Chiapas. Panama disease, which in the past caused the shift in Central America banana regions from the east to the west coast, is not a problem in the Soconusco. The Cavendish banana appears to be immune to this disease. Sigatoka or leaf spot is the second most destructive banana disease. It is a fungus infection which ultimately destroys the banana leaves. Without functioning leaves the fruit will not develop. For over twenty years, control of the disease has been possible by spraying with a refined mineral oil. The Cavendish banana in pure stands is susceptible to Sigatoka, but the latter is a rainy season disease and the dry season of the Soconusco limits its effects. The Soconusco planters interviewed agree that the use of insecticides is beneficial but are reluctant to say how often and what kinds of sprays are used. Farmers with less than 100 acres report that they can usually control diseases by cutting down and destroying infected sepas. This suggests that small planters do not routinely use chemical insecticides and only on the few larger plantations is disease control by chemicals a normal procedure.

Irrigation

In Chiapas, bananas are the only commercial crop routinely irrigated. They can survive through the winter dry season, but the amount of fruit produced is seriously diminished. The Soconusco banana planters have benefitted from the government-developed series of drainage canals in the Soconusco coastal plain. The same canals are used to bring irrigation water during the dry season. Because the primary purpose of these canals is to prevent flooding, they are not associated with holding dams and no large volume of water is retained for irrigation. And although the larger rivers have water throughout the year, volume decreases sharply during the dry season. Therefore, water for irrigation is in short supply. Each planter pays for water and is assigned a definite amount at specific intervals. Competition for water is keen and the farmer never receives as much as he needs. As a result, some maneuvering occurs and some farmers receive more than their allotted share.

Irrigation is accomplished by gravity flow canals, occasionally supplemented by small motor pumps. Each planter must maintain the length of the canal that passes through his property. One farmer has contracted for an overhead spray unit which will irrigate about 125 acres of his property. Although he has been willing to try a different method of irrigation, he is not entirely sure that the benefits of overhead irrigation will offset the heavy expense of its installation. If it proves satisfactory, he intends to install it on his entire 500 acres. None of the other interviewees had considered new methods of irrigation.

Machinery

All farmers interviewed own tractors, which are used for plowing and to pull wagons for the harvest of banana stems. Most have a few small pumps for irrigation. Three have back-packed spraying equipment. Other than this, no mechanical equipment is used in the cultivation. Machetes and a curved blade on a long handle are the important implements, since nearly all work is done by hand.

Harvesting

Bananas are harvested throughout the year, but planting, pruning, and cutting of the fruit must be carefully calculated so as to maintain approximately the same amount each week. Bananas cannot be stored, and regular amounts must reach the market on the same day of each week. They are cut when fully developed but not yet ripened. If harvested at the proper time, they are subsequently ripened artificially at the market before being sold.

When all of the banana hands on a stem are fully developed, but still green without the slightest tinge of yellow, the stem is cut. The entire stem is removed from the psuedo trunk. The stems are then carried to a central location where they must be washed. For all but one of the farmers interviewed, this is the only processing conducted. The entire stem is next loaded on open trucks and sent to market on the same day it is cut, or the following morning at the latest.

One planter carries the processing further. His bananas are washed, separated into hands, and placed in polyethylene bags. They are then packed into forty-pound cartons and loaded immediately into refrigerated trucks. This planter uses more sophisticated processing

because this is the preferred way, but even for him all of the processing is done by hand and by the same employees who carry out all of the other work on the plantation.

Marketing and Transportation

The most critical element in commercial banana transportation is time. Bananas are highly perishable and must be transferred to market immediately after picking. An error or delay anywhere in the harvesting or marketing process may mean loss of the bananas cut at that time.

Markets

At present the market for Chiapanecan bananas is Mexico City. All but two of the farmers sell their product in this market. The two have buyers in the United States. Although the growers obtain fair prices in Mexico City, they would prefer markets overseas but have not secured them. The Mexican market is limited, and bananas for overseas markets are sold under definite contracts. Such contracts require large tonnages on a regular schedule. Because overseas contracts are not available, only forty-eight producers have been attracted to modern banana cultivation and total tonnage is small. Buyers such as United Fruit will not contract for Soconusco bananas until a larger supply can be guaranteed by the growers. A kind of deadlock exists. Growers cannot obtain credit for expansion until they have a contract, and they cannot get a contract until they expand production. Growers dream of the future and a change in the international market. This change can only result from a big increase in demand from centrally-controlled nations or from a disaster in some major banana-growing region of the world. The first will be slow to come, but in the

past disasters have wiped out production in an entire area and given new regions their chance.

Marketing Agents

Banana production in Chiapas has no brokerages comparable to those that exist for coffee, which are organized to purchase locally and ship the product to market. Small jobbers, simply men with access to trucks, do purchase bananas for the local market from non-commercial growers, but each commercial planter must do his own selling and transporting. Two or three growers own trucks and move their product to Mexico City, where they sell to buyers in the central market. However, most turn to the largest producers, those with more than 500 acres, and sell to them.

The growers have formed a co-operative to act as a marketing agent. The co-operative has concentrated on seeking overseas markets and credit for development, but without success. The two growers who have markets in the United States made their own arrangements, without the services of an agent.

Transportation

Speed is important in shipping bananas to market, and all bananas therefore go by truck. The two growers who export to the United States own and operate their own refrigerated trucks, whereas all others use open trucks. The stems are packed in the trucks, protected from bruising with banana leaves and shipped immediately. Dependence is on speed to get the product to market before the bananas ripen extensively.

Good roads are essential to banana regions. A decided lack of secondary roads in the Pichucalco area is perhaps a major reason for

its failure to regain its former importance in banana cultivation. On the other hand, the Soconusco has a better developed road network. All banana plantations are either along the major paved highway or are less than two hours from it by unpaved secondary roads. No banana planter has had to develop his own secondary road, as did the early coffee planters. However, if international markets are secured they may not be limited exclusively to the United States, and an ocean port would then become a necessity. One function of the Puerto Madero development is to provide the highly specialized banana loading facilities not available at the present time.

Cotton

In Chiapas, cotton is the commercial crop which has received the most attention in the past decade. Commercial production has been made possible by the sponsorship and credit of the government. Because of the high incidence of disease, cotton is a high cost crop in Chiapas and its continuation depends upon continued government support.

Land and Labor

Cotton can be grown under a wide range of physical conditions. For tropical regions such as Chiapas, the temperatures are satisfactory throughout the year. Therefore, the actual growing season is determined by rainfall, rather than temperature, as the bolls must open in the dry season. The plants thrive best on deep loamy soils that have a high moisture content during the early growing season and are relatively dry at other times. In Chiapas, the Soconusco and the central region have exceptionally good soils. The Soconusco has more than enough rainfall, while that of the central region is marginal. Both

have the dry season essential for development and harvesting of the cotton. In both regions cotton is planted on relatively level land, which is necessary for the best growth of the plant and facilitates the use of machinery. In addition, cotton requires moist, but well drained, land. The problem of excessively wet soils was solved on the alluvial coastal plain by the drainage system recently constructed by the government. The central zone does not have a drainage problem.

Some 90,000 acres of cotton are planted each year, of which 60,000 are in the Soconusco. Land in the coastal zone is considered first class, and each owner is restricted to 240 acres. That in the central zone, because of lesser rainfall, has varying classifications which permits farmers to own double or triple the acreage allowed in the Soconusco. Despite this difference, the largest amount of land planted to cotton by all but one farmer interviewed is 240 acres. The exception is a farmer on the fringe of the central zone who is experimenting with the crop, and he has planted 390 acres. As he was successful the first year, he intends to increase the amount in succeeding years.

Taken as a unit, an ejido in cotton includes a much greater acreage than do individual farms. In the Soconusco the entire ejido, except for a few acres of subsistence crops, is devoted to cotton and may include up to 3,000 acres. In the central zone the largest cotton growing ejido has 500 acres. But, the cotton ejidos are not all operated as co-operatives. Therefore, when the land is considered as individual lots, the largest holding of cotton by an ejiditario is twenty-five acres and is usually much less.

Cotton cultivation is a purely commercial operation in Chiapas, under strict government supervision. A permit must be obtained to

plant cotton, and the farmer must agree to use machinery and modern technology. More than is true of any other commercial crop in Chiapas, cotton cultivation depends on credit. The government provides credit with the permit, and this enables the farmer to use all the machinery, chemical fertilizers, and pesticides needed.

The cultivation cycle for cotton begins near the end of the dry season when the ground is plowed and fertilized in preparation for planting. In May the second application of fertilizer is done at the same time the seeds are planted. The land must be cultivated at least twice during the early growth of the plant and sprayed twice a month with insecticides throughout the growing period. Only harvesting is a hand operation. With the long winter dry season the harvest may be delayed until all cotton bolls are fully opened and the plant foliage has become dry and withered. Then, the harvest can be completed with a single pass over the fields.

Mechanization has reduced to a minimum the need for permanent employees. In the Soconusco, a little cotton land is owner-operated. Usually the owner hires a foreman and perhaps two or three other employees. In the central zone the owners generally act as foreman-managers and have eight or ten permanent employees, plus additional temporary workers hired locally during the busiest periods. However, the size of the mixed farms in the central zone is much larger and more labor is needed to handle all the crops. None of the permanent employees are hired to work exclusively in the cotton fields. Ejiditarios with the help of their families can do all the required work and have no need of extra workers at any time.

During the harvest period in Chiapas as a whole, more labor is needed. About 25,000 extra or temporary workers are hired. Laborers can be drawn from nearby ejidos and subsistence farms, but most are migrant workers from other parts of Mexico, as shown in Table 2. The

TABLE 2

ESTIMATED SOURCE OF TEMPORARY LABOR IN CHIAPAS FOR COTTON HARVEST[a]

Source	Number of Workers
Soconusco	5,000
Central Zone	1,000
Valle de Oaxaca	18,000
Northern Mexico (probably Guerrero)	1,000
Total	25,000

[a]Interview with Sr. Socrates Castillo y Porrasco, President of the Cotton Union, November, 1972.

entire 25,000 temporary workers are a small number to harvest 90,000 acres by hand, but the extended dry season allows the employment of fewer men over a longer time. Harvesting begins with the onset of the dry season, several months before the next rains are expected. There is no need to harvest quickly to avoid crop damage. The harvest period extends for two months, beginning in early December and ending about the first of February.

Other Inputs

Without the aid of chemical products, cotton could not be produced commercially in Chiapas. All are applied in the manner and amounts prescribed by federal agricultural agents. Although the farmer is

willing or even anxious to use fertilizers and pesticides, he has no choice in what is used or when it will be applied.

Seeds

Cotton grown in Chiapas is average-to-low staple (3/4"), which is known as upland cotton and is similar to that of southeastern United States.[5] It is a hybrid called Delta Pine. Originally developed in the United States, it was first obtained there. However, in the past few years, three ejidos and four farmers have specialized in producing the seeds. Together they can supply nearly 1,000,000 pounds of seeds, which is more than sufficient to supply the needs of the farmers in the Soconusco and central zone.

Fertilizers and Insecticides

The cotton plant is a heavy user of nitrogen. This, combined with the normal rapid loss of nitrogen from tropical soils, indicates the great need for continued fertilization if cotton is to be grown continuously on the same land. The soils are checked each year by the agricultural agents and precise amounts needed are determined. However, more than nitrogen is added. The fertilization program is designed to restore the three major elements of nitrogen, phosphorus, and potassium, a common farm practice throughout the world. The costs to the farmer have averaged twenty dollars per acre. It is applied twice a year, first when the fields are plowed and again at planting time. More than two applications are seldom made in a year.

Chemical sprays are occasionally applied for weed control, but most cleaning of the fields is by cultivation. After two cultivations

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[5]Staple refers to the length of the fibers in raw cotton.

the cotton plants are large enough to prevent further growth of weeds.

Another use of chemicals is for disease and pest control. In the tropics where diseases are both numerous and rapidly destructive, a 40 percent loss of the crop is not unusual even with the most careful attention. Without chemical safeguards the entire crop may be destroyed in two or three weeks. Most of the destruction by disease and pests occurs during the rainy season. After the dry season begins further damage to the crops is unlikely. The farmer watches for signs of disease. If he finds any, he immediately notifies the cotton union. An epidemiologist is immediately sent to identify the cause and prescribe specific chemical sprays. Approximately ten different chemicals are used. Unless a new and different plague results in extra spraying, the cotton fields are sprayed twice each month with the formula the epidemiologists calculate will best control the common diseases. The farmer has no control over the spraying. Considerable dissatisfaction arises when the crop duster fails to arrive when the farmer expects him or does not spray as much as desired. Unfortunately, the farmer has no recourse except to complain to the cotton union. Spraying is one of the major expenses, costing about sixty dollars per acre for the insecticides and twenty dollars for services of the crop duster.

The crop duster service consists of small one-engine planes, Piper Cubs, or similar models, which are fitted for crop dusting. Twelve planes in the Soconusco and eight in the central zone are sufficient. They are employed by the government and not by the farmers association.

Machinery

With the exception of harvesting, all of the cotton producing activities are mechanized. The farmers have access to tractors, plows, harrows, and discs, which are usually part of any mechanized farming. In general only the largest private farms and ejidos have their own equipment. For others, arrangements are made with the credit agency to furnish the necessary equipment. The arrangements vary somewhat from person to person. Farmers sometimes rent the equipment for the entire season, as is most common in the central zone where mixed cotton and grain farming permits its extended use. In the Soconusco rental is more likely to be for a specified period. This is less true of the tractors, however, since most of these are in almost constant use.

Harvesting

Harvesting is the single activity which is not mechanized. In the Soconusco the cotton plants are six feet tall and too large for mechanical pickers. Mechanical pickers would be more satisfactory in the central zone. However, cotton has only been cultivated there during the past four or five years; and for most of the farmers the acreage does not warrant the expense. Actually, the use of mechanical pickers has simply not been considered.

Harvesting begins during December in both regions. Including their permanent labor, the farmers hire about one man for every five or six acres of land in cotton. Christmas week is the peak of the harvest period, but it is not unusual for vast fields to remain unharvested until February. Picking is done by hand and the bolls are simply piled into a truck. No processing is needed on the farm itself.

Yields vary from year to year, depending upon factors such as weather and disease, but average three-fourths to one ton per acre. Today, the value of cotton does not lie solely with the lint. Formerly a waste product, seeds are now valued for the oil they contain.

Marketing and Transportation

Consistent with government supervision of planting and cultivation of cotton, the final marketing and transportation of the crops are conducted directly by government credit agencies.

Markets

There are two markets for cotton. One is the intermediate market for farmers, and the other is the cloth manufacturers. The farmers' market is the credit agency which provides the capital for cultivation. The credit agencies operate the despepitadoras or cotton gins in the area. There are seven gins in the Soconusco and one in the central zone. Most of the farmers interviewed on being asked to whom they sold their crop simply designated the cotton gin. When brought to the gin, the cotton is weighed and credited to the farmer's account. Later, the value of the seed is added. The farmer is not paid immediately, but must wait until March. When the payment arrives, the previous year's loans are paid and the farmer receives the remainder. When a delay in payment occurs, as it did for the central zone in 1971, the farmers become angry. For many the profits are their total income for the year, which they need to make preparations for the next season's planting. Delayed payment has turned several against cotton, and they refused to plant it the following year.

The ultimate destination of Chiapanecan cotton is the textile mills of Mexico. The greater percentage goes to the city of Puebla, and the remainder is fairly evenly divided between Mexico City and Guadalajara. Upon occasion a small amount is sold to Japan and Italy. However, this occurs after the crop had been sent north and local agents are not involved in the transaction.

Marketing Agents

The only cotton buyers are the credit agencies, even for the rare farmer who does not use credit in planting the crop. The latter is usually the farmer who has only one or two acres which are planted on an experimental basis. Credit agencies are government banks which theoretically can provide credit to any farmer for any crop but, in reality, will advance credit only for cattle or cotton. The Banco Nacional de Credito Ejidal is a special bank which serves the ejidos. Individual ejiditarios and private owners are not eligible for credit from this bank.

The farmer, individual ejiditario, or an ejido as a whole are free to obtain credit where they will. Usually they go to the source they prefer for personal reasons, or which they believe will give them the most credit. Loans for cotton are made on the basis of the land value which, since cotton has proved successful, has increased to two hundred dollars per acre.

Each bank has an office in Tapachula for the Soconusco region and a cotton gin on the outskirts of the city. The arrangement is the same in Tuxtla Gutiérrez for the central zone, except that there is only a single cotton gin which operates for all the credit agencies.

Another government agency, assisting the credit agencies, is the Asociación de Algodoneras. The farmers bring their problems here. The application of fertilizers, scheduling of crop dusting, and other procedures are all arranged from this office.

Transportation

Transporting cotton from the fields to the despepitadora is relatively simple and is the responsibility of the farmers. In the Soconusco those whose fields are within five or ten miles of the despepitadora haul their cotton on the trailers loaded in the fields and pulled by tractors. For longer distances in the Soconusco, and all farms in the central zone, the cotton is brought by any available truck. Many farmers own their own, but many others rent them.

TABLE 3

AVERAGE SHIPPING COSTS FOR COTTON IN CHIAPAS PER METRIC TON[a]

Destination	Train	Truck
Puebla	$19.00	$26.00
Mexico City	21.00	30.00
Guadalajara	26.00	40.00

[a]Source: Unión de Algodoneros.

Moving the baled cotton after ginning is by two methods. In the central zone all cotton goes by truck to its final destination. In the Soconusco both truck and train are readily available. More than half goes by train, but actual percentages vary from year to

year. Trucks are gradually replacing the train because of the difference in time saved, not because of cost (Table 3). Shipping by train is less expensive, especially when a large volume is involved, but trains will not handle less than several carloads. Freight by train takes from one to three weeks, whereas trucks reach their destination in from thirty-six to forty-eight hours. As a general rule, cotton needed immediately is sent by truck, and that to be processed later is shipped by train.

CHAPTER VI

ANALYSIS OF THE STUDY

Understanding the present should facilitate valid predictions of the future. Thus, by using the four crops of the study as representative of commercial agriculture in Chiapas, it is anticipated that some indication can be given of the direction commercial agriculture will take in the future. The analysis has been carried out by 1) considering production trends of the crops, i.e. changes in acreage under cultivation and shifts in location and yields; 2) attempting to correlate any changes with present techniques of production; and 3) examining obstacles to further development.

Production Trends

Production trends indicate the growth or decline of crops. An indicator of production trends is the variation in number of acres devoted to a particular crop each year. Continued increase in acreage suggests that the crop is profitable and more land is available for that crop. On the other hand, declining acreage can mean that 1) the land is unsuitable for a certain crop; 2) no market exists, and therefore the crop is unprofitable; 3) a surplus exists and a balance is being sought between the amount produced and the market demand; or 4) decreased acreage, coupled with increases in yield, suggests that changes in techniques have reduced the amount of land needed for the

crop. Changes in coffee, cacao, bananas, and cotton are accounted for by one or more of these conditions and suggest probable conditions for any commercial agriculture in Chiapas.

Coffee

According to official records, the number of acres in coffee before 1930 increased or decreased each year; but these fluctuations were more a result of inaccurate data than reality. Since 1930, data reporting has improved and reflects a continuing growth in acreage. The improvement occurred because the government needed the knowledge for use in land redistribution. From 1928 to 1940 new forms of land tenure were applied in Chiapas. Property in excess of 300 hectares on individual fincas was either expropriated or the owners succeeded in selling it before action could be taken against them. Part of the land taken from large fincas was forested and held in reserve for future plantings. Between 1940 and 1950, much of it was put under coffee cultivation. Between 1940 and the present, a large part of the increase in commercial agriculture has been the result of improved access to new areas. For example, service roads built to facilitate construction of the Grijalva project opened lands in the northern zone where squatters moved in and planted coffee.

From 1960 to 1970 two types of growth occurred. In the northern region several municipios reported coffee cultivation for the first time. As a result of work by the Indian Bureau and the Instituto Mexicano del Café, Indians on a number of ejidos in these municipios were persuaded to try growing coffee. While individual Indians or even an entire ejido do not as yet cultivate many acres, they

collectively account for several thousand acres of new coffee lands. Second, the phenomenon of soluble coffee has added an estimated 8,000 hectares of coffee land to the total.[1] Soluble coffee is manufactured successfully from poorer grades of coffee which are not acceptable for export. Most of the soluble quality coffee is grown at low altitudes and constitutes a new commercial crop.

The best land for coffee is now under cultivation. Perhaps a few hundred acres remain which can be added, but any sizeable addition to acreage will have to be in marginally satisfactory land, which, except for about 5,000 hectares, has so far been avoided. Real growth in coffee production is expected to come from increased yield, rather than from increased acreage.[2]

The volume of coffee produced has steadily increased with increased coffee acreage, but more revealing is the average yield per acre. Actual yields fluctuate each year according to weather conditions, but ten-year averages, barring total disaster, smooth out small fluctuations and indicate the progress of the crop. Ten-year averages in Chiapas demonstrate a general improvement in yield (Table 4). Only the 1950 average fell abruptly. Between 1940 and 1950 an estimated 35 to 40 percent of coffee cultivation was conducted by German-born planters who, during the years of World War II and a short period afterward, were interned. They were unable to manage their properties, and control was turned over to various government banks. In the hands of

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[1]Interview with Ing. Manuel Garcia E., Instituto Mexicano del Café, Tuxtla Gutiérrez, October, 1972.

[2]Interview with Ing. Manuel Garcia E., Instituto Mexicano del Café, Tuxtla Gutiérrez, December, 1972.

TABLE 4

COFFEE ACREAGE AND PRODUCTION
IN CHIAPAS[a]

Year	Acres	Tons/M	Ave. Yield Lb/Acre
1930	59,582	11,740	460
1940	80,542	18,525	498
1950	175,613	30,000	363
1960	227,794	44,000	434
1972	284,160	76,000	587

[a]Secretaría de Agricultura y Ganadería.

inexperienced managers, the yields of the German-owned properties declined drastically and resulted in an overall decrease in the state average for that period. Despite the reduction in yield per acre, total tonnage of coffee increased through the addition of nearly 40,000 hectares to the total under cultivation.

Between 1930 and 1970 the average yield increased from 460 to 587 pounds per acre or a total of 127 pounds per acre in the forty-year period. The increase cannot be accounted for by changes in techniques of cultivation. With the exception of one man, all farmers interviewed follow the same methods of cultivation as did the early planters. They did substitute electric power for water power to operate drying machinery when it became feasible but have made no other changes.

Since 1930 the active enforcement of land tenure laws has changed the structure of land ownership. Today, the owners of private fincas control 29.2 percent, ejiditarios 28.2 percent, and small ranchers nearly 42.6 percent of the land (Table 5). Some variation in yield occurs between microregions, but among the farmers interviewed yield

TABLE 5

SIZE AND TYPE OF COFFEE FARMS IN CHIAPAS[a]

Type of Farm	Size in Acres	Number of Farms	Total Acreage	Percent
Fincas:				
Large	240-700	112	80,640	28.4
Medium	120	11	1,320	0.5
Small	60	12	720	0.3
Ejidos	Variable	225	80,222	28.2
Small Ranches	60	8,141+	121,113	42.6

[a]Personal Interviews and Instituto Mexicano del Café.

appears to have some relationship to acreage cultivated and the form of ownership. Ejiditarios in the sample group produce from three to five quintales per acre.[3] Finqueros with sixty acres or more gather 4.2 to 8.3 quintales, and those with less than sixty obtain from 2.5 to 5 quintales. From observation this suggests that large properties are the most productive and ejidos among the least. Yet,

[3]Quintales are measures under which coffee is handled on the world market. Each quintal of café de oro weighs sixty kilograms or 132 pounds.

three large ejidos managed as co-operatives obtain yields which fall within the range characteristic of large fincas.

Factors more important than size appear to be management, labor, and the type of coffee grown. Those properties supervised by a full-time manager, either the owner or an employee who lives on the property, invariably produce the highest yields. Most such fincas are controlled by planters of German descent. The usual pattern is for non-German owners to spend most of their time off the land, only living there

TABLE 6

FORM OF MANAGEMENT AND SIZE OF LABOR FORCE FOR FINCAS OF 240 ACRES OR MORE[a]

Location	Management	Labor Employed		Average Yield Lb/Acre
		All Year	Harvest	
Soconusco	Full time	270	700-1,000	8.3
	Part time	50-60	300	5.8
Central	Part time	50-80	90-100	5.2
Northern	Part time	0	50-60	2.5

[a]Sample interviews and Instituto Mexicano del Café.

for a short period during the harvest. This is true of the small farmer as well as the finquero. Labor is also of importance. The Soconusco coffee fincas tend to have the highest yields and employ the largest labor force, during the year as well as for the harvest (Table 6). Perhaps the most striking contrast is the difference in yield between the Soconusco fincas and the northern ranches. Allowing

for a possible difference in quality of the land, the amount of labor used in caring for the coffee appears to be one of the important factors.

Although large fincas generally produce higher yields than either ejidos or small farms, the range of yields in each class of land ownership overlaps. The lower yields of the small ranches do not alter the structure of gradual increase with size in all coffee regions, but this increase is a function of the trees and not of improved techniques. Between 1950 and 1972, 45,000 hectares of new coffee land were added. New trees begin bearing fruit in five years, and much of the increase in yields can be attributed to these comparatively young trees in the period of their heaviest production. Also, in the past decade, considerable expert advice has been provided by the Instituto Mexicano del Café and the state experimental stations. Both agencies have developed new types of trees which are suited to the particular terrain and have higher yields. Planters no longer say that all their trees are Bourbon or Tipica. Instead, they plant specific trees for specific conditions. Criollo prevails above 4,000 feet, Bourbon or Marago at 3,500 to 4,000 feet, Mundonova at 2,000 to 3,000 feet, and Robusta in the lowlands. Much of the increased yield is the result of a higher percentage of trees in their best yield period and more trees of high-yield varieties planted in appropriate locations.

The final large gain in yield from 1960 to 1972 was achieved from planting Robusta at low altitudes for the soluble coffee market. Robusta is the highest yielding strain of coffee tree, averaging nearly one metric ton per acre--a yield four times greater than that of the popular varieties of Arabica.

Continued increase in acreage, yield, and numbers of farmers involved in coffee cultivation suggest that coffee is especially suited to the physical conditions in Chiapas. Even the small farmer, including the ejiditario, can be successful. Techniques, although not necessarily the most modern, are efficient and well understood by the farmers. Coffee will remain one of the most important commercial crops in Chiapas.

Cacao

From 1900 to 1940 the acreage under cacao cultivation remained stable, with most production coming from the Soconusco region. Supply satisfied the limited demand. But, with the end of the world-wide depression and the start of World War II, the demand for cacao began to climb, and to meet it more and more cacao trees were planted (Table 7). During the period between 1928 and 1940 land tenure laws were actively enforced, and large estates of all kinds were divided. Some of the land was used to establish ejidos and the remainder sold in small lots to individual buyers. By 1940 the cacao lands of the Soconusco were primarily in the hands of ejiditarios, and little increase in acreage occurred in this region. However, in the northwestern cacao area few ejidos were established and private planters were responsible for most of the increase. No large cacao plantations were developed. Instead, the increase occurred from hundreds of ranchers planting from five to fifty acres of cacao. Over the years the production has not been stable, some of the farmers discontinuing cultivation and others initiating it. Today, most of the cacao is centered in three municipios, with neighboring ones of lesser importance.

TABLE 7

CACAO ACREAGE AND PRODUCTION
IN CHIAPAS[a]

Year	Acres	Tons/M	Average Yield Lb/Acre
1930	5,038	371	162
1940	9,060	606	146
1950	34,231	3,709	238
1960	60,000	6,500	243
1972	96,000	11,000	252

[a]Secretaría de Agricultura y Ganadería.

In the 1960's the agricultural experiment station of Rosario Izapa became, and remains, active in developing improved varieties of cacao. The harvest from the experimental trees made this station the single largest grower in the state. At the same time men who had previously engaged in cotton or banana cultivation became interested in cacao, and began the cultivation. The Soconusco now includes 26,500 acres or approximately one-fourth of the state's total acreage.

The lower yields of the 1930's and 1940's had several probable causes. The trees were older, many past their prime producing years. The turmoil of instituting new forms of land ownership interfered with proper care of plantations, and the ejiditarios had not yet become accustomed to cultivating their own property. Cacao trees are highly susceptible to disease, sometimes becoming infected with more than one disease at a time. In the best years when the minimum loss occurs,

TABLE 8

CACAO YIELDS PER ACRE ON SELECTED SAMPLE CACAO FARMS IN CHIAPAS DURING 1971[a]

Area	Type of Farm	Lbs/Acre
Soconusco	Ejido	455
	Piedmont private farm	500
	Coastal private farm	1,558
North	Private farm	1,750

[a]Interviews of sample group.

the growers still lose one-third to one-half of the cacao crop through this cause. Since 1940 yields have risen steadily. This is due partially to aid provided by the experiment station staff which supplies new, heavy yield trees at nominal cost to farmers, especially ejiditarios, upon request. The experiment station staff and agricultural agents are increasingly reaching the cacao planters with technical advice. Although the ejiditarios of the Soconusco accept such advice, they can seldom follow it. Advice is concerned mostly with the use of chemicals for fertilizers and pesticides. The ejiditarios operate at the subsistence level and simply cannot pay for needed chemical supplies. In contrast, those private growers who have begun cultivation in the past twenty years are willing to carry out the advice of agricultural agents. As a result, their yields have increased to nearly the maximum expected from any cacao orchard (Table 8).

The ejiditario and the piedmont small farmer obtained very much the same results as shown in the table. The only difference between the ejiditario and the coastal farmer is that neither made regular use of fertilizers or insecticides, but the coastal plain private farmer from the Soconusco and the northern farmer harvested nearly three times as much cacao. The latter made regular use of pesticides and occasional use of fertilizer. The slightly larger yield of the northern farmer may have been a matter of chance for the year covered in Table 8. The trees may have produced a larger number of fruit or the loss to disease was smaller during that particular period. According to the farmers of the northwest, it is not the usual result for they believe that the soils are depleted and yields are decreasing each year.

Although the number of acres under cultivation has continued to increase rapidly, further growth will be slight. The northwestern region has nearly reached its probable maximum acreage. As the north is decidedly cattle country, most cacao growers are more interested in their herds than in cacao. In the Soconusco almost all available land is under cultivation and to increase the acreage of cacao would require that land be taken out of other crops. It is unlikely that more than a few farmers will be interested in doing so.

Bananas

Bananas are well adapted to physical conditions in Chiapas, but have had an erratic history in the state. The northwestern region was the first area in production, soon followed by the Soconusco. From the beginning of cultivation in the 1920's until the 1940's, it was affected by the changes in land tenure. By the late 1940's the cultivation in

the northwestern region had been virtually wiped out by plagues. From that time to the present the only true commercial cultivation has been in the Soconusco (Table 9).

TABLE 9

BANANA ACREAGE AND YIELD IN CHIAPAS SINCE 1930[a]

Year	Acreage	Ton/M Produced	Yield Ton/M Per Acre
1930	4,680	35,096	7.5[b]
1940	16,445	98,669	5.8[b]
1950	8,544	15,949	1.7
1960	367	1,530	4.2 (est.)
1970	5,765	21,618	3.8
1972	10,320	13,300	3.8

[a]Secretaría de Agricultura y Ganadería.

[b]Includes all forms of bananas, cooking and finger, as well as many whose size and shape and degree of ripeness would be rejected for export under today's standards.

Unlike those of the northwestern area of the state, climatic conditions of the Soconusco are not best suited to bananas. But, because of demand during World War II, the United States purchased all of the Soconusco bananas and later when that market was lost the Mexican market absorbed them. Therefore, cultivation persisted in the Soconusco. In 1960 a cyclone destroyed nearly all production, and in 1969 the harvest was lost through plagues and flooding. Many important banana planters ceased operation, but small farmers began cultivation and the

area planted to bananas expanded. By 1972 it exceeded 10,000 acres. In the late 1960's the addition of irrigation partially alleviated the harm caused by the dry season, and bananas have since become an increasingly favored crop. The improvement is dramatic despite an apparent reduction in average yield per acre. With irrigation, the commercial banana growers expect to obtain from 120 to 190 metric tons per acre. However, in the Soconusco, commercial growers control about one-half of the banana plantings. The remainder is a combination of "kitchen garden" groves and former commercial plantations which are no longer cared for or regularly harvested. But, production by irregular harvesting is recorded and disguises the actual yield of commercially grown bananas. Bananas offer promise in Chiapas, but are today a crop which only a few men cultivate successfully.

Cotton

Cotton was introduced as a commercial crop in Chiapas in the late 1950's.[4] Acreage has increased steadily, although it has fluctuated slightly by municipio. Some started to grow the crop, then dropped it when they found the crop unsuitable. Still others have started raising cotton as a suitable commercial crop. In 1968 cotton was introduced into a second area, the central zone. Although there are now 60,000 acres of cotton in the Soconusco, compared with 44,400 in the central zone, the greatest potential for expansion lies in the latter. Both the Soconusco and central zone face the immense and expensive problem of plague control. Fluctuations in yield are ordinarily tied to the success or failure of plague control measures. However, the decrease

[4]Secretaría de Agricultura y Ganadería.

in yield for 1972 (Table 10) is an expression of an unexpected hazard in the central region. For the first time in the memory of farmers in the area, the rains failed and subsequent drought caused a loss of most of the crop.

TABLE 10

COTTON ACREAGE AND YIELD IN CHIAPAS[a]

Year	Acreage	Tons Produced	Yield Ton/M Per Acre
1961	40,596	29,160	.71
1966	54,562	35,013	.63
1970	62,165	54,643	.83
1972	92,400	38,500	.42

[a]Secretaría de Agricultura y Ganadería.

As cotton is the only crop grown under modern techniques, yields in Chiapas have changed very little since the crop was first introduced. Methods of cultivation are specified by the government, and no variation in techniques or results exist between the two regions. However, cotton is a high cost crop in the tropics and has been successful in Chiapas because of readily available credit. Without credit, cotton would not have become a major commercial crop. Because of firm government control the farmer's only choice in cotton cultivation is the decision whether or not to grow it. All subsequent actions are directed by the government and growers must agree to follow directions before they receive a permit to plant. Failure of a farmer to carry out directions results

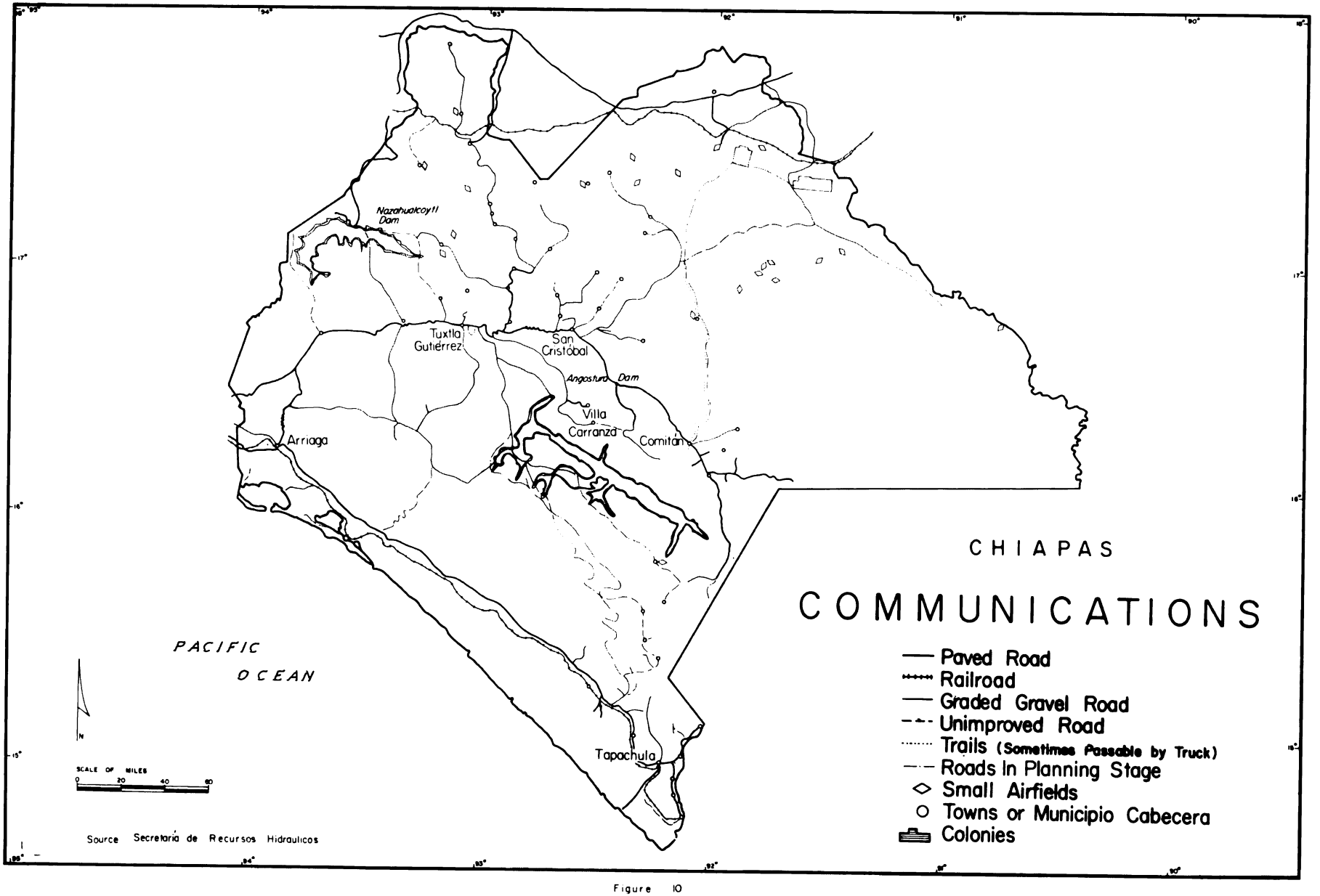
in loss of credit and permission to plant in the following year. The absolute authority of the government, through the medium of credit, has been the first instance of centralized control in Chiapanecan agriculture. This, in effect, makes all the cotton lands of Chiapas into a single operation. The farmer, by delegating his authority, has become a foreman directing the work, rather than the decision maker. Such control by government has not always been successful in other parts of the world, and it remains to be seen if farmers will continue to favor cotton as a major crop in Chiapas.

Obstacles to Further Development

Commercial farming cannot succeed without an infrastructure to serve it. There are several successful commercial farming operations in Chiapas, but improvements in the institutions which serve the farmer are needed before commercial cultivation can approach maximum development.

Communication

Among the media of communication, roads and railroads rank first in importance for the farmer. Without them he has no means of sending his products to market. Today, roads take precedence over railroads. Roads represent a saving in time which offsets higher transportation costs. In many areas railroad service is not available. Chiapas is serviced by slightly more than 2,000 miles of roads (Figure 10). Unfortunately, less than half of the total mileage is paved (Table 11). The graded gravel roads are considered passable all year by trucks and the remainder are generally usable during the dry season only. Many roads even during the dry season are passable by truck only. Two paved roads, the Inter-American Highway and the coastal branch of the


Nazahuatcoyt!
Dam
Tuxtla
Gutiérrez
San
Cristóbal
Angostura Dam
Villa
Carranza
Comitán
Arriaga
Tapachula
PACIFIC
OCEAN
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0 20 40 60
N
Source Secretaría de Recursos Hidraulicos
CHIAPAS
COMMUNICATIONS
Paved Road
Railroad
Graded Gravel Road
Unimproved Road
Trails (Sometimes Passable by Truck)
Roads In Planning Stage
Small Airfields
Towns or Municipio Cabecera
Colonies

Figure 10

TABLE 11

TYPE OF ROADS IN CHIAPAS[a]

Type of Road	Length in Miles
Paved	730
Graded, tarred or gravel	260
Graded dirt	923
Unimproved dirt	206

[a]Manuel Velasco Suarez, Segundo Informe del Gobierno, 1972.

same highway are the only east-west roads in the state. They serve as major communication routes with the rest of Mexico, connecting outside the state with roads leading to Oaxaca and Veracruz. The major problem within the state is the lack of north-south routes. In the south the Sierra Madre forms a serious obstacle and as yet has been breached only once. A single short paved road leads from the central highway across the mountain chain to the coast on the western and lowest edge of the mountains. Only footpaths cross the central and eastern Sierra Madre. Another single road branches northward from the central Inter-American Highway and goes to Pichucalco in the northwest, where it joins a paved road to Villahermosa in the state of Tabasco. This is the only road which ultimately connects the center of the state with the Caribbean coast. Only thirty miles of this road are paved and the remainder, about seventy miles, is graded and graveled in places. However, it passes through the dense rainforest of the northern mountains and in every ravine runs a turbulent mountain stream which washes

out the road. Repairing these sections is a continuous task and the road is impassable for automobiles much of the time. Before the road can be paved, at least ten or fifteen bridges must be constructed. Of these, only one has been started and is near completion.

A second road turns north from the Inter-American Highway east of San Cristóbal de las Casas, and passes through the mountains, but through much easier, more open terrain. It extends, however, only as far as Tila and has not been cut through to the border of Chiapas and Tabasco. None of the road is paved, and it has only recently been graded and open all year for traffic. Two more roads are in the planning stage. One in the far northeast will connect that area with the center of the state and will open a part of the Selva Lacandona for settlement. The second will cross the eastern Sierra Madre and simplify connections between the Soconusco and the central part of the state. Plans for this road are not complete, and construction lies far in the future because it will pass through the most difficult terrain of the state. When completed, these roads will form needed north-south arteries.

An improved secondary road system is also greatly needed. Soconusco cotton and banana plantations are located within easy access of primary roads, but few others are as well situated. Early growers of cacao and coffee built their own feeder roads to connect with the main roads. These are in use today but are unimproved, consisting of a ribbon of track wide enough for a truck and kept clear of undergrowth. Where these roads exist, a seventy-two hour trip may be required to travel by truck as little as fifty miles. For the small growers the problem is especially difficult. Unable to pay in

time or money to build a passable track, these farmers must bring their coffee or cacao out by horses or mules and this can take a week or more to accomplish. The lack of secondary roads has played a part in the failure of banana redevelopment in the northwest. Not only does the paucity of roads hinder the transport of crops to market, but it also affects the quality of technical help the farmers, and particularly the ejiditarios of the north and northwest, can expect to receive. Agricultural agents cannot disseminate information rapidly if they are not in close contact with the farmer. Nor can they assist him on site at the precise time help is needed.

Two railroads traverse Chiapas, one across the north and one along the southern coast. Completed in 1907, the coastal railroad was an important factor in the development of Soconusco. But today less and less use is made of the railroad, since shipping by truck is preferred. In the northwest cacao area an almost total absence of roads has made railroads important. However, this is satisfactory only because the cacao is first sold to a chocolate processing factory. The factory then ships large lots of the chocolate bricks to central Mexico. One train per day each way is the normal schedule for the northern railway, while on the coast trains move only when sufficient cargo, usually cotton, is accumulated to make a load. Use of trains has decreased since construction of the coastal branch of the Inter-American Highway, and the new paved connections from Pichucalco to the main highway crossing Tabasco will affect the use of trains in northern Chiapas. Trains are less favored because of the uncertain length of time needed for cargos to reach their destination. Freight by truck reaches Mexico City in twenty-four hours whereas by train the farmer never knows when

his freight will arrive at its destination. It may take from three days to three weeks.

Air service has become an acceptable substitute for road transport where poor roads exist, particularly in northern Chiapas. All towns of importance have small airports suitable for use by one- or two-motor planes. Businessmen habitually travel by air between towns. Moreover, many of the ranches and ejidos in northern and eastern Chiapas have airfields that are used to transport coffee to the regional markets. Coffee is, however, the only crop transported by air, since the cost is prohibitive for any others.

Telephone and telegraph service which could at times substitute for face-to-face communication is possible only between larger towns. The government is making every effort to extend these services to small villages and ejidos, but at present over half of the communities in Chiapas are without them.

Land Tenure

The changed structure of land tenure since the revolution of 1910 is not currently an obstacle to improved commercial agriculture, but certain practices that have grown out of it do make progress less rapid. Unlike those in many other areas of Mexico, the ejidos of Chiapas are generally fertile and receive sufficient rainfall for cultivation. Except for the plateau, the area is not overpopulated, and each ejiditario can expect to have an average of twenty to twenty-five acres assigned to him. The obstacle lies in the operation of most ejidos. On an individual basis, an entire family can barely subsist on twenty-five acres. But, if the ejidos were operated as

a single immense farm, an ejido could support its population in a reasonable manner. Three successful co-operative coffee-growing ejidos, each one operated as a single unit, have proved this. The government encourages all attempts at co-operative operations, but the ejiditario's pride in his own assigned acreage prevents, or at least delays, his acceptance of the idea. Operating tiny individual farms with consequent lack of available cash for improvements, ejiditarios are less responsive to new ideas in crops and techniques of cultivation. New ideas are usually acceptable only when the customary crops have proven unsatisfactory or, as in the case of cotton, the government provides credit and dictates all operations in the cultivation.

Among private owners limitations on land holdings give rise to many evasions. Theoretically, the land is in the hands of many small farmers, but in reality much of the land is owned by large growers. In coffee, for example, 735 acres is the maximum size of holding under the law, but a single owner often operates as many as five or more separate holdings of 735 acres. Titles are in the names of relatives or friends and the true owner holds a bill of sale which, if necessary, he can execute. The same occurs in the cotton lands of the Soconusco. In 1971-72, approximately 2,200 permits were issued to plant cotton in lots of 245 acres or less. Perhaps as many as one-third of these were issued to a few men. While large land holdings in themselves are not an obstacle to progress, they are often divided into separate parcels located many miles apart and require the owner or manager to divide his time between them instead of concentrating on a single large holding. Local officials are well aware of the situation and ignore it. It is not uncommon in general farming and ranching areas to have

first-class land classified as second or third class, thus increasing the number of acres allowed to one owner. The resulting inaccuracy of records, if done on a large scale, makes it difficult for government officials to plan efficiently for future development of the state. Also, the knowledge that under-the-table payment will permit contravening of any law does not engender a healthy respect for government.

Ejidos present a problem in land tenure, both at present and for the future. Chiapanecos consider the ejido as permanently established, but what is not permanent are the limits of the ejido. Operated on an individual basis, twenty-five acres or less is not enough land upon which to support a family. If a large finca or ranch abuts the ejido, and if the ejiditarios can prove the need for more land, the adjacent land will be expropriated, even though the finca is within the legal size for private holdings. Ejiditarios are always favored over large landowners. Only the owner of twenty to fifty acres can hold his own against the threat of the ejiditario's need. This has encouraged the practice by large land holders of selling small plots on the outer boundaries of the finca or ranch to their laborers. Putting a kind of neutral zone of small owners between the ejido and the finca has become a safeguard to ensure the viability of the finca.

The vulnerability of large fincas, particularly coffee fincas, has given rise to a type of extortion racket. A group of twenty to fifty men will move in during the night and settle on a finca and try to claim it. The owner must then resort to the police and to the courts to have them removed. These "parachutists," as they are called, have never succeeded in retaining the land. In fact, they do not intend to actually claim it, but they do have a nuisance value in the

owner's time and money. They usually show up during harvests when their occupation is most expensive for the owner. By so doing they hope to force the finquero to pay them to move out, rather than waste time taking them to court.

Ejidos will present a serious obstacle to development in the future. At present, few are older than forty years. First and second generation ejiditarios are working the land. Already acreage is small, and as children reach maturity and become entitled to assigned land, individual plots will be further decreased. If no land is available to enlarge the ejido, it will become so subdivided as to be totally uneconomical.

Production Techniques

Production techniques in Chiapas vary from the oldest to the most modern. Coffee and cacao cultivation involves the oldest methods and cotton the most modern. With the exception of harvesting, cotton planters make use of all the labor saving machinery and apply all of the necessary chemical aids. None of this, however, do they do on their own initiative. Rather, it is an example of modernity by government decree.

In coffee, cacao, and to a large extent banana cultivation, machinery cannot be used. Labor substitutes for machines because no machines have been invented to take the place of labor on these crops. Coffee and cacao are both grown under shade as on the earliest plantations. In the case of coffee, it is now known that shade actually decreases yield. The average yield of export coffee grown under shade is approximately 500 pounds per acre, while without shade the yield is

doubled. However, unshaded coffee requires the utmost in care and knowledge as well as considerable expenditure for fertilizer and pesticides. The same is true of cacao cultivation. On the other hand, shade compensates for neglect and lack of knowledge. For this reason, the technical experts advise the small planters and ejiditarios to follow the older techniques.

Beyond the lack of technical knowledge and careful cultivation techniques, the greatest obstacle in improving commercial agriculture is the erratic use, and often total ignorance, of fertilizers and pesticides. Lack of routine application is generally caused by inability to pay for expensive chemicals. Until farmers are able to obtain credit for needed improvements, this obstacle will remain as one of the most critical.

In the case of cacao, a further obstacle exists. Until the growers are willing to recognize the need for fermentation and sorting of the beans by types, their cacao will continue to be unacceptable on the international market. They will therefore have to compete for the limited domestic market.

Credit

Credit is the single most important factor in establishing and maintaining modern commercial agriculture, for which cash outlays for machinery, fertilizers, and pesticides are high. Crop yields must be correspondingly high to cover the expenses and provide the family an annual income.

Facilities for credit are well organized in Chiapas. They are a combination of private banks and government credit agencies. Private

banks lend primarily to commercial businesses, to more important coffee planters, and to livestock ranchers. On the other hand, government credit offices are specifically established to serve all farmers, particularly the small ones who generally cannot obtain credit from private banks. One of the five government credit agencies, the Banco Nacional de Credito Ejidal, was established to assist ejidos only. However, credit from this bank is offered to the entire ejido and not to individual ejiditarios. The ejido and individual ejiditarios are not restricted to this bank, but may apply to any bank for desired credit.

Although credit is theoretically available for all crops, in reality it is granted only as short-term loans. Cattle and cotton are the only things for which credit is abundant. For cotton, the loan is payable after the harvest, and cattle loans must be repaid within one year or a year and one-half. Banks are extremely reluctant to advance funds which require long-term repayments or for crops which lack an assured market. Of the four crops included in this study, only cotton is grown under conditions of adequate credit. This is partially because cotton is an annual crop, but primarily because the development of cotton has been entirely through intensive efforts of the government and was based upon guaranteed credit.

Bananas are the only other crop studied which can be planted and the harvest begun by the end of the first year. Nevertheless, banana planters cannot obtain credit because they do not have guaranteed contracts for sale of their crop overseas. At present, a sufficiently large inter-regional market exists for the sale of all bananas grown in Chiapas, but with credit available the supply would rapidly increase and flood the present market.

Credit is essentially non-existent for coffee and cacao cultivation. For a few of the largest coffee planters credit can sometimes be obtained in limited amounts from private banks. But, in the past such loans often were not repaid and the banks had to take over and operate the plantations. This was a job they neither wanted nor were successful in carrying out.

For the more modern cacao and banana plantations credit is usually obtained indirectly. The planters have other assets, such as commercial businesses or cattle ranches, for which they can obtain credit. The credit is then applied to their cacao or banana groves. Without exception, planters using modern farming techniques do not depend upon their cacao or banana groves for the major part of their incomes.

The need for credit for all agricultural products is recognized by the government, and some plans have been made to make it available. The Instituto Mexicano del Café plans to allow small amounts of credit, with the year's harvest as collateral for the small coffee farmers of the northeast. Several meetings have been held between government officials and cacao growers to discuss the credit needs of the growers. Unfortunately, these plans are in the discussion stage with no actual target date for their implementation.

Markets

As coffee is the most valuable commercial crop, after more than one hundred years of development, the market infrastructure is generally well developed. The planter has no difficulty in finding coffee brokers, both private and government, to purchase his crop. The major difficulty is in getting the crop to market over an inadequate road

system. The coffee brokers, by establishing a price range, have provided an incentive for the planter to grow and prepare the best quality beans. Even the government buyer, Beneficios Mexicanos, purchases only export quality coffee. Moreover, the new soluble coffee market has developed, using lesser quality beans which the grower previously had difficulty in selling in any sizeable quantity.

The major marketing handicap for coffee planters is, of course, the yearly international coffee agreements which regulate the amount of coffee each nation may sell. These agreements on the whole benefit growers by reducing extreme price fluctuations, but through the medium of the Instituto Mexicano del Café they sometimes prevent the grower from obtaining a permit to sell all of his coffee harvest. In particularly good years, growers are often left with a surplus which they must either store for an indefinite period or sell for lower than normal prices to buyers for the domestic market.

Very little Mexican cacao enters the international market for two reasons: 1) the domestic market can absorb the entire supply, and 2) for technical reasons, Mexican cacao is not considered high in quality. Until the supply is very much greater than the domestic demand and an international outlet is sought for the surplus, or until domestic buyers become more particular and refuse to purchase poor quality cacao beans, the market situation is unlikely to change. At present, facilities are adequate for buying and shipping the beans. The greatest handicap to improved production is the rigid price structure. The government has a monopoly on the purchase of all raw beans, and it, in turn, sells the beans to chocolate manufacturers. No competitive interaction is permitted between growers and processors of

the raw product. A single price is declared at the beginning of the year for each cacao-growing state. It will not rise or fall regardless of the demand. However, the price does vary between states, according to whether the government wishes to encourage or discourage cultivation of the crop. Chiapas cacao is not promoted. Growers in states such as Oaxaca receive nearly double the price those of Chiapas receive. To prevent growers from seeking better prices across state lines, all cacao must be sold in the state where it is produced.

The rigid price structure also acts as an inhibitor to improvement in the quality of beans. All beans, regardless of quality, are sold for the same price. Should a graduated scale of prices be established, growers would be more willing to recognize the need to ferment the beans and grade them for size before selling them. If this were done, the beans would be acceptable for purchase on the international market.[5]

Cotton, like cacao, is subject to a rigid government monopoly of the market. All Chiapanecan cotton is sold on the domestic market with the government as the single broker. Because the government instituted and strictly regulates the cultivation of the crop, there is no real variation in quality and quantity from grower to grower. Also, because the government is the buyer and provides all the credit for its cultivation, the crop is, in effect, sold before it is in the ground. As the crop is harvested in the dry season, and the ginning mills serve as storage depots, facilities are adequate for the market.

Bananas involve, perhaps, the most unstable market condition. Except for the produce of two large growers, the national market absorbs

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[5]Emilio España Krauss, Los problemas del cacao en México y su posible solución (México, D. F.: By the Author, Noviembre de 1969), p. 10.

the entire crop. There are no large, permanent buyers in Chiapas, and no particular facilities or arrangements exist for collecting the fruit for shipment. All growers must arrange to transport their own crop and find their own buyers, usually retailers in Mexico City. While the growers are few, and the domestic demand strong, the situation is satisfactory and the growers make a profit. But it is admitted by all the present planters that there is little room for expansion without a permanent overseas market. For a number of years the supply of fruit has exceeded demand on the international market, and, barring a disaster in another banana growing country or a more rapidly growing demand from communist nations, the growers themselves do not foresee obtaining contracts from overseas buyers.

Technical Assistance

A common obstacle in any developing area is the paucity of trained agricultural agents. Chiapas is more fortunate than most such areas, as the number and types of agricultural agents is rather high. The Secretaría de Agricultura y Ganadería has a minimum of thirty field agents. Some are specialists in crops and others in livestock. The Instituto Mexicano del Café has an agent in each regional coffee-buying area whose duties, in addition to inspecting the coffee before it can be sold, include giving technical advice wherever needed. The institute also maintains several nurseries where planters can obtain healthy and high yield varieties of seedlings. Unfortunately, the coffee agents are not all full-time employees and do not reach many growers. In the cotton regions, credit agencies maintain a staff of inspectors whose duties include the provision of technical advice. The credit

agencies provide fertilizer and pesticide supplies, plus a few crop epidemiologists whose knowledge is critically needed in high plague areas such as Chiapas. Despite the large number of highly skilled experts, more are needed for the entire state. They are heavily concentrated in the best developed areas and very scarce in the areas which, in some ways, need their help the most. Other than cotton growers, the majority of farmers interviewed stated that they had never received help from any agricultural agent in any form.

CHAPTER VII

THE FUTURE OF COMMERCIAL AGRICULTURE IN CHIAPAS

Since the initial decline of agricultural productivity in the late 1920's which accompanied the restructuring of land ownership in Mexico, growth in the agricultural sector has been steady. More land has been put under cultivation and yields, particularly those of corn and wheat, have increased. Mexican agricultural exports now exceed minerals or manufactured goods. Today, less than 50 percent of the population is engaged in agriculture.[1] Although oxen and wooden plows remain in common use, machinery is substituted for them in areas of commercial farming. Subsistence farmers are selling some of their crops for cash and gradually converting themselves into commercial farmers. With the rise of commercial agriculture there has been an increased recognition of the need for chemical fertilizers and pesticides. But, recognition of need cannot be equated with application, for few have the means to pay or the knowledge to use them. Lack of knowledge is partially compensated for by technical assistance from agricultural agents. The number of these specialists, mostly graduates of the flourishing agricultural colleges in Mexico, is increasing rapidly but many more are needed. Most of the growth in agriculture is found in the peripheral states, as the government has invested large sums in development

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[1]Dirección General de Estadísticas, "Censo de población de 1970." (Mimeographed)

and particularly in irrigation. Credit and technical assistance have been made available for specialized crops which the government favors.

Although the government encourages agricultural development in the state, Chiapas has not received such huge capital investments for irrigation as are provided to northern desert areas. The central zone and Pacific coastal plain in particular would benefit from irrigation. With a dependable source of water two crops a year could be grown. Moreover, yields of the present summer crops would improve because the average rainfall in the area is less than optimum. Due to the mountainous character of the state, the land has been divided into numerous small cultivatable areas. This has led to a program of small projects which benefit single communities, or at most micro regions, rather than major agricultural projects. Emphasis is placed on the development of special commercial crops, such as cotton. With the growing emphasis on a cash economy and with the technical assistance of agricultural agents, true subsistence farming, even among the Indian groups of the plateau, is slowly being converted to commercial agriculture. Although the conversion is occurring, future growth will require the use of modern techniques. At present all farmers are willing to use fertilizers and pesticides, but the small farmers and ejiditarios lack the financial resources to purchase them. Hence, such needed adjuncts to commercial agriculture are seldom used.

Including subsistence cropland, about 1,800,000 acres are under cultivation in the state. Perhaps as much as 200,000 acres have been cultivated since prehistoric times, while the remainder has been added as the population increased and as commercial crops became important. Drainage of the Soconusco coastal plain added nearly 60,000 acres of

generally unused scrubland in the late 1950's and early 1960's. In the future any additional land to be put under cultivation will come from two possible sources: 1) At present approximately 4,000,000 acres of unimproved pasture are used to feed the cattle population of Chiapas. Some could be used for food crops. 2) In the Selva Lacandona over 2,500,000 acres are suitable for cropping, but are now completely undeveloped. Despite the availability of new lands, most efforts of the government are directed toward the improvement of presently cultivated land.

The Four Crops of the Study

Coffee, cacao, bananas, and cotton are four of the most important commercial crops in Chiapas. Together, they account for nearly 30 percent of the cultivated land, and harvests are valued at $121,500,000. The four crops alone provide more than 50 percent of the value of all agricultural products in the state. The continued cultivation of these crops on a commercial scale appears certain. However, with new crops being added to those already commercially cultivated, changes should be expected in the patterns of production.

Coffee

Coffee is the preferred export crop in Chiapas and therefore has a secure place in Chiapanecan agriculture. However, some changes are needed. Acreage will decrease by 20,000 to 25,000 acres, and production techniques will be improved (Table 12).

Although a few hundred acres of good but unused coffee land may still be found in scattered parcels, officials of the Instituto Mexicano del Café believe that almost all the best coffee lands are now in use.

TABLE 12

CLASSIFICATION OF COFFEE ACREAGE[a]

Classification of Land		Number of Acres
Adequate		261,000
Marginal:		
Soils	7,000	
Rainfall	20,000	27,000
Total		288,000

[a]Personal Interview with Ing. Manuel García E. of Instituto Mexicano del Café, November, 1972.

Future adjustments in acreage will depend upon the program developed by Mexico, in accordance with the international coffee agreements. Throughout the country the Instituto Mexicano del Café has worked to reduce fluctuations in the two-year cycle of yield, restrict coffee to the best lands, and build the domestic coffee market. In Chiapas, the national program has encouraged expansion into new lands and, where coffee has long been grown, the replacement of older trees with improved strains. With the recent addition of lowland coffee for the soluble market, this phase is concluded. The Instituto intends to continue working toward improved yields through the development of higher yielding trees and expanded use of fertilizers. Only 15,000 acres are adequately fertilized today, mostly in the newest areas of lowland Robusta coffee. Other than increased use of fertilizers and pesticides, no changes are expected in the methods of cultivation.

Despite the increase in yield when coffee is grown without shade, officials do not advocate widespread adoption of this method. While yields are lower in shade grown coffee, this method is more tolerant of poor management and is more suitable for small farmers. And having been successful in the past the important finqueros are not always receptive to changes demanding more time and attention as does coffee grown without shade.

As yields improve, a gradual reduction of acres planted to coffee can be expected. But, until substitute crops are found for marginal coffee land, this reduction will be slow. Most of it will occur in the western half of the central zone where rainfall is minimal for coffee. In a small way, this reduction has already started. Many owners of small- to medium-size fincas are also cattle ranchers. Finding cattle more profitable, a few have already destroyed coffee trees to extend their pasture land. Another area of marginal coffee soil lies in the north, but lack of satisfactory substitute crops makes it unlikely the area will be altered for many years.

A further change will come in the labor pattern. Extra harvest hands will always be needed, but owners are already reducing the number of permanent workers. Government regulations for the welfare of permanent employees have become more stringent, and in some instances finqueros have difficulty satisfying these requirements. Owners must provide a school and a teacher for children living on the finca. The owners often cannot find qualified teachers as most prefer to join school systems which offer greater permanence and more substantial benefits. Social security and labor taxes must be paid in addition to workers' salaries. In the view of the finqueros, the solution lies

in decreasing the permanent work force. Reduction of permanent labor has been carried to an extreme in the northern region, which to some extent forces neglect of the coffee trees and reduces yields. On the other hand, growers of the Soconusco maintain large numbers of employees and substitutes for hand labor have been few. A small Japanese tractor, used to spread beans on the drying patio, replaces four to six men on one finca, and on another one man with a back-pack power sprayer does the work of three to four men in clearing undergrowth. Changing the old system of payment for area picked to payment for weight of ripe fruit picked per tree encourages fast picking, ultimately reducing the number of harvest hands needed.

Cacao

The future of cacao in Chiapas is uncertain. Most of the growers are not dedicated cacao planters, and the market, although stable, is not one which brings great profit to the growers. The planters are of two types: 1) ejiditarios and small farmers who lack the financial resources to care for their trees with modern, but expensive, techniques and 2) ranchers and growers who produce cacao as only one of several sources of income. These men can and do apply scientific methods of cultivation and have consequently caused the average yield per acre in Chiapas to double. In comparison with small farmers or ejiditarios they obtain more than triple the harvest. They are also responsible for the increase in acres cultivated and the increased tonnage of beans sent to market.

Cacao is cultivated on nearly 100,000 acres of land. The total acreage suitable for cacao has never been precisely calculated, but it probably could be increased at least four times. Nevertheless, little

further increase in acreage can be expected. Nearly every interested rancher in the northern zone has planted a few acres of cacao. None of the ranchers interviewed evidenced any intention of planting more. In the Soconusco new cacao orchards on the coastal plain compete with cotton for space, and under present conditions little expansion in this area is expected. The ejiditarios of the piedmont have been unable to expand or improve their orchards, but they can be expected to maintain them and harvest the fruit. Improvements in their groves will be slow.

The cacao market in Mexico operates under a fixed price system which maintains a reasonable balance between supply and demand. Until supply exceeds the domestic demand, international markets may be desirable but not necessary. The international market is unstable, fluctuating from month to month and even from day to day. A single rumor, such as that one transport ship has failed to meet a contract and hence decreased available supplies, is sufficient to start action among the buyers to send the prices up. The reverse is also true; rumors of surplus will send prices plummeting down. Prices are also influenced by the supply of cacao from Africa, where production has greatly increased in the past decade. Should the cacao growers of Chiapas be granted the opportunity to seek international markets, several changes would have to be made before their cacao would be of competitive quality. Improvements in the method of processing the beans after harvest would be essential as would grading for size and kind. Failure to secure a foothold in the export market would quickly reduce cacao cultivation because the major part of the supply comes from ranchers interested in several forms of agriculture. If their cacao became

unprofitable, they would not hesitate to destroy their groves in favor of other, more stable products.

The stability of cacao cultivation, then, depends upon a fixed price and sufficient demand. If these prerequisites change, and they can readily, cacao growers will soon respond. Under present conditions the spread of cacao should slow and stabilize at somewhere near 100,000 acres. Should the government decide to favor Chiapanecan cacao over that of other states by either raising the price per pound or subsidizing the farmers with credit for fertilizers and pesticides, a rapid increase in cacao acreage would occur. If, on the contrary, the government lowered the price, the acreage would immediately decline.

Bananas

The future of bananas is even less certain than that of cacao. Although the present market is primarily domestic, demand is strong and steadily increasing to satisfy the needs of the growing population of urban Mexico. But the demand is met by production from Tabasco. The two regions in Chiapas are tolerated because they can be useful, but are not necessary to satisfy present demand. The northern region exists because of its proximity to Tabasco and the ease of including its yield with the Tabascan for shipping. The small Soconusco region is successful because of modern techniques, satisfactory roads, and planters who transport their own product to market. Both regions are capable of expansion, but present conditions do not encourage further growth.

Real development is closely related to specific contracts in international trade, but no foreign buyers will offer contracts unless

many thousands of stems of bananas can be guaranteed on a weekly basis. Without contracts, credit is not forthcoming. Expansion of the area under banana cultivation will be slight, because of competition from other crops or livestock.

Despite the present lack of foreign markets and uncertain prospects of securing them in the future, the Soconusco planters and their association seem alert to all activity in the international trade. They have calculated the precise savings in time their location has over other banana growing regions. They know the weather conditions and estimated production of most world banana regions. They seem optimistic about securing contracts. In this, government planners concur as reflected in plans for the new port in the Soconusco which include loading docks and expensive equipment specifically designed for banana cargoes. Growers are especially optimistic that they may be able to gain a market in the centrally planned nations. They do not expect this market to materialize in the next few years, but definitely sometime in the next decade or so. Meanwhile, they intend to continue selling bananas to the market in Mexico City.

Cotton

Cotton is the only commercial crop in Chiapas completely subsidized by the government. Expansion has been rapid. The preferred land in the Soconusco is now under cultivation, and the area has stabilized at 60,000 acres. Growth in the central cotton zone is intended to proceed more slowly. The central zone is expected to add another 60,000 acres before expansion ceases, although it contains nearly double that amount of land suitable for cotton.

A difference in the attitude of the farmers exists between the two regions. In the Soconusco, farmers seem to feel they have found an endless supply of white gold. They contemplate no end to cotton growing. While the farmers of the central zone accept cotton, they do not expect to have it dominate their lives. The difference in attitude may evolve from the difference in land. Since the advent of cotton, land value in the Soconusco has risen to $250 per acre. Before, it was nearly valueless scrub forests and pastures. Although the land can produce other export crops, without government aid the farmers did not attempt other commercial agriculture. For them it has been cotton or nothing. The men of the central zone were not so restricted, since commercial agriculture with a variety of crops was already established. For them cotton is but one of several options.

As long as a strong domestic market for cotton exists and Japan continues to be an important buyer of Mexican cotton, conditions will remain much the same. However, Chiapanecan cotton is a high-cost crop, and the government may not always be willing to finance it. The Soconusco region would then produce little cotton, while cultivation in the central zone would continue. Even in the central zone the number of acres in cotton would probably be reduced.

With the farmers accustomed to government credit for a special crop, all aid could not be discontinued without causing serious unrest in the Soconusco. Therefore it is probable that if cotton were no longer subsidized by the government, aid would be shifted to other short-term crops.

Other Commercial Crops

Commercial agriculture includes crops other than coffee, cacao, bananas, and cotton. Some have promise for the future. Most promising for the future are crops that have been grown under subsistence agriculture for many decades. Part of the present commercial acreage is cultivated by the transitional subsistence farmer, and part is grown by the full-time commercial farmer (Table 13).

TABLE 13

LESSER COMMERCIAL CROPS
1971-1972[a]

Crop	Acres	Production /Tons	Value
Rice	16,800	28,600	$1,875,000
Sugar Cane	10,327	603,262	2,399,338
Avocado	2,671	26,400	7,500,000
Yucca (Industrial)	2,275	51,920	590,000
African Oil Palm	720	990	281,250

[a]Secretaría de Agricultura y Ganadería.

African oil palm is cultivated by a single rancher, but it has proved so successful that agricultural agents are anxious to encourage further plantings. It is estimated that from 12,000 to 24,000 acres have excellent soil and humidity conditions for the trees. Small farmers can successfully enter this field, providing a processing plant is available to extract oil and credit is available for the first few years. African oil palms, like coffee, require several years before full fruiting occurs and the trees can be regularly

harvested. Credit, therefore, will be needed to assist the small farmers for the first few years.

Unlike coffee land which the small farmer can claim from the wilderness, good palm oil land is found only on the Pacific coastal plain area already occupied by cattle. To convert the land from high-profit livestock raising will require credit. As banks, government and private, are unwilling to give long-term credit, a special development program will be needed to provide such aid to the farmers. Otherwise, no expansion will occur.

Yucca has been a part of subsistence agriculture in the state for centuries, but grown for industrial purposes it has proven valuable only in the past two or three decades. It competes successfully with cotton, but at present its cultivation is located in the single municipio of the Soconusco in which no cotton is grown. Cotton was tried there and the land proved satisfactory, but yucca was the preferred crop. A small factory, located near the fields, processes it into a white glue. At present, demand is not sufficient to require increased acreage, but cotton lands could be converted should the demand increase. Yucca is less costly to produce than cotton, even when modern techniques are used. Because yucca, like cotton, is harvested the first year it is planted, credit should be relatively easy to obtain when expansion is needed.

Rice is still raised mostly by traditional methods in Chiapas, but 3,600 acres now are cultivated by commercial farmers with the aid of fertilizers, pesticides, and some machinery. Commercial rice is sold within the state, as rice is a daily staple in the diet of the Chiapanecos. The state is now self-sufficient in production, but

demand will rise with increased population. Land good for rice could be converted from other crops, and as demand is growing, commercial rice cultivation will increase extensively in the next few years.

Sugar cane has been grown in Chiapas by subsistence farmers. The brown panela or unrefined sugar has been a regular part of the diet. Today, due to extensive research by the agricultural experimental station, and the use of the cane for rum, more than 8,000 acres under cane cultivation benefit from fertilizers and pesticides. Yields are high, exceeding 500 tons per acre. Many locations in the state have proved satisfactory for sugar cane, but new areas are likely to be numerous, small in extent, and dispersed throughout Chiapas. Increased concentration may occur in the northeast, as opposed to the central valley where sugar cane is now predominant.

Avocados are particularly successful in Chiapas and are being raised experimentally by a few commercial farmers. They are grown in the central portion of the Pacific coastal plain, just west of the cotton regions. The farmers are either converting pastures or taking land out of cacao to plant avocados. Commercial cultivation is minor, since most of the avocados are harvested from kitchen gardens. At present, Chiapas absorbs most of the yield and only a minor volume is sent to Mexico City. Demand is strong in the regional market and an international market is developing, particularly in the United States. This crop should become increasingly popular with commercial farmers, and in the future micro regions of avocado cultivation are likely to develop throughout the state.

As throughout Mexico, corn is the most important crop in Chiapas. More than 950,000 acres throughout the state are planted each year, of

which 150,000 acres are cultivated by commercial farmers. Yields have increased, and well over a million tons per year have been harvested. Government storehouses reduce the loss to rodents, and over two-thirds of the crop of Chiapas is surplus corn for sale. Undoubtedly more of the acreage under subsistence corn crops will be converted to commercial production in the future. With higher yields from modern techniques, less acreage will be needed for the crop. Yet, corn will continue to dominate the agriculture of Chiapas for many years.

Livestock occupies most of the forested and scrub land in Chiapas. Ranchers have been active in upgrading the quality of their cattle, but, as in most tropical areas, they do not supplement the grass diet of their animals with grain. Beyond an initial sowing of seed, pastures are unimproved. As commercial farmers require more land, pasture is likely to be reduced and owners will be forced to use other forms of feed to maintain their herds. The cattle population will always remain large, but most of it will be concentrated in the northeastern areas, where waterlogged soils offer fewer opportunities for crops.

Government Activities

Every two years an agricultural plan is established for each state in Mexico. The plan indicates the condition of the land, the crops grown, and improvements to be made. Included is the percentage of improvement desired. Lacking are directions to implement the planned improvements. Each state develops these for itself. In reality, the efforts of many government agencies are united in the effort to improve agriculture.

Agents from the Secretaría de Agricultura y Ganadería have greatest contact with the farmer. Much of their work is directed toward

improvement of cotton, corn, and livestock. These men are usually graduates of the agricultural schools. Unfortunately, they envision rapid improvements through massive application of chemicals, use of better seeds and machinery, rather than through small improvements over a period of time. All of the big improvements depend upon credit, which is not always available. Their future work will follow much the same pattern but include the organization and operation of new small irrigation projects.

In conjunction with the Secretaría de Recursos Hidraúlicos, agricultural engineers are planning and working on a series of water control projects. A completed part of this plan is the drainage system for the Soconusco coastal plain, which permitted the development of cotton cultivation in that area. Future projects are designed to provide irrigation water in semi-arid areas, drain water-logged areas, and provide flood control for valuable agricultural lands. Sixteen or seventeen projects are planned, and one in the Cuxtepeque region at San Vicente is already completed (Figure 11). They are all designed to develop irrigation systems and in some instances help control flooding, as in the Comitán project. Two drainage systems similar to that of the Soconusco are also planned. One is adjacent to the present Soconusco area, and the other is at the extreme western end of the coastal plain near Arriaga. These improvements will involve as much as 200,000 acres. Some projects are being implemented for the near future, and others are planned. If all are eventually constructed, the coastal areas will be developed for specialty crops. However, no indication is yet given as to what these crops will be.

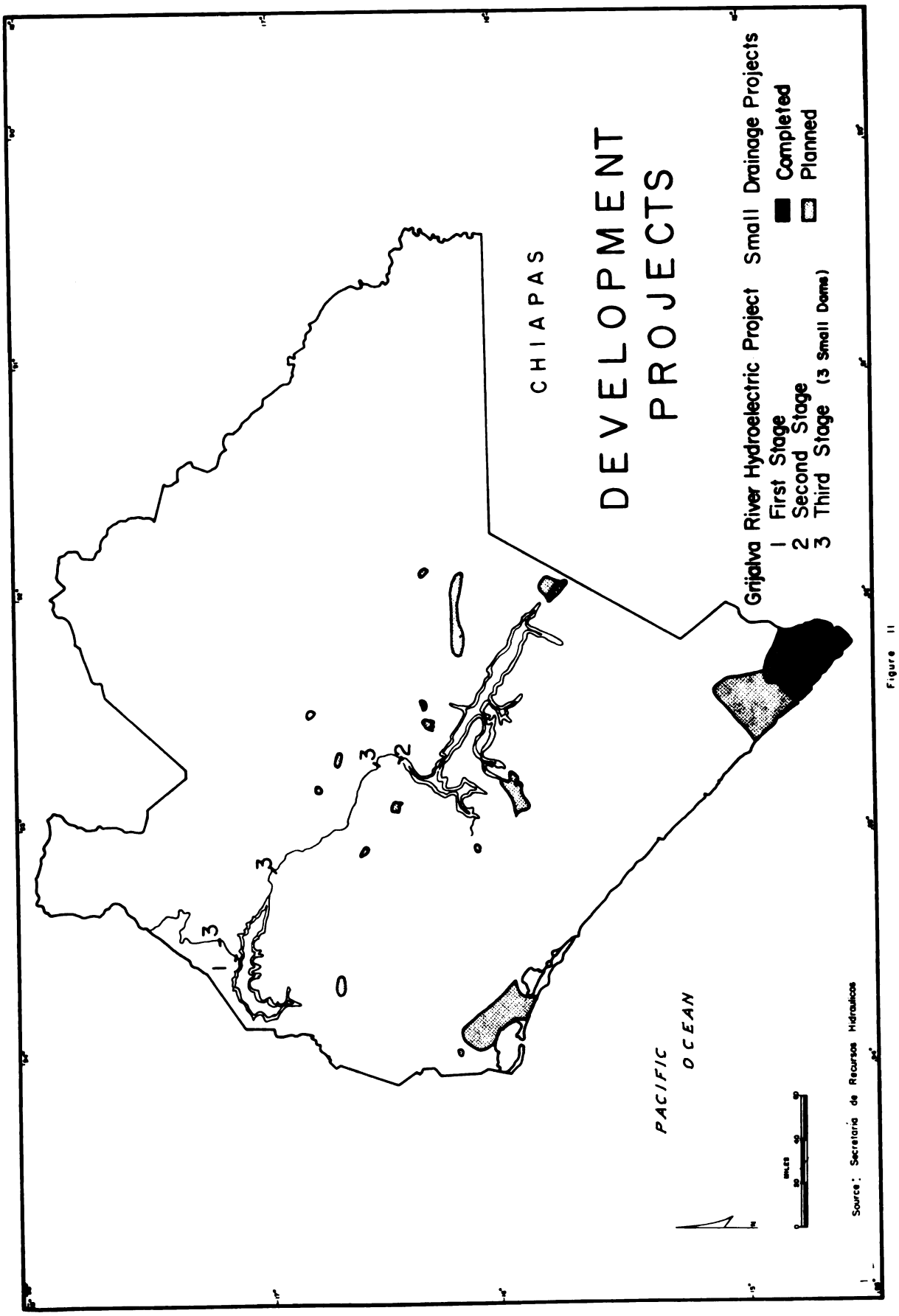
DEVELOPMENT
PROJECTS
CHIAPAS
Grijalva River Hydroelectric Project Small Drainage Projects
1 First Stage
2 Second Stage
3 Third Stage (3 Small Dams)
Completed
Planned
PACIFIC
OCEAN
Source: Secretaría de Recursos Hidráulicos

Figure 11

Two immense electrical projects are also in progress. While the intent is to benefit the nation, Chiapas will receive both direct and indirect benefits. The Grijalva project is basically to provide electric power for central Mexico, but from the second stage, the Angostura Dam and reservoir, water will be diverted to irrigate 2,500 acres of the central depression. The dam will also prevent the frequent flooding of valuable agricultural land in the Grijalva valley.

Yet another project is the construction of a deep water port, Puerto Madero. When completed, the facilities will accommodate any size vessel in two deep bays and include a sheltered shipping canal along most of the coast of Chiapas. The port will be equipped to handle any form of agricultural product in the state and is designed to encourage the development of light manufacturing in the area. Facilities for this manufacturing, which includes food processing, wood working and production of small objects such as electrical parts, will be constructed near the docks. Except for the state capital, Tuxtla Gutiérrez, the small amount of existing manufacturing in the state is located on the Pacific coastal plain and particularly in the city of Tapachula. The new industry which the port is expected to attract will be complimentary, or essentially the same as that which is now found in the area.

Prospect

Commercial agriculture in Chiapas is based upon large regions of coffee, cacao, and cotton, with micro regions of other crops (Figure 12). Changes will depend upon an improved road system, deep water port, and various soil and water conservation measures which are now under

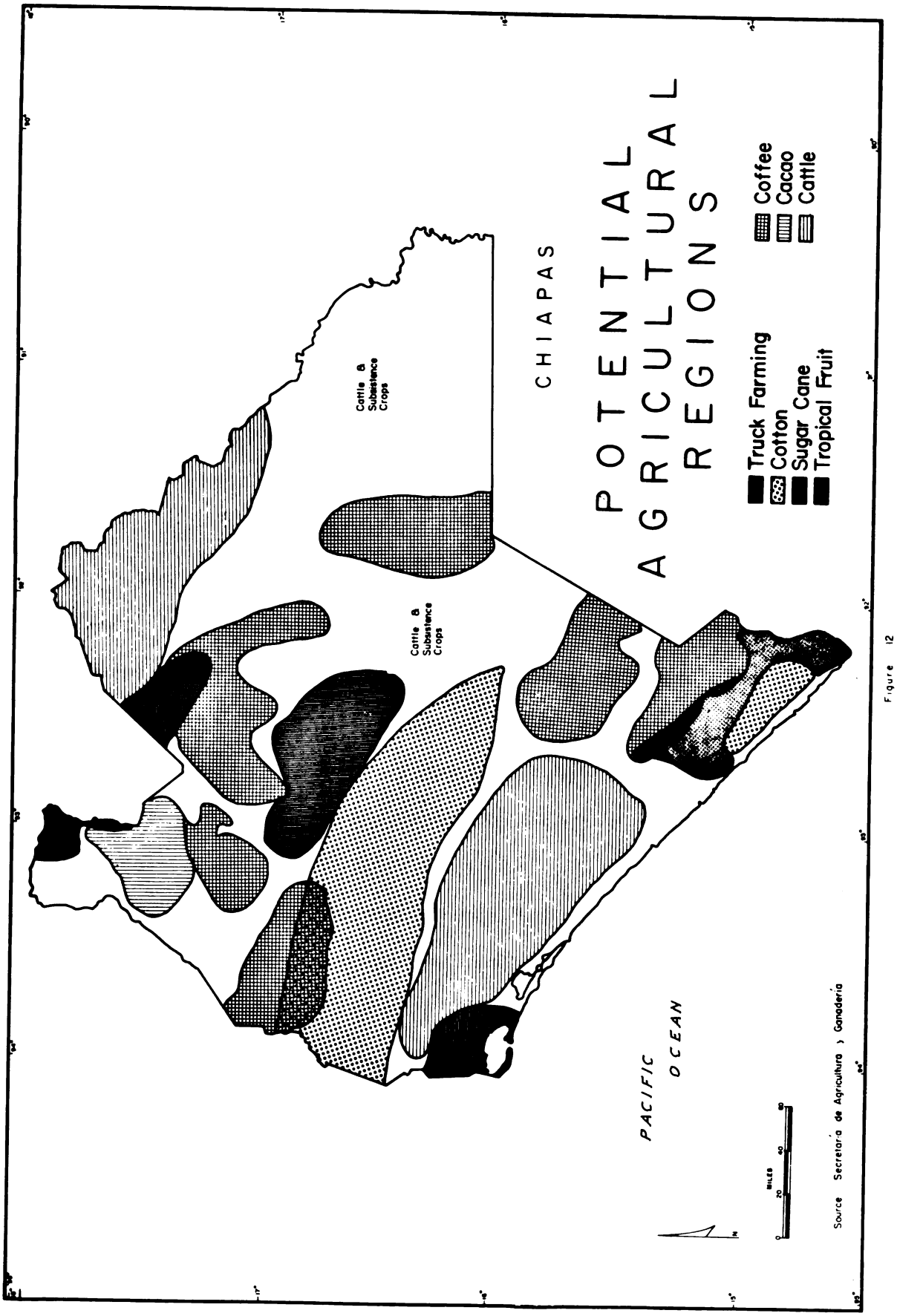
POTENTIAL AGRICULTURAL REGIONS
CHIAPAS
Truck Farming
Cotton
Sugar Cane
Tropical Fruit
Coffee
Cacao
Cattle
Cattle & Subsistence Crops
Cattle & Subsistence Crops
PACIFIC OCEAN
Source Secretaría de Agricultura y Ganadería

Figure 12

construction or in the planning stage. With irrigation water available from numerous streams, deep-water port facilities in operation, and a food-processing industry developing in Puerto Madero and Tapachula, the agricultural land of the Soconusco will become too valuable to remain in cotton. The cotton region will decrease in acreage and migrate westward along the coast (Figure 12). The Soconusco will become an area of tropical fruit cultivation. In the United States and Europe, especially, the market for citrus, mangos, avocados, pineapples, and other fruits is growing. Increased banana acreage can be expected on the extreme western edge of the Soconusco and perhaps along the eastern border. Cacao in piedmont areas will disappear in favor of fruits.

In the western Pacific coastal area, land devoted to grazing will decrease, although the number of cattle may not. Remaining pastures will have improved grasses capable of feeding increased numbers. In the area to be drained near Arriaga, land will be available for truck crops and sugar cane. As the sugar cane lands of the Isthmus of Tehuantepec are not far away, cane cultivation is especially likely to expand.

Decrease in coffee acreage is expected in the western portion of the central coffee zone, where beef and dairy cattle are already beginning to replace coffee. However, as population increases, the demand for milk and milk products will increase. This area is a logical place for development of dairying, and small ventures are already flourishing. The present dairy herds serve local demand. Growth will depend upon improved roads. A central location permits the area to serve both the Soconusco and central depression. Coffee will remain the favored crop of the eastern Sierra Madre.

Corn, beans, and cotton will continue to predominate in the central depression. Cotton acreage will increase as irrigation becomes available, and total acreage will overshadow that of the Pacific coastal zone. For soil improvement, as well as for oil, soybeans will form an important part of crop rotation. The rice and sugar cane already grown on a minor scale in the area will remain, improved in yield through fertilizers and insecticides. But these crops are not likely to increase in acreage, as the land is the best in Chiapas for cultivation of corn and beans.

In the western portion of the central plateau, the trend toward truck gardening will intensify. The land is unsatisfactory for extensive cultivation of grains, other than those presently grown as subsistence crops. But the area is already benefitting by the small amount of truck crops grown there. The Indians of the plateau will become suppliers of mid-latitude fruits and vegetables for the state. Fruit trees, now grown in kitchen gardens and in the future as hillside orchards, will replace subsistence corn. The plateau will also increasingly supply small animals, chickens, and pigs. Sheep will continue to graze on the mountain pastures.

In the northern region, coffee and cacao will continue to be cultivated by ranchers whose main interest lies in cattle. In the northwestern horn of the state, where oil has been discovered, cattle are the primary source of income. They will remain important, but along the roads which will be built to bring out the oil, more truck farming is expected to develop. But truck crops will be marketed in the flourishing city of Villahermosa, in Tabasco, rather than in Chiapas. In the northeast, sugar cane will again be planted in the

valleys too low for coffee, although cattle will continue to flourish on the wet pasture lands.

La Selva Lacondona will be the last to be developed, and, as the potential of the territory remains speculative, it is difficult to predict the future of the area. Coffee is planted on the northwestern fringe, and cattle are raised to the north. Coffee and cattle-raising will expand at first, but as the area has many fertile river valleys almost any crop not requiring a long dry season could flourish there when population pressure forces development of the land.

All of the foregoing predictions are based on activities now in progress or in the planning stage. It would be useless to assume that all farmers of the state will become progressive commercial cultivators. Chiapas will always have some farmers who barely eke out a living on their land, but the potential for model development of highly valuable commercial cultivation is there. A major part of that potential could be achieved within the next few decades.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

A change from subsistence agriculture to commercial cultivation is imperative for many tropical nations. A land-use study of a tropical region where commercial agriculture has been developing with government aid for cotton only could indicate conditions favorable to the growth of commercial agriculture in tropical regions generally. Moreover, the patterns of operation in that region may reflect needed changes and give a basis upon which the future of commercial agriculture can be predicted. Chiapas, Mexico, was selected as the location for such research.

Summary

Literature and official statistics on land use in Chiapas are scant, so most of the research was directed toward observation of the area and interviews with men actively engaged in commercial agriculture. The study was centered on procedures and techniques in the cultivation of coffee, cacao, bananas, and cotton as these were considered important export crops which could be used as indicators for all commercial agriculture.

Physical conditions of the land in Chiapas are similar to those of many other tropical regions. Orogenic forces had been active, leaving a landscape of two mountain regions, a central depression, and two coastal plains. The northern mountain range has three divisions: a

Central Plateau and a folded mountain area to the north and east which is divided into two sections, the Northern and Eastern Mountains. These major features separate the state into seven physiographic subregions which provide a basis for research, as the various commercial crops are located in specific physiographic divisions. As a whole, Chiapas is tropical with rainy summers from June to November and dry winters from December to May. Total rainfall is greatest in the mountains and declines to the minimum needed for cultivation in the Central Depression. The coastal lowlands of the north are under the influence of the Caribbean year-around rainy climate, but the Pacific Coastal Plain has a pronounced wet summer and dry winter climate. Where level land exists, soils are generally fertile, particularly in the southeast where volcanic ash is mixed into the alluvium of the coastal plain. Along with two of the largest rivers in Mexico, the Grijalva and Usumacinta, many smaller rivers drain the land and offer development possibilities.

Cultural patterns of the state correspond to the physiographic divisions. The population is 30 percent Indian, perhaps 5 to 10 percent of unmixed European ancestry, and the majority mestizos or ladinos. Indians are located almost entirely in the less accessible areas of the plateau and northern mountains, while the mestizos and Europeans occupy the best agricultural lands of the coastal plains and Central Depression. Commercial agriculture and, in fact, all business of the state is in the hands of the latter groups.

Agriculture is the important source of livelihood. Most of what little industry exists is based upon food processing. Minerals have been almost unknown, except that in the past few years petroleum has

been discovered in the extreme north of the state and two fields have been brought into production. More recently, the government has announced the discovery of exploitable copper deposits. A primarily rural economy has limited the number of cities to three: Tuxtla Gutiérrez, Tapachula, and San Cristóbal de las Casas. While other towns have populations of 2,500 or more, they remain rural in character and lack most urban amenities.

Coffee, cacao, bananas, and cotton are four of the most valuable crops in Chiapas. However, they were developed for markets outside the state and are to a large extent the preferred crops of commercial farmers. Due to the pronounced physiographic divisions of the state, each of the four crops is found in two or three distinct regions. These contrasts are sometimes in the emphasis placed upon the crop and at other times differences in techniques of production.

Coffee has been successfully cultivated in Chiapas for more than one hundred years. The state now produces the largest portion of Mexico's coffee, which is 40 percent. Coffee is restricted to mountain areas. The southern region is one of full-time coffee planters, both private and ejiditario. Their livelihood comes solely from coffee. In the northern area coffee and cattle share the land of the private owners, while the ejiditarios raise both coffee and subsistence crops. The central region is a blend of both. Some growers have only coffee, while others have cattle and coffee.

Although cacao has been cultivated in the state for many centuries, it is one of the least successful crops. Cash returns are so slight that, even among the ejiditarios, no single grower cultivates only cacao. In the southern or Soconusco region the ejiditarios, who

produce most of the region's cacao, also grow subsistence crops. The private growers obtain most of their income from coffee, bananas, cotton, livestock, or any combination of these. In the northwestern region cacao growers are also cattle ranchers. Ejiditarios encouraged by agricultural agents to discontinue cacao cultivation are destroying their trees and replacing them with cattle.

Bananas, theoretically, are grown in two regions. The northwest was the earliest, but because of plagues banana cultivation was nearly wiped out. Today fewer than 2,500 acres of commercial bananas are grown in the region. Even the Soconusco, following severe storm damage in 1961-1962, nearly ceased to be a banana growing region. But with cultivation primarily by a few private farmers, it is experiencing a comeback. The region is small, but has the advantage of an irrigation-drainage system recently constructed by the government. The growers have developed their own markets and provide their own transportation. These men receive good prices for their bananas in Mexico City. Success has given them a somewhat optimistic view of the future of banana cultivation in Chiapas. They expect continued, although slow, growth in production.

Cotton cultivation is subsidized and strictly regulated by the government. Cotton is the only crop grown successfully by both ejiditario and private owners, following modern techniques. Two regions, the Soconusco and the central depression, are well suited to its cultivation. Soconusco farmers concentrate strictly on commercial agriculture, and the result is a broad region of cotton monoculture. On the other hand, farmers of the central zone are successful commercial growers of corn, beans, and livestock. Unlike

Soconusco growers, they view cotton as an additional crop, rather than the only possible one. Cotton is planted on one-fourth to one-half of their acreage. This is also true for the ejiditarios.

Several other crops are commercially grown in Chiapas. Corn, rice, and African palm oil are among these. All could be expanded, but generally at the expense of other crops. Growth will depend primarily upon market conditions.

Production techniques vary from antiquated to the most modern. In Chiapas, coffee cultivation follows older techniques. Varieties of Arabica, the first commercial variety, are the most popular and are grown under shade without the aid of fertilizers or pesticides. Harvesting requires large numbers of temporary laborers who come from the Indian lands of the plateau and from Guatemala. The Soconusco produces the most coffee and also accounts for the greatest number of employees, both temporary and permanent. Toward the north, labor becomes progressively more difficult to obtain. As a consequence, growers in the central region hire fewer men than those of the Soconusco. Those of the northern region employ even fewer laborers for year-around work and for harvesting. Coffee markets are well developed. Growers have their choice of processing the coffee to the final stage and selling in the international market or partially processing their harvest and selling the beans to coffee brokers who, in turn, sell overseas. The greatest problem lies in transporting the coffee from farm to market centers, as the secondary road system is very poor.

Cacao has been raised for centuries in Chiapas but has become less attractive, despite an increasing number of acres under cultivation. Most of the cacao is cultivated by two types of farmers:

the ejiditario who lacks capital and cannot purchase the necessary chemicals to increase his yields, and the cattle rancher who cultivates cacao as a minor crop. Financially secure as a result of cattle profits, the ranchers apply chemical fertilizers and pesticides and have correspondingly raised their yields. Cacao is harvested all year, and consequently no seasonal labor is needed despite the fact that all work is done by hand. As is true of coffee, transporting cacao to market is a problem in the north where the road system is particularly poor. Since processing the harvested beans does not include needed fermentation, Chiapanecan cacao is not sold internationally. Instead, it is all sold to the government which in turn sells it to domestic chocolate producers.

Banana cultivation is now minimal in Chiapas. The major region is within the Soconusco, where the cultivators practice modern techniques. However, there is insufficient water for irrigation during the dry season. The bananas are sold by individual growers who establish their own outlets and are responsible for transporting the crop to market. Future expansion of the region depends upon improvement in ocean transport facilities, which will come with the completion of a deep water port now under construction and the development of overseas markets.

The Pacific Coastal Plain and the Central Depression are well suited to cotton cultivation, and under government auspices more than 90,000 acres have been planted. All aspects of cotton cultivation are dictated by the government, which uses permits to plant and credit as the instruments of control. Because of land tenure laws, Soconusco farmers rarely plant more than 240 acres. Farmers of the central zone

have more acreage available, but they, too, generally plant not more than 240 acres. The tropical location makes disease the greatest handicap, and without credit it is unlikely that farmers could grow this crop. The use of machinery for all activities has reduced the need for a large labor force, except during harvest. Then, about 25,000 extra laborers are hired. Transportation of the cotton to ginning mills is the responsibility of the farmer, but distances are generally short. The cotton is sold at the mill, and the government mills then transport the seeds and the lint to the north. Trucks are favored over rail because time saved offsets the lower cost of rail transportation.

The four crops of the study have had periods of prosperity and depression. Coffee and cacao acreage has expanded, particularly in the past three decades, to the point where continued expansion is unlikely. Coffee yields have generally increased despite the lack of chemical inputs, and even greater yields can be expected if fertilizers and pesticides are routinely used. Ranchers who have recently begun cacao cultivation have doubled yields by a minimal application of chemicals. Cotton has proved, in ten years of commercial cultivation in Chiapas, to be a successful crop provided the necessary credit is available. The boundaries of the coffee, cacao, and cotton regions are unlikely to expand to include a greater number of acres under cultivation. Commercial banana cultivation is scarcely ten years old, and modern techniques are followed. Depending upon market conditions, the Soconusco could become a major region of production or remain much as it is. Suitable lands for bananas are now in cotton, and to replace cotton with bananas requires firm contracts from overseas markets. Due to the present oversupply of bananas in world markets, this contingency is somewhat remote.

All commercial agriculture will benefit from improvements in communications; the solution of land tenure problems, particularly the fragmentation of ejido holdings; adoption of modern production techniques by all farmers; and increased availability of credit. Technical assistance is increasingly needed, but as the supply of agricultural agents improves this obstacle to commercial agriculture will be most easily overcome.

The future of commercial agriculture is promising. Coffee, as the most valuable commercial crop, is stable and likely to become more profitable through increased yield. Cacao cultivation is less certain because of the rigid price structure. Given incentive in price and credit, yields could improve, particularly those of ejido grown cacao. Bananas are unlikely to be planted on increased acreage without extensive development projects by the government, including irrigation and transportation facilities. Chiapas has a promising future in other crops, such as sugar cane, rice, yucca, and avocados. Using the experience of commercial farmers, the change from subsistence to totally commercial agriculture can be accomplished through increased government interest and assistance. With the use of credit and increased irrigation, soil conservation, and adequate technical assistance, Chiapas is likely to become known for multiple-crop commercial agriculture, rather than for concentration upon a few valuable crops.

Conclusions

Conclusions drawn from the study can be grouped in four categories: 1) the quality of existing commercial agriculture, 2) characteristics of the human resources, 3) the role of government, and 4) potential for development.

The Quality of Existing Commercial Agriculture

Although other crops are also produced for the commercial market, coffee, cacao, bananas, and cotton are good indicators of the variation in conditions under which commercial agriculture exists.

Grown for more than a century in Chiapas, coffee is the best established and most prestigious of commercial crops. The coffee growers are highly conservative. Perhaps because they continue to obtain good harvests, the planters are reluctant to recognize the need for chemical fertilizers and pesticides. Despite proven success in other countries, the Chiapanecos have conducted little experimentation in coffee growing without shade.

The cattle rancher-cacao planters and the banana and cotton growers have demonstrated by their willingness to use modern techniques that modern methods can overcome the problems of tropical lowland agriculture. Infertile soils and disease control can be managed to the point that commercial agriculture is both viable and practical.

The further development of some crops will depend primarily on markets. The coffee market, alone, operates smoothly, despite difficulties in communication. For cacao and cotton, the government maintains a monopoly buying power. With a stable government market, planters are encouraged to increase supply through improved yields and expanded acreage. But an assured market with fixed prices provides little incentive for improved quality, which in the case of cacao prevents the development of an international market. On the other hand, lacking a fixed market, banana planters strive for both quality and high yields. Aware that the market they supply will accept even low quality, they nevertheless do not relax their standards. Their intent is to develop an overseas market.

Marketing facilities vary according to the crop rather than identity of the buyer. Coffee is a long-established export, with warehouses, drying facilities, independent company and government buyer facilities, and transport arrangements commensurate with its status as a highly valuable crop. Elaborate facilities and arrangements handle the cotton crop, but cacao and bananas are less valuable commodities and have correspondingly less complicated infrastructures. Cacao is bought and sold with a minimum of personnel and physical plants in Chiapas, while no facilities exist at all for bananas.

Therefore, two sets of conditions exist, one of well developed market infrastructure based upon the value of the crop and the other of minimal development. There are also two major types of markets, the government as a monopoly with volume prized more than quality and a competitive market in which quality is as important as volume. The latter is characteristic of coffee now and will be in the future for bananas. These types of markets are applicable to other crops as well. Corn and beans as major crops, and yucca and palm oil as scarce but valuable crops, are sold only to the government or buyers designated by it. Other crops, such as rice and avocados, enter a competitive market.

Characteristics of the Human Resources

Although to the Chiapanecos the possession of land is equated with prestige, farming the land is equally important to them. No arable land is deliberately left idle. However, in the minds of many, the need to cultivate the land does not equate with performing the work oneself. The ideal is to manage the operation and hire others to

perform the labor. This applies even to the hundreds of small farmers who have been able to purchase land since the changes in land tenure laws. The small farmers seldom work their land full time. Instead, they "moonlight," i.e. they work as hired labor on large farms or as employees in the tertiary sector. They choose crops which demand a minimum of time, which is one reason for the great expansion of coffee cultivation. But, since the easily grown crops are not carefully cultivated, they fail to produce the maximum possible yields. A change in attitude toward physical labor would help to raise agricultural productivity.

The ejiditarios do not appear to avoid labor, but suffer a lack of education. Although the laws of Mexico require each child to receive at least a few years of schooling, they often are not fully implemented. The government provides a school and at least one teacher for each ejido, but parents often do not see the necessity for education and refuse to send their children to school. Therefore, ejido farmers often lack the primary skills of reading and writing. In addition, the schools provide no education aimed at improving knowledge of agriculture. Hence, the ejiditarios depend upon the few available agricultural agents for information on new crops and methods.

Education aimed at changing attitudes and improving agriculture is needed throughout rural Chiapas. The farmers are generally receptive to new ideas, as evidenced by their willingness to change to cotton cultivation, but lack the means and knowledge to utilize them.

The farmers, laborers, and ejiditarios have not yet contributed much to the migration of surplus labor to the cities. Migration has begun from some of the more densely occupied municipios of the

Soconusco, but the numbers remain small. The migrants have moved mainly to other municipios or to the cities of Tuxtla Gutiérrez and Tapachula, where they can easily return home if they so choose.

Surplus labor on the plateau, where population densities are highest and arable land is extremely limited, is less of a problem than might be expected. This is because of a somewhat symbiotic relationship which exists between the plateau and the coffee lands. Coffee harvests occur in or around December, the time when agricultural activities on the plateau are at a minimum. Consequently, large numbers of laborers can be attracted from their farms and ejidos to harvest the coffee. In this manner plateau farmers are employed the year around, and they also obtain badly needed cash. Even if the trend toward truck farming on the plateau is encouraged by the agricultural agents, the same situation will prevail, for the high altitude there precludes winter cropping.

The Role of the Government

When a government is sincere in promoting agricultural development, as the Mexican government has proven to be, it can be highly effective. Part of the government's role is to supply trained agricultural agents to assist the farmers and to engage in research on crops and methods of cultivation that could be used in a particular region. The rapid development of cotton cultivation in Chiapas illustrates the magnitude of possible change when actively promoted by a government. The saga of cotton also demonstrates the government's most potent instrument: credit.

Credit, when accompanied by realistic planning, is necessary for the establishment and development of all commercial agriculture.

Originally, coffee cultivation was undertaken by men who had outside sources of credit. The growth in cacao and bananas has come from men who could obtain agricultural credit intended for other crops or who owned businesses from which they could obtain cash and apply it to cacao or banana cultivation. The time is past when farmers could change their crops or establish new ones with a bare minimum of credit, and only governments now have sufficient credit to radically change the agriculture of an entire region.

An inherent danger lies in government direction and control of change. In Chiapas the establishment and continuation of cotton as a commercial crop is one such example. What happens if that credit and direction is withdrawn? The richer farmers could continue and they might do so, but the small farmers and ejiditarios could not. Cotton is a high cost crop in the tropics, and the profit is just sufficient to pay living expenses and the cost of the next year's seed.

Absolute control and direction tends to destroy initiative. Other Latin American governments have found this true in colonization schemes. In Chiapas the cotton farmers of the Soconusco, except for a very few, cannot conceive of cultivating any other crop or of the cotton-engendered prosperity coming to an end. Part of the government's role should be to prevent further loss of initiative on the part of the farmers.

Another facet of government activity will be needed as more commercial farming is generated in the state. Massive use of chemicals in modern cultivation upsets the ecological balance. It is thus far evidenced only in loss of bird life in the cotton regions, but

other changes will come. It will be the government's responsibility to avoid dangerous alteration in the environment.

The Potential for Development

Throughout the research, it has been evident that the potential for valuable commercial agriculture in Chiapas is very good. Based on the present variety of commercial crops, the multitude of climatic variations, and change in attitude toward commercial cultivation, development should move toward many specialized crops rather than to increased acreage of present crops. Nearly all tropical crops could be profitably cultivated. Now is the time, while the state remains somewhat of a frontier zone and before population increases to the point that all of the state's revenue and thought must be directed toward welfare activities, that the government should act to develop the full agricultural potential of the area.

With improvements in communications, particularly roads and the deep water port, and improvements in commercial agriculture, the potential for development of food processing industries will increase. The oil of the north brings needed revenue, but does not lend itself to the development of heavy industry or the employment of a large labor force. And except for the newly discovered copper, the state lacks mineral resources upon which to base other forms of industry. Food processing appears to be the most practical form of industrial development. A beginning has been made with rice mills, meat, and fish processing plants, but much more could be developed.

Little research other than in crops, or for specific projects, has been carried on in Chiapas. Data collection is in the most

rudimentary stage and needs considerable improvement and expansion. Although inadequate data is a handicap to the researcher, the need for field research is evident and offers opportunities for scholars in almost any discipline.

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