The Savanna of Central Panama: a Study in Cultural Geography.

Robert Henderson Fuson

Louisiana State University and Agricultural & Mechanical College

Follow this and additional works at: https://repository.lsu.edu/gradschool_disstheses

Recommended Citation
https://repository.lsu.edu/gradschool_disstheses/461

This Dissertation is brought to you for free and open access by the Graduate School at LSU Scholarly Repository. It has been accepted for inclusion in LSU Historical Dissertations and Theses by an authorized administrator of LSU Scholarly Repository. For more information, please contact gradetd@lsu.edu.
THE SAVANNA OF CENTRAL PANAMA:
A STUDY IN CULTURAL GEOGRAPHY

A Dissertation

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Geography and Anthropology

by

Robert Henderson Fuson
A.B., Indiana University, 1949
M.A., Florida State University, 1951
May, 1958
PREFACE

Preparation for a cultural study of the savanna of central Panama began in the spring of 1955, when I was appointed Instructor in Geography and Anthropology, Caribbean Program, Louisiana State University, Panama Canal Zone. Prior to my departure for Panama in September, 1955, discussions with Professor Robert C. West, Louisiana State University, led to a general topic for investigation and outlined the approach. Under the direction of Dr. West, a six months' search of the literature was made at the Hill Memorial Library, Louisiana State University.

Field work and library and archival research were undertaken in Panama and the Canal Zone between September, 1955, and June, 1956. In the Republic a number of public and private libraries, including the Biblioteca de la Universidad de Panamá and the Biblioteca Nacional de la República de Panamá, provided documentary data. Archival investigation in the Archivos Nacionales de la República de Panamá yielded more. A number of Panamanians, including Professor Angel Rubio and Don Simeon Conte, kindly permitted full use of personal collections. Public libraries in all provincial capitals and larger towns in the savanna were searched for pertinent materials.
In the Canal Zone research was carried out mainly at the Canal Zone Library, Balboa Heights. The Canal Zone Library is the most complete library on the Isthmus, containing over 10,000 volumes dealing specifically with Panama and the Canal Zone. Weather materials were collected from the Meteorological Library of the United States Air Force, Albrook Air Force Base, Canal Zone, and the Meteorological and Hydrographic Branch of the Panama Canal Company, Balboa Heights. Further information was obtained from private sources in the Canal Zone, including collections of H. M. Smith (botany), C. R. McGimsey III (archaeology), and Dr. E. F. Masingill (history).

Most of the documentary data used in the study were obtained from the Archivo General de Indias, Sevilla, Real Academia de Historia, Madrid, and Archivo Central de Marina, Madrid. These materials were personally collected by Dr. Robert C. West, between September, 1955, and April, 1956, while carrying out research in Spain. During this period close contact was maintained with Dr. West and periodic progress reports were submitted.

Writing was begun upon return to Louisiana State University, August, 1956, and further library research was made in the University library between that date and August, 1957. During this time the personal collections of Dr. West and the author were also thoroughly digested. Final library work and composition were carried out at the University of Miami, Coral Gables, Florida, in late summer.
and autumn of 1957.

Over 8,700 miles were traveled within the Republic of Panama, and more than one hundred days were spent in the central savanna. All available means of transport were utilized. They included: train, private automobile, Army staff car, commercial vehicles, private command car, Air Force H-19 helicopter, boat, horse, oxcart, and walking. The entire study area was covered a number of times and in a variety of ways. Trips were also made into the rain forest of the Atlantic coast, and down that coast toward Colombia, into the Cuna Indian territory. A complete log was kept for each field excursion. Detailed notes were made, interviews conducted, and check-lists employed. Topographic maps were annotated in the field and sketches and measurements taken when essential. Color (35 mm) and black-and-white (120) photographs were taken.

In gathering material for this study I was greatly aided by the assistance of many friends and scholars, both Panamanian and North American. I am especially grateful for the guidance of Professor Robert C. West, and his sincere interest in and encouragement of this work. Also, an extra debt of gratitude is owed Professor West for his kind permission to use documentary data collected by him in Spain. I am indebted to Professor Angel Rubio, Departamento de Geografía, Universidad de Panamá, for his valuable advice during the field year in Panama and his continuing interest in the study after my departure from his country. Archival
and library research in Panama was facilitated by the assistance of Don Ernesto Nicholau, director of the Archivos Nacionales, and Srta. Carmen de Herrera, director of the Biblioteca de la Universidad de Panamá. Appreciation is also tendered to all of the personnel in the Canal Zone Library and the Biblioteca Nacional for their patience and help.

I wish to thank Charles R. McGimsey III for affording me the opportunity to understand better the pre-Columbian culture of Central Panama. Special thanks go to H. Morgan Smith for a series of unforgettable lessons in the practical aspects of jungle survival. A sincere word of appreciation is due Air Force Captains William B. Peel and Paul W. Van Boven, and to the entire 26th Air Rescue Squadron, Albrook Air Force Base, Canal Zone. Not only was I permitted to make numerous helicopter flights in Panama (as a USAF Reserve officer), but the Rescue Squadron responded immediately during the one major crisis I experienced in the Isthmian jungles.

Agricultural information came from many sources. All of the personnel of the University of Arkansas Agricultural Mission to Panama gave willingly of their time and talents to further the investigation of rural economies. Thanks go to all of the men and women of this team, and to their director, Dr. Carl D. Koone. Permission to use the facilities of the Instituto Nacional de Agricultura, Divisa, was freely granted by its director, Sr. Rubén D. Arosemena.
Sr. Manuel B. Moreno, chief of the Sección de Estadísticas Agrícolas, kindly supplied all of the agricultural statistics used in the study. Additional information came from the Contraloría General de la República (Dirección de Estadística y Censo), Servicio Interamericano de Cooperación Agrícola en Panamá, and the Ministerio de Agricultura, Comercio e Industria.

I am deeply grateful to many people who invited me into their homes and demonstrated wonderful hospitality. Two such new friends are Don Miguel A. Conte and Don Simeon Conte of Penonomé. Similar appreciation is due Mr. Richard Clark and Captain Richard Taffe, USARGARIB, Public Information Office, for countless courtesies extended over the entire length of time I was in Panama. Other individuals who helped bring this study to finality include: Sr. Alberto F. Alba, Dr. J. W. Brouillette, Mr. W. H. Esslinger, Dr. Fred Fenn, T/Sgt. G. L. Frichette, Mr. Raymond Fuson, Captain J. W. Gromme, Jr., Ing. Tomás Guardia, Jr., Dr. W. G. Haag, Dr. F. B. Kniffen, Sr. Fernando Lombardo, Dr. W. G. McIntire, Sr. Juan Pérez, Mr. L. M. Spencer, and Mr. J. H. Vann, Jr. Hundreds of unknown Panamanians, encountered during the field period, deserve a word of recognition.

Of the many public and private organizations assisting my work, several merit a special citation, along with all of their personnel with whom I came in contact. They include: Camara de Comercio de la República de Panamá, Encomiendas, S. A., Guardia Nacional de la República de
Panamá, Instituto de Fomento Económico, Junta Nacional de Turismo de la República de Panamá, Louisiana State University, Ministerio de Obras Públicas (Dirección de Cartografía), Museo Nacional de la República de Panamá, United States Corps of Engineers (Inter-American Geodetic Survey), and the University of Miami.

Needless to say, without the patience, perseverance, and consistent encouragement of my wife, Amelia, the completion of this work would have never been realized. To her this study is sincerely and respectfully dedicated.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREFACE</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF MAPS</td>
<td>xvii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xix</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>xx</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
</tbody>
</table>

**Chapter**

**I. THE ORIGIN AND NATURE OF THE SAVANNA**

- Origin of the Name "Savanna"
- Previous Studies of Savanna Areas
- Climate and Vegetation
  - Intertropical Convergence Zone (ITC)
  - Wind Velocities and Direction
  - Rainfall, Humidity, Temperature, and Evaporation
  - Surface Configuration and Its Effect on Climate
- Climatic Classification
- Soils and Vegetation
  - Soils
  - Summary of Edaphic Influences
- Man and Vegetation
- Notes to Chapter I

**II. POPULATION AND SETTLEMENT**

- The Period Before 1515
  - Cerro Mangote
  - Monagrillo
  - Sarigua
  - The Coastal Landscape
  - Cocle
  - Tribes and Chiefs
  - Aboriginal Population Density
# TABLE OF CONTENTS—Continued

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Period After 1515</td>
<td></td>
</tr>
<tr>
<td>The First Entrada</td>
<td></td>
</tr>
<tr>
<td>Settlement Types</td>
<td></td>
</tr>
<tr>
<td>Settlement Forms</td>
<td></td>
</tr>
<tr>
<td>Population Characteristics</td>
<td></td>
</tr>
<tr>
<td>Notes to Chapter II</td>
<td></td>
</tr>
<tr>
<td>III. HOUSE TYPES</td>
<td>135</td>
</tr>
<tr>
<td>The Indian Dwelling</td>
<td></td>
</tr>
<tr>
<td>The Detached Kitchen of the Bohio</td>
<td></td>
</tr>
<tr>
<td>Diffusion of the Indian Dwelling to Central Panama</td>
<td></td>
</tr>
<tr>
<td>The Spanish Dwelling</td>
<td></td>
</tr>
<tr>
<td>The Detached Kitchen of the Spanish House</td>
<td></td>
</tr>
<tr>
<td>House Construction</td>
<td></td>
</tr>
<tr>
<td>The Junta</td>
<td></td>
</tr>
<tr>
<td>Distribution and the Related House Complex</td>
<td></td>
</tr>
<tr>
<td>Recent Trends</td>
<td></td>
</tr>
<tr>
<td>Notes to Chapter III</td>
<td></td>
</tr>
<tr>
<td>IV. RURAL ECONOMIES</td>
<td>188</td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>Subsistence Agriculture</td>
<td></td>
</tr>
<tr>
<td>Land Tenure and Distribution</td>
<td></td>
</tr>
<tr>
<td>Subsistence Roza Crops</td>
<td></td>
</tr>
<tr>
<td>Subsistence Huerta Crops</td>
<td></td>
</tr>
<tr>
<td>Introduced Huerta Crops</td>
<td></td>
</tr>
<tr>
<td>Native Tree Crops Associated with the Huerta</td>
<td></td>
</tr>
<tr>
<td>Introduced Tree Crops Associated with the Huerta</td>
<td></td>
</tr>
<tr>
<td>Animal Husbandry</td>
<td></td>
</tr>
<tr>
<td>Pastures</td>
<td></td>
</tr>
<tr>
<td>Animals</td>
<td></td>
</tr>
<tr>
<td>Fowl</td>
<td></td>
</tr>
<tr>
<td>Hunting, Fishing, and Gathering</td>
<td></td>
</tr>
<tr>
<td>Hunting</td>
<td></td>
</tr>
<tr>
<td>Fishing</td>
<td></td>
</tr>
<tr>
<td>Gathering</td>
<td></td>
</tr>
<tr>
<td>Handicrafts and Home Industries</td>
<td></td>
</tr>
<tr>
<td>Semi-Commercial Domestic Manufactures</td>
<td></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS--Continued

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weaving and Dress</td>
<td></td>
</tr>
<tr>
<td>Basketry</td>
<td></td>
</tr>
<tr>
<td>Ceramics</td>
<td></td>
</tr>
<tr>
<td>Woodworking</td>
<td></td>
</tr>
<tr>
<td>Hides, Skins, and Leather</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous Manufactures</td>
<td></td>
</tr>
<tr>
<td>Conclusion</td>
<td></td>
</tr>
<tr>
<td>Notes to Chapter IV</td>
<td></td>
</tr>
<tr>
<td><strong>V. TRADE, TRANSPORT, AND COMMUNICATION.</strong></td>
<td>322</td>
</tr>
<tr>
<td>Land Routes</td>
<td></td>
</tr>
<tr>
<td>Means of Transport</td>
<td></td>
</tr>
<tr>
<td>Water Routes</td>
<td></td>
</tr>
<tr>
<td>Boats</td>
<td></td>
</tr>
<tr>
<td>Air Routes</td>
<td></td>
</tr>
<tr>
<td>Postal, Telephone, and Telegraph Service</td>
<td></td>
</tr>
<tr>
<td>Radio, Television, Newspapers, and Motion Pictures</td>
<td></td>
</tr>
<tr>
<td>Trade</td>
<td></td>
</tr>
<tr>
<td>Markets</td>
<td></td>
</tr>
<tr>
<td>Notes to Chapter V</td>
<td></td>
</tr>
<tr>
<td><strong>VI. SUMMARY AND CONCLUSION</strong></td>
<td>360</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>364</td>
</tr>
<tr>
<td>APPENDIX I</td>
<td>401</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Introduced Pasture Grasses.</td>
<td>13</td>
</tr>
<tr>
<td>II. Sea Level Pressure.</td>
<td>22</td>
</tr>
<tr>
<td>III. Wind</td>
<td>26</td>
</tr>
<tr>
<td>IV. Cloudiness, Fog, and Thunderstorms.</td>
<td>29</td>
</tr>
<tr>
<td>V. Relative Humidity, Cloudiness, and Sunshine.</td>
<td>29</td>
</tr>
<tr>
<td>VI. Temperature</td>
<td>31</td>
</tr>
<tr>
<td>VII. Farm-to-Market Transport.</td>
<td>330</td>
</tr>
<tr>
<td>VIII. Marketing Farm Commodities.</td>
<td>356</td>
</tr>
</tbody>
</table>
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Aerial View of the Savanna</td>
<td>11</td>
</tr>
<tr>
<td>2.</td>
<td>Open Savanna Landscape</td>
<td>11</td>
</tr>
<tr>
<td>3.</td>
<td>Park Savanna Landscape</td>
<td>12</td>
</tr>
<tr>
<td>4.</td>
<td>Thorn Savanna Landscape</td>
<td>13</td>
</tr>
<tr>
<td>5.</td>
<td>Representative Soil Profiles</td>
<td>37</td>
</tr>
<tr>
<td>6.</td>
<td>Remnant of the Semi-Evergreen Forest on Reddish-brown Clay Soils</td>
<td>39</td>
</tr>
<tr>
<td>7.</td>
<td>Topography and Vegetation Associated with Copé Soils</td>
<td>41</td>
</tr>
<tr>
<td>8.</td>
<td>Copé Soil Landscape</td>
<td>41</td>
</tr>
<tr>
<td>9.</td>
<td>Tertiary and Quaternary Sandstones</td>
<td>42</td>
</tr>
<tr>
<td>10.</td>
<td>Guinea Grass Pasture on Brownish-red Savanna Clay</td>
<td>43</td>
</tr>
<tr>
<td>11.</td>
<td>Contrasting Vegetation on the Shallow and Deep Phases of Brownish-red Savanna Clay</td>
<td>45</td>
</tr>
<tr>
<td>12.</td>
<td>Mangrove Swamp</td>
<td>47</td>
</tr>
<tr>
<td>13.</td>
<td>Gallery Forest</td>
<td>48</td>
</tr>
<tr>
<td>14.</td>
<td>Three Vegetation Forms</td>
<td>55</td>
</tr>
<tr>
<td>15.</td>
<td>A Culturally Disturbed Gallery Forest</td>
<td>55</td>
</tr>
<tr>
<td>16.</td>
<td>Savanna Trees, Cut with Axes</td>
<td>56</td>
</tr>
<tr>
<td>17.</td>
<td>Excavating at Cerro Mangote</td>
<td>69</td>
</tr>
<tr>
<td>18.</td>
<td>Panama Tree</td>
<td>86</td>
</tr>
<tr>
<td>19.</td>
<td>Memorial to Gaspar de Espinosa</td>
<td>89</td>
</tr>
<tr>
<td>Figure</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>20. Church of San Juan de Dios de Natá</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>21. Sketch Map of Cañazas, Veraguas</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>22. Sketch Map of El Caño, Coclé</td>
<td>104</td>
<td></td>
</tr>
<tr>
<td>23. Sketch Map of Montijo, Veraguas</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>24. Sketch Map of La Atalaya, Veraguas</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>25. Plaza of Chitré, Herrera</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>26. Church and Plaza of Aguadulce, Coclé</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>27. Plaza of Natá, Coclé</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>28. Plan of Penonomé, Coclé</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>29. Children of Veraguas</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>30. School Children, Santiago, Veraguas</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>31. Mestizo Mother and Children</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>32. Racial Types, near Chitré, Herrera</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>33. Population Growth and Decline</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>34. Bohío of Wattle-daub, Straw, and Tile</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>35. Mestizo Mother and Baby in front of Two Bohíos</td>
<td>139</td>
<td></td>
</tr>
<tr>
<td>36. Bohío Frame</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>37. Detailed Sketch of Bohío Frame</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>38. Bohío of Cane-and-Thatch</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td>39. Wooden Bohío</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>40. Floor Plan of Typical Bohío</td>
<td>143</td>
<td></td>
</tr>
<tr>
<td>41. Floor Plan of Typical Bohío</td>
<td>143</td>
<td></td>
</tr>
<tr>
<td>42. Quincha-and-Thatch Bohío, with Detached Cane-and-Thatch Kitchen</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>43. Typical Rural Stove</td>
<td>147</td>
<td></td>
</tr>
<tr>
<td>44. Oven</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>45.</td>
<td>Water Storage Jar</td>
<td>149</td>
</tr>
<tr>
<td>46.</td>
<td>Spanish House of Quincha-and-Tile</td>
<td>154</td>
</tr>
<tr>
<td>47.</td>
<td>Tile Detail of Spanish House</td>
<td>154</td>
</tr>
<tr>
<td>48.</td>
<td>Detail of Porch Extension on the Spanish House</td>
<td>156</td>
</tr>
<tr>
<td>49.</td>
<td>Town Houses, Chiré, Herrera</td>
<td>156</td>
</tr>
<tr>
<td>50.</td>
<td>Wooden Spanish Town Houses, Santiago, Veraguas</td>
<td>157</td>
</tr>
<tr>
<td>51.</td>
<td>Detached Kitchen of the Spanish House</td>
<td>158</td>
</tr>
<tr>
<td>52.</td>
<td>Evolution of the Spanish and Indian Savanna Dwelling</td>
<td>162</td>
</tr>
<tr>
<td>53.</td>
<td>Jungle Vines Used for Tying</td>
<td>164</td>
</tr>
<tr>
<td>54.</td>
<td>Detail of Porch Roof of the Spanish House</td>
<td>165</td>
</tr>
<tr>
<td>55.</td>
<td>Detail of Method Used for Fastening Posts, Beams, and Rafters in a Hip-Roofed Kitchen</td>
<td>165</td>
</tr>
<tr>
<td>56.</td>
<td>Oxen and Cart</td>
<td>168</td>
</tr>
<tr>
<td>57.</td>
<td>Kitchen Frame</td>
<td>168</td>
</tr>
<tr>
<td>58.</td>
<td>Preparing Quincha</td>
<td>169</td>
</tr>
<tr>
<td>59.</td>
<td>Preparing Quincha</td>
<td>170</td>
</tr>
<tr>
<td>60.</td>
<td>Semi-Detached Kitchen, Ready for Plastering with Quincha</td>
<td>171</td>
</tr>
<tr>
<td>61.</td>
<td>Spanish House</td>
<td>172</td>
</tr>
<tr>
<td>62.</td>
<td>Plastering a Wall with Quincha</td>
<td>172</td>
</tr>
<tr>
<td>63.</td>
<td>Smoothing Quincha with Wet Fist</td>
<td>173</td>
</tr>
<tr>
<td>64.</td>
<td>Housebuilders Pausing to Sip Chicha</td>
<td>173</td>
</tr>
<tr>
<td>65.</td>
<td>Kitchen Frame</td>
<td>174</td>
</tr>
<tr>
<td>66.</td>
<td>Floor Plan of Spanish House</td>
<td>176</td>
</tr>
<tr>
<td>67.</td>
<td>Floor Plan of Spanish House</td>
<td>176</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>68</td>
<td>Floor Plan of Spanish House</td>
<td>177</td>
</tr>
<tr>
<td>69</td>
<td>Plan of Huerta-House Assemblage</td>
<td>177</td>
</tr>
<tr>
<td>70</td>
<td>Tambo, or Building with No Walls</td>
<td>181</td>
</tr>
<tr>
<td>71</td>
<td>Sign Erected to Advertise the Government's Rural Housing Program</td>
<td>183</td>
</tr>
<tr>
<td>72</td>
<td>A Roza Field</td>
<td>191</td>
</tr>
<tr>
<td>73</td>
<td>Felling Large Trees</td>
<td>191</td>
</tr>
<tr>
<td>74</td>
<td>Agricultural Implements</td>
<td>196</td>
</tr>
<tr>
<td>75</td>
<td>Irrigated Rice</td>
<td>208</td>
</tr>
<tr>
<td>76</td>
<td>Yuca</td>
<td>217</td>
</tr>
<tr>
<td>77</td>
<td>Irrigated Sugar Cane Field</td>
<td>225</td>
</tr>
<tr>
<td>78</td>
<td>Spanish Gate</td>
<td>250</td>
</tr>
<tr>
<td>79</td>
<td>Criollo Steers Grazing on Faragua</td>
<td>253</td>
</tr>
<tr>
<td>80</td>
<td>Panamanian Dog and Iguana</td>
<td>261</td>
</tr>
<tr>
<td>81</td>
<td>Commercial Fishing Fleet, Panama City</td>
<td>264</td>
</tr>
<tr>
<td>82</td>
<td>The Playa Grande</td>
<td>267</td>
</tr>
<tr>
<td>83</td>
<td>The Playa Grande</td>
<td>267</td>
</tr>
<tr>
<td>84</td>
<td>Fish Weir</td>
<td>268</td>
</tr>
<tr>
<td>85</td>
<td>Black Palm</td>
<td>277</td>
</tr>
<tr>
<td>86</td>
<td>Campesina Clothing Styles</td>
<td>289</td>
</tr>
<tr>
<td>87</td>
<td>Pounding Rice in a Pilón</td>
<td>293</td>
</tr>
<tr>
<td>88</td>
<td>King's Bridge, Panama City</td>
<td>325</td>
</tr>
<tr>
<td>89</td>
<td>Concrete Bridge and National Highway</td>
<td>326</td>
</tr>
<tr>
<td>90</td>
<td>Macadam Portion of National Highway</td>
<td>327</td>
</tr>
<tr>
<td>91</td>
<td>Gravel Portion of National Highway</td>
<td>327</td>
</tr>
<tr>
<td>92</td>
<td>Dirt Farm-to-Market Road</td>
<td>329</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>93.</td>
<td>Las Cruces Trail</td>
<td>329</td>
</tr>
<tr>
<td>94.</td>
<td>The Chagres River Meets the Atlantic</td>
<td>331</td>
</tr>
<tr>
<td>95.</td>
<td>Team of Oxen</td>
<td>333</td>
</tr>
<tr>
<td>96.</td>
<td>Method of Horse Transport</td>
<td>334</td>
</tr>
<tr>
<td>97.</td>
<td>Transporting Milk by Horse</td>
<td>335</td>
</tr>
<tr>
<td>98.</td>
<td>Camioneta (Station Wagon)</td>
<td>336</td>
</tr>
<tr>
<td>99.</td>
<td>Chiva (Bus-Truck)</td>
<td>337</td>
</tr>
<tr>
<td>100.</td>
<td>Street Market</td>
<td>348</td>
</tr>
<tr>
<td>101.</td>
<td>Public Market Building</td>
<td>349</td>
</tr>
<tr>
<td>102.</td>
<td>Interior of Public Market</td>
<td>349</td>
</tr>
<tr>
<td>103.</td>
<td>Abattoir at Chitré, Herrera</td>
<td>351</td>
</tr>
<tr>
<td>104.</td>
<td>Buying Meat at Public Market</td>
<td>352</td>
</tr>
<tr>
<td>105.</td>
<td>Roadside Stands</td>
<td>352</td>
</tr>
<tr>
<td>106.</td>
<td>Typical General Store</td>
<td>355</td>
</tr>
</tbody>
</table>
# LIST OF MAPS

<table>
<thead>
<tr>
<th>Map</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Index Map of Panama</td>
<td>before 1</td>
</tr>
<tr>
<td>II. Relief and Natural Vegetation</td>
<td>after 4</td>
</tr>
<tr>
<td>III. Mean Annual Rainfall</td>
<td>after 28</td>
</tr>
<tr>
<td>IV. Climatic Types</td>
<td>after 32</td>
</tr>
<tr>
<td>V. Present Vegetation</td>
<td>after 33</td>
</tr>
<tr>
<td>VI. Length of Dry Season</td>
<td>after 34</td>
</tr>
<tr>
<td>VII. Soils</td>
<td>after 36</td>
</tr>
<tr>
<td>VIII. Archaeological Sites</td>
<td>after 68</td>
</tr>
<tr>
<td>IX. Indian Cultures of 1500 A.D.; Spanish Entradas, Exploration, and Settlement before 1521 A.D.</td>
<td>after 75</td>
</tr>
<tr>
<td>X. Tribes and Chiefs in 1500 A.D.</td>
<td>after 81</td>
</tr>
<tr>
<td>XI. Indian Population Density, 1500 A.D.</td>
<td>after 82</td>
</tr>
<tr>
<td>XII. Settlement Types, According to Function</td>
<td>after 86</td>
</tr>
<tr>
<td>XIII. Population Distribution, 1950</td>
<td>after 112</td>
</tr>
<tr>
<td>XIV. Population Density, 1950</td>
<td>after 112</td>
</tr>
<tr>
<td>XV. Population Distribution of Modern Indians, 1950</td>
<td>after 113</td>
</tr>
<tr>
<td>XVI. House Wall Construction</td>
<td>after 138</td>
</tr>
<tr>
<td>XVII. Roof, Wall, and Floor Construction</td>
<td>after 138</td>
</tr>
<tr>
<td>Map</td>
<td>Page</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
</tr>
<tr>
<td>XVIII. House Types.</td>
<td>after 175</td>
</tr>
<tr>
<td>XIX. Land Transport</td>
<td>after 324</td>
</tr>
<tr>
<td>XX. Air and Water Transport</td>
<td>after 339</td>
</tr>
<tr>
<td>XXI. Communications</td>
<td>after 341</td>
</tr>
</tbody>
</table>
LIST OF ABBREVIATIONS

ACM ........ Archivo Central de Marina, Museo Naval, Madrid
AGI ........ Archivo General de Indias, Sevilla
IFI ........ Instituto de Fomento Económico
INA ........ Instituto Nacional de Agricultura
RAH ........ Real Academia de Historia, Madrid
SICAP ...... Servicio Interamericano de Cooperación Agrícola en Panamá
UAAMP ...... University of Arkansas Agricultural Mission to Panama
ABSTRACT

This study of the savanna of central Panama is primarily one of cultural geography; it deals with the relationships between culture and nature. From the time of Indian dominance up to the modern era, central Panama has been a center for the concentration and origin of culture traits that have spread to adjacent areas. In this respect it may be considered the cultural hearth of Panama. The central savanna has functioned as the Panamanian hearth since the pre-Hispanic Coclé peoples attained a relatively high civilization in the area. Spain successfully introduced its culture to Panama in the sixteenth century, and the former Indian culture was submerged, though not totally destroyed. Indian culture and race were blended with that from Iberia. A new race, the mestizo, emerged to bear a new culture that was neither all Indian nor all Spanish.

More than three years of library and archival research preceded the writing of this study. An entire year (1955-56) was devoted to field work in the Republic of Panama. Final composition was done at the Department of Geography and Anthropology, Louisiana State University, and at the University of Miami, Florida.
ABSTRACT--Continued

The question of the genesis of the savanna is the primary physical problem of the work. Man is seen as an important force in modifying the natural landscape, in interaction with climate, soil, and vegetation. The discussion of this, in Chapter I, serves as a physical basis for an understanding of the five succeeding, culturally oriented chapters.

It is possible to understand the present man-land relationships only if the historical and prehistorical ones are first comprehended. Special attention is given in Chapter II to population and settlement, from pre-Columbian times to date. From this comes an awareness that settlement types and forms, and population have diffused from the savanna hearth. Another significant feature of the cultural landscape is the rural dwelling, discussed in Chapter III. Two distinct house types prevail today in the area: one is basically Spanish; the other, Indian. Investigation of the rural dwelling affords an excellent opportunity to sift and sort cultural elements from a larger complex. In so doing it is learned that Spanish traits predominate. The same Iberian dominance is again noted in Chapter IV, which deals with rural economies.

Nothing is more basic to cultural geography than man's use of the land. Therefore, more space is devoted to agriculture, animal husbandry, and related activities
ABSTRACT—Continued

than to certain other aspects of material culture.
Evidence is offered to support the view that the modern
Panamanian agricultural complex is essentially of Spanish
origin. Iberian supremacy is further observed in the realm
of trade, transport, and communications, covered in
Chapter V.

Analysis suggests that the Indian made the following
major contributions to the cultural landscape: (1) he
altered the natural environment with fire; (2) he was
responsible for one of the two basic house types; (3) he
had become thoroughly familiar with virtually all useful
native plants before the Conquest, and had domesticated
many of them; (4) he established population centers that
still persist; and, (5) he developed avenues of trade and
communication. The latter served for the dispersal of
Spanish culture as it had served for Indian dispersals.

All of the above-mentioned Indian contributions have
merged with similar Spanish elements. Furthermore, count-
less European traits were added to the existing aboriginal
complexes; even new complexes were introduced. Colonial
Spain provided an extensive livestock complex; modern
North America, the automobile complex. For these reasons,
the cultural landscape of central Panama today is
generally European and specifically Iberian.
INTRODUCTION

The central savanna has long been the cultural hearth of what is now the Republic of Panama (Map I). As such it has served as a center of concentration and origin of culture traits that have spread to adjacent areas. It is with the hearth area that this study in cultural geography is primarily concerned. Prehistorically, the oldest culture known to the Isthmus appeared on the savanna, probably between 1 A.D. and 500 A.D. A general cultural evolution gave rise to the magnificent Coclé civilization, encountered by the conquistadores in 1515. At that time, the limits of Coclé culture corresponded closely with those of the hearth, and from this cultural center Coclé traits had been widely diffused. The aboriginal culture was shattered during the first two decades of Spanish conquest and settlement (1515-1535). During this period, control of the hearth passed from Indian to European. So thoroughly was Hispanic culture imposed on the natives that much of it diffused to groups still unconquered.

Spanish colonization in the New World, unlike English or French, was a methodical plan to "reduce" (not destroy) the Indians and establish Iberian cultural patterns at virtually every level of society. This was not fully achieved, but mestizo culture in Panama today is more nearly
Spanish than is generally believed. When the modern material
culture of rural Panama is broken down into patterns, com­
plexes, and traits it is relatively simple to ascertain what
is or is not Spanish. Many traits, formerly thought to be
traditionally Indian, have modern equivalents in Spain.
Furthermore, a large body of traits was known to both
Spaniard and Indian before the Conquest. The conquistador
found many things in central Panama familiar to him from
Spain. However, in most instances the cultural elements were
not identical.

Again, contrary to popular opinion, not all Spanish
influences in central Panama are of Andalucian or
Extremadurian origin. Many elements from the cultures of
northern Spain diffused to the savanna, for colonists came
to America from all sections of Iberia. One section of the
central savanna, in the Azuero Peninsula, was settled to a
large degree by people from Asturias and other northern
Spanish provinces. This is clearly the most Hispanic part
of the Republic today. Throughout the study comparisons will
be made between this strongly Spanish portion of the savanna
and other areas possessing a stronger Indian flavor.

The hearth served Spanish culture in much the same
manner as it had previously served the Cocolé peoples. The
area became a new center of dispersals, and from it the
culture of colonial Spain diffused east and west. Today in
Panama, family names, kinship, legends, songs, dances, dress,
vocabulary, numerous institutions, and other cultural forms
may be traced to savanna origins. And, most important, there arose there the mestizo class—a product of the blending of Indian and Spanish physical types. The more than a quarter of a million mestizos living in the hearth are the protagonists of the most typical Panamanian culture at the present time. Culturally, the savanna mestizo is a well-integrated individual, belonging to a stable society. Moreover, he senses that he "belongs" and considers himself an interiano, or citizen of the interior (central savanna). The urban Panamanian always points to the interiano when asked who represents the "typical" Panamanian. It is the mestizo's homeland that merits the designation "the true Panama."

In contrast to the cultural solidarity found in the hearth, the trans-Isthmian population (between Panama City and Colón) has never attained a feeling of social unity. This group is composed of people from six continents, representing all races, most of the world's major languages and religions, and possessing an assortment of dissimilar cultures. Traditionally, the population along the route of interoceanic passage has been mercenary, living off the world's commerce. Many nationalities are recognized among this group. Usually the person claiming to be a panameño hurriedly adds that he, or his family, comes from the interior.

Since this study is primarily a cultural one, it focuses on the mestizo and the cultural landscape that he and his Spanish, Indian, and Negro forebears have created.
A major objective is to determine the relationships between mestizo culture and the natural landscape. For this reason, the physical habitat is considered to be the stage upon which the culture of the savanna has appeared and matured. An understanding of the landscape can best be accomplished through an evaluation of the physical and cultural processes involved; by regarding the culture of Panama as never static; by considering the value systems of the people concerned; and by investigating technological evolution in the savanna.

A large portion of the first chapter is devoted to a discussion of the origin of the savanna, its physical nature, and its desirability as a home for man. As in the case of the cultural landscape, it has never been studied in detail, nor fully understood. Most geographers treat savannas as a product of certain climatic influences. This is not the case in central Panama. The central savanna is either the result of culture or determined by peculiar edaphic conditions. Climate is, at best, a secondary influence. The question of the genesis of the savanna is the primary physical problem in this study.

Central Panama is more than a cultural unit. It is largely a portion of one of the five major landscape subdivisions represented by Map II. Comparing Map II with Maps III-VII we observe that the natural landscapes include: (1) the coastal lowlands of the Atlantic coast; an area of heavy rainfall, dense jungle, and deep clay soils. (2) The forested lowlands and hills of the Pacific coast include
Rubio and Guzmán, Regiones Geográficas Panameñas (Panama, 1957).
R.P., Dir. de Cartografía, Mapa Especial No. 2, 1:500,000 (Panama, 1937).
R.P., Dir. de Cartografía, Mapa de Suelos—Llanos de Cock, 1:50,000 (Panama, 1955).
R.P., Dir. de Cartografía, Mapa de Suelos—Región Surorl de Chirigui, 1:50,000 (Panama, 1936).
Savanna-covered hills & plains, below 300 meters
Forested hills & plains, below 300 meters
Forested hills & plains, above 300 meters
Mangrove-covered swamp, & tidal flats, below 10 meters

Known elevation, in meters
most of Darién Province, the southern end of the Canal Zone and the hills to the west, portions of Veraguas and Chiriquí provinces, and the Panamanian islands in the Pacific Ocean. (3) The mountainous sections extend east and west of the Canal Zone, reach into the Azuero Peninsula, and form the Serranía de Maje between Panamá and Darién provinces. (4) Mangrove swamps, marsh, and tidal flats border the Pacific in places, and a large expanse of mangrove swamp is found around the Chiriquí Lagoon. (5) The savannas of the Pacific watershed stretch from the lower course of the Bayano River westward to Chiriquí Province. The discontinuous savanna belt may be divided into three distinct areas, occupying a total area of approximately 5,000 square miles.

Of the three savanna landscapes, the central savanna most accurately represents the blending of advanced aboriginal culture with that of colonial Spain. The inhabitants of the eastern savanna, on the other hand, are not typically mestizo today. This area witnessed an early concentration of Negroes who escaped from Spanish masters in the trans-Isthmian zone. Furthermore, the east never had a large, advanced, pre-Columbian culture. The western savanna is merely a cultural extension of the central one. Chiriquí Province possessed a relatively high native civilization before the Conquest, and European settlement types follow closely those of central Panama. Moreover, the west was colonized by people from the cultural hearth at a much later date, and does not provide so rich an accumulation of
colonial Spanish elements as the study area. To a large
degree, the mestizo culture of the central savanna has not
been spoiled by recent trends. It has remained relatively
free from commercial plantation development, industrial-
ization, and immigration.

**Previous work done in the Central Savanna**

Angel Rubio, Professor of Geography, University of
Panama, is the only other cultural geographer to have under-
taken research in the savanna. He has investigated
Panamanian culture for more than twenty years. Before coming
to Panama from Spain, Rubio devoted most of his energies to
work in the Archivo General de Indias, Sevilla. All of his
published works relative to this study are listed in the
Bibliography, as are those of the below-mentioned authors.

Recently, one doctoral dissertation in geography has
appeared, dealing with Panamanian farming on a nation-wide
basis. Written by Louis Guzmán, the study is primarily one
of agricultural economics. Another dissertation, by Dorthea
E. Burton, focuses on the economic geography of the entire
Republic. This regional study is not developed historically
or culturally.

Of the early visitors to Panama, one man stands above
all others, Gonzalo Fernández de Oviedo y Valdés, who came
to Santa María de la Antigua del Darién (formerly located in
what is now Colombia) on June 30, 1514. His residence in
Castilla del Oro (the Isthmus west of the Gulf of Darién)
lasted until 1525, though two brief trips to Spain intervened
during this period. Oviedo's writings touch on all phases of the natural and social sciences, and he was the first man to publish an on-the-scene account of the natural history of Panama. He traveled through most of the central savanna, and we must turn to him for the best of the sixteenth-century accounts. In classic reports (relaciones) made to the Spanish government by the earliest Spanish explorers, there are occasional references to Panama. Especially significant are the narratives of the first two Espinosa expeditions.

The pre-Columbian culture of the central savanna went without investigation until 1915. In that year, Karl P. Curtis of the Canal Zone recognized the existence of the Coclé civilization. Field work, however, was postponed until 1925-26, when A. Hyatt Verrill made some exploratory excavations in Coclé Province. The most noteworthy archaeological work began in 1930, near Penonomé, Coclé. Samuel K. Lothrop and his collaborators made a spectacular find at Sítio Conte. Investigations were later conducted in other parts of Coclé Province and in Veraguas Province. Recent work in the savanna has been done by M. W. Stirling, G. R. Willey, and C. R. McGimsey III.

It is hoped that a cultural study of this sort will do much to unite the geographical and anthropological investigations that have already been made in the area. No deliberate attempt has been made to synthesize the findings of other researchers, for such works are readily available to the interested reader. The study is historical, descriptive,
and analytical, but slight attention is paid to suggesting changes or predicting the course of future events. The reader is left free to speculate about such things and my only desire is to provide a sound foundation of the cultural geography of the central savanna.
NOTES TO THE INTRODUCTION

1. Throughout this study, the term Isthmus is used as a proper name and refers to the total land area of the Republic of Panama. This is in complete agreement with virtually all authors on the subject.

2. The trans-Isthmus area is that narrow zone between the Pacific and Atlantic Oceans, approximating the present Canal Zone territory and adjacent lands in the Republic. As a hyphenated word it conforms to general usage in Panama and in the literature. The highway linking Panama City and Colón is officially known as the Trans-Isthmian Highway.
CHAPTER I

THE ORIGIN AND NATURE OF THE SAVANNA

Among the current theories that attempt to explain the origin of savannas, only three have gained many adherents: (1) The climatic theory, based on rainfall deficiency; (2) the edaphic theory, based on chemical deficiency in the soil or on subsoil drainage characteristics; (3) the cultural theory, based on the activity of man. This chapter analyzes the three theories of savanna origin. A detailed treatment is deemed necessary, for the tree-studded, grassy plain is the most conspicuous and significant feature of the central Panamanian landscape.

Seen from the air, the savanna resembles a mid-latitude prairie (Fig. 1). The plain is flattest toward the sea, but becomes rolling further inland. Savanna blends into forest on the slopes of the mountains and hills to the north, west, and southwest (compare Maps II and V). Scattered throughout the savanna plain are occasional low, flat-topped hills of basalt. Many streams, bordered by gallery forests, flow from the mountains and wind across the plain. During the dry season (mid-December to mid-April), a number of the smaller streams disappear. But, when rains are heaviest (usually in October), the rivers become swollen and overflow.
Fig. 1.—Aerial view of the savanna, near Chitré, Herrera (looking south). Widely spaced trees are chiefly Mimosa sp. and Acacia sp., while pasture grasses are Hyparrhenia rufa (faragua) and Panicum maximum (Guinea). March 17, 1956.

Fig. 2.—Open savanna, five miles west of Penonomé, Coclé. Panicum purpurascens (Paré) is the grass in the foreground. Woody vegetation occurs on the ridge in the distance. November 5, 1955.
The savanna may take the form of almost pure grass (open savanna, Fig. 2), grassland with widely spaced trees (scattered-tree savanna, Fig. 1), with "islands" of trees (park savanna, Fig. 3), or with scattered gnarled trees or bushes (orchard, dry, or thorn savanna, Fig. 4). There are no palm or pine savannas in central Panama, such as occur in other parts of tropical America.

Fig. 3.—Aerial view of the Park savanna, near Chamé, Panamá. Some gullying has occurred in the sandy soils. The palms in the center are cultivated. March 17, 1956.

Today, the central savanna is primarily a grassland, with introduced domestic grasses predominating. The most important introduced grasses are listed in Table I.
Fig. 4.—Thorn savanna, five miles east of El Roble, Coclé. The trees are Mimosa sp. and Acacia sp. In the center may be seen a native cactus (Nopalea dejecta). April 14, 1956.

TABLE I

INTRODUCED PASTURE GRASSES

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynodon dactylon</td>
<td>Bermuda grass</td>
</tr>
<tr>
<td>Hyparrhenia rufa</td>
<td>faragüa, iaragüa, yaraguá,</td>
</tr>
<tr>
<td>Melinis minutiflora</td>
<td>calingêiro, iaragüa, yaguará,</td>
</tr>
<tr>
<td>Panicum maximum</td>
<td>Guinea or India grass</td>
</tr>
<tr>
<td>P. purpurascens; P. barbinode</td>
<td>Pará grass</td>
</tr>
<tr>
<td>Paspalum notatum</td>
<td>Paraguay, Paspalum, or Bahía grass</td>
</tr>
<tr>
<td>Pennisetum purpureum</td>
<td>elefante, elephant, or Napier grass</td>
</tr>
<tr>
<td>Pueraria phaseoloides</td>
<td>Kudzu</td>
</tr>
</tbody>
</table>
Within the grassy plains woody growth occurs as scattered bushes and trees, and forms gallery forests along stream courses. In wet areas, where soils are deep and drainage good, there are over one hundred species of trees. However, where edaphic conditions are unfavorable, there are fewer species. Poor soil may reduce tree height and support spiny legumes, such as *Prosopis juliflora* (mesquite, *aromo*), and *Acacia farnesiana* (also called *aromo*). In regions where burning has been practiced on poor soils there is a high percentage of fire-resistant species. They include such common plants as *Curatella americana* (sandpaper-tree, *chumico*) and *Xylopia frutescens* (malaguetahembra). Other characteristic bushes are *Byrsonima* sp. and *Anacardium occidentale* (cashew, *marañon*). There is also a variety of sedges, native grasses, and trees. The most typical and wide-spread savanna trees are of the family Mimosaceae (genus *Mimosa* or *Acacia*). *Enterolobium cyclocarpum* (ear-tree, *corotí*), a large mimosa with a distinctive ear-shaped seed pod, is the single most characteristic savanna tree.

**Origin of the Name "Savanna"**

The first published mention of the word "savanna" seems to have been made by the Spanish chronicler, Peter Martyr, shortly before his death in 1526. In writing of the Spanish colony of Savana, Hispaniola, Martyr says:

...thus named because it stands in a savana, that is to say, in a swampy plain
overgrown with grass very suitable for rearing cattle and horses; such is the name given in Spain to a place of this kind.³

Martyr's interpretation is suspect, for there is no evidence that the word was known in Spain before the Voyages of Discovery.

The next Spaniard to write of savannas in the New World was Gonzalo Fernández de Oviedo y Valdés. In 1535, he said:

The name savanna is given to land which is treeless but with a lot of grass, either tall or short.⁴

Oviedo makes frequent reference to the savannas of Panama and tropical America throughout his Historia.

Bartolomé de Las Casas was the third of the three principal Spanish historiographers to describe the tropical grasslands. Referring to Santo Domingo, Hispaniola, he states:

...and therefore, the Spaniards call the province 'of the savanna,' because savanna in the language of the Indians means plain.⁵

The word "savanna" is probably of Carib origin, although some sources attribute it to the Arawaks or Tainos. The Spanish word for savanna, sabana, does not appear to be related to the Spanish sábana, meaning a sheet or blanket. It is logical to make the inference that savannas are as flat and bare as a sheet, but there is no record that Spanish-speaking peoples ever used the word sábana to mean sabana. The fall of the accent is most important in spoken Spanish, and Spanish historians generally attribute the term
to the Indies. Beard has suggested a modern definition for the word savanna: "Any grassland in tropical America, with or without trees or shrubs, natural or man-made."  

**Previous Studies of Savanna Areas**

Probably the first scholar to consider the origin of American savannas was Saint-Hilaire. In 1831 he devised the concept of original vegetation and laid the foundation for the first theory of plant succession. Saint-Hilaire's studies in Brazil led him to believe that grasslands could be artificially created through burning. He further held that if burning was stopped before the second-growth vegetation was destroyed, the area would revert to forest.

It remained for Grisebach, in 1872, to present a true ecological treatment of tropical grasslands. The theory of climatically determined savannas made its first serious entry into the literature at this time. Grisebach attributed savannas to the alternation of wet and dry seasons. This concept of a "savanna climate" became increasingly important and was supported by another student in 1892. In that year, Warming published the results of field work done in Brazil between 1863 and 1866. He noted the association of savannas with a wet-and-dry, seasonal climate, but he also recognized the edaphic factor. Warming dismissed the notion that some savannas might owe their origin to fire. In 1909, however, Warming returned to the climatic theory, neglecting edaphic factors altogether. It is possible that he was
influenced by Schimper, who reiterated the climatic theory of Grisebach and spoke in terms of "grassland climate" and "woodland climate." Schimper's basic argument was that dry, cool winters or a very long rainless season were unfavorable to forests. A number of other writers devoted some attention to the savannas soon after this time. Among the more prominent were Warming and Graebner, Bouillenne, and Bews.

The idea of a so-called "savanna climate," which may have originated with Grisebach, has prevailed to the present day. Geographers, more than any other professional group, have held out for a theory of climatic climax savanna. This was, and is, done in spite of evidence to the contrary. As early as 1932, Karl Sapper published the results of field work done years earlier in Central America, citing areas found in that region where climate alone could not explain the occurrence of a savanna. He went so far as to discuss the influences of soil and culture on savanna formation. But German writers were largely ignored by North American students. J. G. Myers was more widely read in the 1930's than Sapper. Myers holds to the climatic climax hypothesis, and says that most savannas are of this type.

Most college freshmen are still taught that "savanna climate" produces savanna vegetation. Several of our leading basic geography texts present this concept. Although there has been a recent trend to rename the climatic type, savanna vegetation continues to be related to
alternating wet and dry seasons.\(^{18}\) Even on the graduate level, faulty interpretation of Köppen's works often leads students to believe that Aw climate is savanna climate. In studies dealing specifically with Panama, Angel Rubio couples alternating wet and dry seasons with the rain-shadow effect of the cordillera to explain the existence of the central savanna.\(^{19}\) None of Professor Rubio’s writings indicates a consideration of cultural or edaphic factors.

As Beard points out, nearly all writers have regarded fire as a secondary factor because it has been assumed that a natural grassland or low, open vegetation was first present.\(^{20}\) During the dry season such low growth is susceptible to fire and is later modified by it. Degradation of forest to savanna by felling and burning (the savanna thus being purely a fire climax) is popular with very few. However, there are some notable exceptions. First, there is the work of Saint-Hilaire. Walter Busse developed the hypothesis that the tropical savannas and steppes of Africa were originally forests.\(^{21}\) Through constant burning, Busse argues, they have been transformed into open grasslands. H. M. Cristoffel says essentially the same thing, when describing the process of felling and burning practiced by the aborigines of the Guiana plateau.\(^{22}\) Another supporter of the fire climax theory is Felix Rawitscher, who arrived at this conclusion for the Brazilian cerrado at Emas.\(^{23}\) Probably most significant to American geographers is the full support given the fire climax hypothesis by Carl Sauer.
Sauer says:

Suppression of fire results in a gradual recolonization by woody species in every grassland known to me. I know of no basis for a climatic grassland climax, but only of a fire grass "climax" for soils permitting deep rooting.24

Note that Sauer does not ignore the edaphic influence on vegetation formation.

The idea that savannas owe their existence entirely to edaphic factors began with Pulle. In 1906 he suggested that the savannas of Surinam were of this nature.25 Pulle advocates severe leaching as the prime cause for grassland formation. Ijzerman, working in the same general area, points out that the climate in the Surinam savanna is no different from that of adjacent forest zones.26 Lanjouw accepts the edaphic theory of Pulle and Ijzerman, but also recognizes the secondary roles of fire and climate.27 As soon as soil deterioration has sufficiently impoverished the woodlands, he thinks that burning alone will maintain the character of the vegetation.

The edaphic origin of savannas is further supported by Bennett and Allison's study of Cuban soils,28 and by Bennett's work in the Canal Zone.29 In Cuba it was observed that certain rocks, notably serpentine, seem to be associated with savannas. However, no definite correlations have been made between savanna and parent material.

A number of other researchers have been concerned with questions of soil moisture. They include Vageler,30
Charter, Van Der Merwe, Milne, Richards and Mohr and Van Baren. The most prolific contributor to savanna ecology is J. S. Beard. His main interests are problems of drainage, waterlogging, porosity, and related vegetation. The following summary of the theories of savanna origin is modified from Beard.

1. CLIMATIC: Based on Moisture Deficiency
   (a) The savannas are due to alternating wet and dry seasons.
   (b) The savannas are associated with a seasonal climate and special soil conditions which decrease available moisture.
   (c) Rainfall periodicity is the root cause of savanna formation, but the vegetation has been later modified by fire.

2. EDAPHIC: Based on Chemical Deficiency in the Soil
   (a) Profound leaching of the soil produces a poor, low forest that is liable to burn. Through burning the forest is converted into savanna.
   (b) Certain geological formations develop soils that can support only savannas.

   Based on Subsoil Drainage
   (a) Savannas occur upon more or less flat areas with impeded soil drainage, generally due to the presence of an impermeable layer in the soil.
   (b) Savannas occur in exceedingly sandy areas where soil drainage is not impeded and an arid soil climate results.

3. CULTURAL: Based on Man's Activity
   (a) Savannas have resulted from the destruction and burning of the forest by man, the result being purely fire climax.
   (b) In addition to burning, man has introduced certain domesticated animals that have further reduced the growth potential of woody plants through browsing and trampling.
Regardless of the causes underlying savanna formation in other parts of the world, the central savanna of Panama appears to be primarily edaphic in origin. Subsoil drainage is the principal determining factor, although there are a few areas of man-made savanna. Both edaphic and cultural savannas have been further modified by fire.

**Climate and Vegetation**

The climate of Panama is characteristic of low latitudes in the inner tropics. Temperatures and humidity are high throughout the year, and rainfall is abundant for most of the year. There is relative freedom from violent general storms, such as hurricanes, and wind damage is rare. Great departures from normal conditions are infrequent, except for rainfall. Noteworthy features usually concern variations in length of the dry season, excessive rains in the late rainy season, and an occasional norther during the dry season.

In the mid-latitudes, where frontal activity predominates, fluctuations in weather elements are extreme. Frequently, climatological means may serve to obscure rather than reveal the actual weather conditions. In Panama, however, only rainfall varies greatly, and the other climatological means can be considered representative of the daily weather. This is fortunate, because the Republic has no organized meteorological service. For weather data Panama usually depends on the Meteorological and Hydrographic Branch of the Panama Canal Company.
When it is said that the range through which meteorological elements fluctuate is narrow, it does not mean that conditions are constant throughout the year. Nonetheless, for some elements, such as pressure, this is essentially true (Table II).^{39} Within each month, and even within each season, the relative constancy is easily observed. Nevertheless, the seasonal change in meteorological conditions from dry to wet, or wet to dry, is clearly discernible.\(^{40}\)

**TABLE II**

**SEA LEVEL PRESSURE**

(Inches)

<table>
<thead>
<tr>
<th>Station</th>
<th>Years of Record</th>
<th>Bi-hourly Mean</th>
<th>Record Maximum</th>
<th>Record Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balboa Hts.</td>
<td>50</td>
<td>29.831</td>
<td>30.053</td>
<td>29.610</td>
</tr>
<tr>
<td>Madden Dam</td>
<td>24</td>
<td>29.826</td>
<td>30.045</td>
<td>29.620</td>
</tr>
<tr>
<td>Cristóbal</td>
<td>48</td>
<td>29.847</td>
<td>30.080</td>
<td>29.628</td>
</tr>
</tbody>
</table>

Climatically the Republic of Panama lies in an area primarily dominated by the southern limits of circulation around the Bermuda high-pressure cell. On April 13, the zenithal position of the sun moves northward across Cristóbal-Colón. This is followed by the northward displacement of the Atlantic anticyclone and the northeast Trades. Winter, or *el invierno*, begins in Panama at this time.\(^{41}\) By May the Trades have moved far enough to the north to permit the region of equatorial low pressure to cover Panama. The sun recrosses Cristóbal-Colón on August 29, followed by the
southward displacement of equatorial low pressure, Trades, and oceanic anticyclones. Panama is again the meeting place of Trades and Doldrums by November. The regression southward is sufficient, by December, to bring the region again entirely within the Trade Wind belt, where it remains until April or May. The dry season, when the Trades predominate, is known locally as _el verano_, the summer. \(^{42}\)

The dry season begins when the Bermuda high strengthens in intensity. It carries an influx of stable, subsiding air aloft which effectively limits the diurnal convective activity. When the high gradually weakens and, with many fluctuations, retreats from the western Caribbean, the dry season ends. During the latter part of the dry season, when there are numerous brush fires, surface visibility is often restricted to a few miles. This is due to the subsidence inversion at 8,000 to 10,000 feet, which acts as a lid to hold haze and smoke to the lower levels. Usually the maximum concentration of haze and smoke is found immediately below the subsidence inversion.

In July and parts of August the conditions with respect to rainfall are similar to those near the beginning of the wet season. The wind flow aloft is predominantly easterly, for by this time the Atlantic anticyclone is a more or less permanent feature to the north. The steady easterly Trades aid in convection, producing showers on the windward (northern) side of the _cordillera_. However, they tend to dissipate convective processes on the leeward side.
For this reason, July and/or August is commonly referred to as el veranillo, or "little summer." The Trades reach a velocity of twenty-five to thirty miles per hour aloft and convection is apparently limited to the strong Trade inversion. High velocity Trades tend to keep the equatorial front south of Panama for a few weeks during this period.

Recent investigations by Crowe suggest that the Trade Winds are subject not only to seasonal migration, but also to seasonal pulsation. Pulsations in the mean strength, or east-west contraction and expansion, account for certain climatic variations within a given season. Crowe believes that rainfall will be greater when a segment of the Trades expands, and will decrease with contraction. This helps explain the great amounts of rain accompanying the onset of the Trades in many parts of the tropics. According to Crowe, the veranillo occurs when the Trades contract.

Intertropical Convergence Zone (ITC)

Many meteorologists consider the Doldrums and the ITC as one and the same. This is perhaps true for ocean areas far removed from large land masses, but is not the case in Panama. On occasions there are two fronts of weather within the Doldrums in Panama (from April to December), with improved weather between. The ITC is quite unlike the well-developed fronts accompanying polar air masses in the mid-latitudes. Crowe describes it as "a mobile, evanescent feature of a synoptic situation." This is a reasonable
statement, because the ITC is difficult to forecast and the
weather intensity and distribution vary considerably from
day to day. Usually the fronts occur on the boundary between
the Trades and the Doldrums to the north of Panama, and the
relatively cold waters of the Humboldt Current and the
Doldrums to the south. Possibly two fronts exist when a
main front advances a little north of its normal position.
While in a dissipating state another front forms to occupy
the normal position. Canal Zone meteorologists generally
believe that only one front forms when light northeast and
southeast winds within the Doldrums converge in a line.
Crowe thinks that the ITC is a boundary surface between
relatively stagnant Doldrums' air and fresh Trades' air
underrunning it.\textsuperscript{45}

Regardless of the explanation given, there are
frequently two ITC's in the vicinity of Panama. Each is a
zone of poorer-than-normal weather and is respected by
military and civilian pilots alike during the wet season.\textsuperscript{46}
Most students of Panamanian synoptic situations believe that
once more is known about the surface and upper air weather
south of the Republic, the movement and intensity of the ITC
may be forecast with some accuracy. Until that time we must
be content with information obtained from pilot interviews
concerning the nature of tropical fronts in Panama.
Wind Velocities and Direction

The prevailing wind direction in southern Panama is from the north, or a few degrees either side of north (Table III). Winds blow from this direction some 60 to 70 per cent of the time. The backing of the wind from north or northeast to northwest is a common occurrence. This feature of the low-level wind pattern of Panama results when surface friction slows winds crossing the Isthmus.

**TABLE III**

<table>
<thead>
<tr>
<th>Station</th>
<th>Prevailing Direction</th>
<th>MPH</th>
<th>5-minute Maximum Velocity</th>
<th>Direction Maximum Velocity</th>
<th>Date Maximum Velocity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balboa Hts.</td>
<td>NW</td>
<td>6.8</td>
<td>46</td>
<td>S</td>
<td>7/10/09</td>
</tr>
<tr>
<td>Madden Dam</td>
<td>N</td>
<td>4.1</td>
<td>30</td>
<td>N</td>
<td>3/4/54</td>
</tr>
<tr>
<td>Cristóbal</td>
<td>N</td>
<td>9.9</td>
<td>38</td>
<td>NW</td>
<td>11/25/27</td>
</tr>
</tbody>
</table>

During the dry season the Trades blow more or less steadily from northerly quadrants. Southerly winds occur during the rainy season and can bring abnormal rains if their flow is intensified by violent tropical storms in the Caribbean. Even a normal low north of Panama will pull the ITC toward it, with an accompanying increase in precipitation. The average mean wind velocity, irrespective of direction, will approximate seven to nine miles an hour in central Panama. March is generally the windiest month, with the mean velocity reaching nine to eleven miles an hour. Five-minute maximum velocities frequently attain twenty-five to
thirty miles an hour, and gusts up to fifty miles an hour have been experienced.

The relative high constancy and speed of winds in the savanna have a direct influence on soil, vegetation, and culture. In places exposed to the wind, soil dries rapidly, hardens on the surface and cracks, even during certain periods of the wet season. Seeds blown or carried there cannot take root as readily as in protected locations. Surface soil, when dry, is blown away and it becomes impossible to keep the finer dust out of homes, vehicles, and equipment. Undoubtedly dust is one of the major causes of respiratory ailments in the savanna. Because burning occurs in the savanna during the windiest season, fires spread rapidly across the level grasslands. Smoke and haze, added to high wind constancy, creates flying hazards in the area. Frequently, flying conditions are more unfavorable at this time than during the rainy season.

Military and commercial aviation have taken advantage of wind constancy in Panama. All airfields are constructed with only one runway, generally northeast to southwest. Another response to the prevailing wind may be seen in certain modifications of the dwellings. Native houses are often enclosed only on the windward side, a pre-Columbian practice in the savanna. Finally, there is the monotony of steadily blowing winds. A person accustomed to mid-latitude situations normally finds the constant wind annoying at first. However,
the breezes lower the sensible temperature during the hottest part of the year and drive insects to the sea.

Rainfall, Humidity, Temperature and Evaporation

Rainfall in the savanna varies from forty to one hundred inches, approximately (Map III). Ninety per cent, or more, falls during the wet season, from mid-April to mid-December (Appendix I). During this time thunderstorms are almost a daily occurrence at many interior stations. Along the Pacific and Atlantic coasts there is about one day in three with thunderstorms (Table IV). At times thunderstorms are very intense, with strong, gusty winds and severe lightning. Yet, lightning seldom occurs during the dry season and it is not a cause of grass fires. Fogs in the savanna are rare and were never experienced during the field year (Table IV). They do create hazards along the Trans-Isthmian Highway and obstruct navigation in the Panama Canal from time to time.

Relative humidity, while high throughout the year, is at its maximum during the wet season (Table V). From May through January it will average from 80 to 90 per cent in the savanna. During the dry season (February through April) the average is in the middle seventies. March has the lowest relative humidity in central Panama, while the highest occurs between June and November. Amounts of sunshine and cloudiness are closely related to relative humidity. During
Sources:
Panama Canal Co., Meteorological and Hydrographic Branch, Balboa His., C.Z., 1956.
PANAMA

MEAN ANNUAL RAINFALL

INCHES

1926.
### TABLE IV

**CLOUDINESS, FOGS, AND THUNDERSTORMS**

<table>
<thead>
<tr>
<th>Station</th>
<th>Number of Days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With .01 inch rain</td>
</tr>
<tr>
<td>Balboa Hts.</td>
<td>173</td>
</tr>
<tr>
<td>Madden Dam</td>
<td>210</td>
</tr>
<tr>
<td>Cristóbal</td>
<td>240</td>
</tr>
</tbody>
</table>

### TABLE V

**RELATIVE HUMIDITY, CLOUDINESS, AND SUNSHINE**

<table>
<thead>
<tr>
<th>Element</th>
<th>Balboa Hts. (Pacific side)</th>
<th>Madden Dam (Mid-Isthmus)</th>
<th>Cristóbal (Atlantic side)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Cloudiness</td>
<td>6.8</td>
<td>7.3</td>
<td>7.0</td>
</tr>
<tr>
<td>(tenths)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible % Sunshine</td>
<td>49.0</td>
<td>41.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>83.2</td>
<td>85.0</td>
<td>82.6</td>
</tr>
<tr>
<td>(bi-hourly mean)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The dry months the percentage of possible sunshine attains a maximum of 45 to 60 per cent. The percentage is usually less than 30 at the beginning of the wet season. It decreases to less than 10 per cent during the latter part of the year. Although the percentage of possible sunshine is low during the rainy months, there are many days when
the sun makes an appearance. The Pacific coast of Panama averages only eleven days a year with no sunshine. 57

Every month in Panama is a "summer" month, with the annual range of temperature less than 40°F. for all stations. In the savanna April is usually the hot month, with an average of about 82°F, while the cool month is often January, with an average of 78° or 79°F. (Table VI). 58 Diurnal ranges approximate 15°F, from a daily low of 72°F to 74°F, to a high of 90°F to 93°F. It is evident that terms like "winter" drought and "summer" maximum (rainfall) possess little meaning in Panama. A consideration of seasonal precipitation unquestionably has merit and validity in higher latitudes. Where evaporation during the high-sun period far exceeds that of the low-sun period there is a direct relationship to plant growth. But, in central Panama, evaporation, along with temperature, is lower during the wet months (summer in the northern hemisphere) than during the dry months. 59 The significance of this phenomenon is further developed in the discussion of climatic classification.

Surface Configuration and Its Effect on Climate

The climate of central Panama is greatly influenced by the Cordillera Central (Maps II, III). Averaging between 3,000 and 4,000 feet where it faces south to the savanna, the east-west cordillera presents an effective obstruction to the prevailing northerly winds. Another mountainous section, the Cordillera Occidental de Azuero, separates the
<table>
<thead>
<tr>
<th>Element</th>
<th>Balboa Hts.</th>
<th>Madden Dam</th>
<th>Cristóbal</th>
<th>Chame</th>
<th>Aguadulce</th>
<th>Pocri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Mean Temperature</td>
<td>80.3</td>
<td>79.1</td>
<td>80.6</td>
<td>80.8</td>
<td>81.5</td>
<td>79.7</td>
</tr>
<tr>
<td>Mean Daily Max. Temp.</td>
<td>87.4</td>
<td>87.1</td>
<td>85.0</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Mean Daily Min. Temp.</td>
<td>73.2</td>
<td>71.0</td>
<td>76.2</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Record Max.</td>
<td>97.0</td>
<td>98.0</td>
<td>95.0</td>
<td>97.0</td>
<td>100.0</td>
<td>93.0</td>
</tr>
<tr>
<td>Record Min.</td>
<td>63.0</td>
<td>59.0</td>
<td>66.0</td>
<td>67.0</td>
<td>62.0</td>
<td>67.0</td>
</tr>
<tr>
<td>Greatest Daily Range</td>
<td>27.0</td>
<td>31.0</td>
<td>24.0</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>8 A.M. Mean Wet Bulb</td>
<td>74.3</td>
<td>73.9</td>
<td>75.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>8 A.M. Mean Dew Point</td>
<td>73.2</td>
<td>72.9</td>
<td>74.1</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Water Temp. Bi-hr. Mean</td>
<td>80.1</td>
<td>83.6</td>
<td>82.5</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Monthly Mean Temperatures</td>
<td>January</td>
<td>79.0</td>
<td>78.0</td>
<td>78.0</td>
<td>80.0</td>
<td>78.0</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td>80.0</td>
<td>79.0</td>
<td>80.0</td>
<td>80.0</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>March</td>
<td>81.0</td>
<td>80.0</td>
<td>80.0</td>
<td>82.0</td>
<td>81.0</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td>81.0</td>
<td>81.0</td>
<td>80.0</td>
<td>80.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>81.0</td>
<td>81.0</td>
<td>80.0</td>
<td>82.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>June</td>
<td>79.0</td>
<td>81.0</td>
<td>80.0</td>
<td>82.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>78.0</td>
<td>79.0</td>
<td>80.0</td>
<td>80.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>79.0</td>
<td>79.0</td>
<td>80.0</td>
<td>82.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>78.0</td>
<td>79.0</td>
<td>81.0</td>
<td>81.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>78.0</td>
<td>79.0</td>
<td>80.0</td>
<td>80.0</td>
<td>82.0</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>78.0</td>
<td>79.0</td>
<td>79.0</td>
<td>80.0</td>
<td>81.0</td>
</tr>
<tr>
<td></td>
<td>December</td>
<td>78.0</td>
<td>79.0</td>
<td>78.0</td>
<td>80.0</td>
<td>80.0</td>
</tr>
</tbody>
</table>
southwestern portion of the central savanna from the Pacific Ocean (Map II). These highlands hinder southwesterly winds, and orographic rainfall is heavy on the windward slopes.

The central savanna is a plain of marine origin, and lies between the two mountain areas. Virtually all of the savanna is below 600 feet in elevation, with the greater portion below 200 feet. It is set apart from the Chiriquí savanna by low mountains and hills that extend southward from the Cordillera Central to the Pacific (Map II). Thus the savanna is shielded by mountains and hills on the north, south, and west. Only from the Gulf of Panama is there an open approach to the area. The climate, in turn, is affected by the topographic obstructions, and precipitation is less on the leeward (savanna) side. Because of this, many investigators have attributed savanna formation in central Panama to climate. Overlooked is the fact that forests grow under the same climatic conditions.

Climatic Classification

According to the Köppen classification, the climate of central Panama is Aw'gi (Map IV). Simply translated, this formula means that every month has an average temperature of 64.4°F (18° C.), or higher. The dry season occurs during the season of lowest sun and rainfall maximum is in the autumn. The hottest month comes before the summer solstice and there is less than 90°F (5° C.) range between the warmest and coolest month. The general classification, Aw,
Sources:
PANAMA

CLIMATIC TYPES

Af—Tropical rain forest
Am—Tropical monsoon
Aw—Tropical wet-and-dry
Cfa—Wet tropical highlands
Cwa—Wet-and-dry tropical highlands

Weather station and length of record in years

Limit of the Central Savanna

MAP IV
includes most stations in the Republic having an annual rainfall from forty to one hundred inches (compare Maps III and IV). This is a wide latitude for rainfall in an area with an exceedingly high evaporation rate. Within the boundaries of Panama's Aw climatic region may be found a variety of vegetation formations (compare Maps IV and V). In central Panama areas similar to steppes lie adjacent to dense tropical jungle. Therefore, the term "savanna climate" is meaningless.

Although climate does not determine savanna formation it does have an effect on it. Periodicity of rainfall appears to be essential to savanna development under natural conditions. Fluctuating water tables and waterlogging, alternating with dry seasons, impart certain characteristics to the soil that make it unfavorable to tree growth. Long dry spells crack the soil to great depth, and soil structure may be altered if sufficient time elapses.

There are extant several world climatic maps, most of which are modifications of Köppen. Trewartha's revision of the original Köppen map alters none of the climatic regions. The modification of Köppen, by James, Russell, and Renner, places too much of central Panama in the Af category. Thornthwaite's system of measuring evapotranspiration and determining precipitation effectiveness is not valid in Panama. It is impossible to apply the Thornthwaite system without evaporation figures. R. J. Russell sums up the problem of utilizing evaporation data
Tropical rain forest (3 stories, upper usually continuous)

Tropical evergreen forest (3 stories, upper usually discontinuous)

Tropical semi-evergreen forest (2 stories, upper usually continuous)

Tropical semi-deciduous forest (2 stories, upper usually discontinuous)

Savanna: open, scattered-tree, park, orchard or thorn (1 story)

Mangrove swamp, marsh, or tidal flats
when he says:

As records of evaporation are quite rare, and quite uncertain where they do exist, it would be almost impossible to map climatic distribution according to any set of definitions that call for evaporation records. 58

None of the existing classification systems accurately portrays the climates of Panama, but Köppen's is the best we now possess. 67 No attempt is made in this study to present a new method for mapping the climates of the Republic, though boundaries have been redrawn in accordance with the Köppen technique.

From the climatic viewpoint the most critical factor is not total rainfall or season of drought, but length and intensity of the dry season. Recent studies by Lauer indicate that the boundary between wet savanna and dry savanna usually conforms to the seven-month isohyromene. 68 Applied to central Panama, the line suggested by Lauer satisfactorily delimits the driest part of the country. There are no stations in Panama reporting a wet season of less than seven months, but dry savanna conditions would theoretically prevail up to a point where the wet season is no longer than five months. 69 At the five-month isohyromene savanna would blend into low-latitude steppe.

When thinking in terms of the length of the dry season it is rather awkward to employ the term isohyromene. For this reason, the term isoxeromene is recommended for lines connecting points of equal-length dry seasons. Map VI
Sources:
Berlin, 1932.
Treadwell et al., Possibilities for Para Rubber
Production in Northern Tropical America (Washington, 1926).
represents an attempt to map the length of the dry season in the Republic of Panama. The one-month isoxeromene separates rain forest from semi-evergreen forest (compare Maps V and VI). Woodland can and does exist throughout the area delimited by the five-month isoxeromene on one side and the one-month line on the other. Again, the idea of a so-called "savanna climate" is contradicted. Evidence is accumulating in favor of the view that all lowland tropical grasslands and open savannas are edaphic or cultural climax.

sovils and Vegetation

Soil moisture is the essential natural factor determining different types of vegetation in the savanna. This is a function of climate, topography, and physical characteristics of the soil. Within a single climatic region certain combinations of soil or topography may create a moist habitat favoring an evergreen hardwood forest. Other combinations may produce a dry habitat that favors semi-evergreen or semi-deciduous forest. The moisture-supplying ability of the soil is determined by its physical structure (permeability, aeration, porosity, and moisture-holding capacity). Soils that are too-freely drained will be physically dry, whereas soils that are too-poorly drained will be physiologically dry.

In sections of the savanna where climate, topography, culture, and parent material are the same, a change in
vegetation will indicate a change in soil. Soil is the only factor that can explain a natural savanna under such conditions. If one or more of these factors is variable, the balance will be disturbed. Climate will make a savanna more or less susceptible to burning, as it regulates the density of growth and the length of the dry season. The degree of reduction and specialization of the vegetation is determined by the magnitude of alternating waterlogging and desiccation. Topography will affect drainage, precipitation, and wind direction. Culture may alter the landscape through burning, grazing, agriculture, or a combination of the three. Parent material, under certain conditions, may weather rapidly or slowly. It may produce soils that are acid or basic, clayey or sandy. Unfavorable conditions for plant growth are produced by excessive or impeded surface and subsoil drainage, claypans or hardpans, and a periodic rainfall regime.

Soils

Five principal soil groups may be distinguished in the central savanna (Map VII). They include: (1) reddish-brown clay soils, (2) sandy soils, (3) savanna clay soils, (4) marsh and swamp soils, and (5) alluvial soils.

Reddish-brown clay soils.--The soils in this group represent the best upland type, and are typified by Arraiján clay (Fig. 5). They are slightly crumbly or friable when moderately moist and are underlain by red clay.
H. H. Barnwell, Soil Reconnaissance of the Panama Canal Zone and Contiguous Territory (Washington, 1929).
Servicio Interamericano de Cooperación Agrícola en Panamá, Divers, R.P., 1956.

Sources:

- Marsh and swamp soils
- Alluvial soil
- Savanna clay, hardpan usually present
- Sandy soils
- Reddish-brown clay, shallow phase
- Reddish-brown clay, deep phase
- Limit of the Central Savanna

MAP VII
Fig. 5.—Representative soil profiles.

Sources: Lothrop (VIII, 8-12; Bennett (1929); USGS (1955); SICAP; Min. of Agr., Com., and Ind., R. P.; U. of Ark. Agr. Mis. to Panama; Bur. of Cartography, R. P.
Reddish-brown soils are residual, formed from either diorite, andesite, or basalt. Steep slopes are occupied by a shallow phase of the soil. In some areas the reddish-brown clays are rather stony, though this does not greatly decrease the land value. Stones actually add to the value if land is to be devoted exclusively to agriculture. They catch particles of soil and organic matter washed from higher places and thus help to maintain soil fertility.

Reddish-brown clay soils generally support semi-evergreen forest (compare Maps V and VII; see Fig. 6). On slopes where orographic rainfall is unusually heavy, there are patches of evergreen or rain forest. As a rule, these soils tend to support a heavier cover of vegetation than is now present in many localities. Between Chamé and the Canal Zone most of the vegetation on these soils is second growth. In many places the forest has been completely destroyed by man, and grasses now predominate. Where the reddish-brown clays occur on exposed outcrops in the savanna they bake and crack deeply during the dry season, and plants wither. Vegetation suffers more on the shallow phase. Pará grass does not fare well on the upland, well-drained soils, and though Guinea grass may be planted it becomes severely parched by March. With shallow cultivation in the dry season there probably would be better conservation of soil moisture.
Fig. 6.—Aerial view of a remnant of the semi-evergreen forest, near Capira, Panamá. The forest, growing on reddish-brown clay soils, will be completely destroyed in a few years by migratory farmers. April 30, 1956.

Most tropical fruits grow well on the reddish-brown soils, some very successfully. Mangoes and citrus produce good crops, and bananas succeed in the rainy season on the deeper phase. Unless continuously watered, cultivated and wild annual plants tend to die during the dry season. An important truck farming center is developing between Chame and Panama City on these soils, and the reddish-brown clays are much sought-after by interior farmers.

Sandy soils.—The sandy soils are located south of the cordillera, between Chamé and Antón (Maps II and
VII). Recently they have been partially mapped and the name Copé complex assigned to them. 77 Copé soils are exceedingly dry and sandy, very well-drained internally and externally, and constitute one of the most arid soils in the Republic. Further, they are located in the driest climatic region of the country (see Map III). Low annual rainfall, coupled with the inherent soil aridity, has a pronounced effect on the vegetative cover.

Copé soils are associated with Tertiary sandstones that have been uplifted and tilted. The resulting topography is deeply dissected and rolling (Fig. 7). Ravine bottoms are wooded and the interfluves are covered with open or scattered-tree savanna (Fig. 8). Slopes are frequently covered with thorn savanna. This is an edaphic savanna which has been further modified by burning, browsing, and trampling.

Settlement in the sandy soil area is confined almost entirely to alluvial bottomlands near the coast. Where the soil extends to the Gulf of Panama, ending in an abrupt cliff thirty-five or forty feet high near Río Mar and Santa Clara, there is a sparse coastal population (Fig. 9). The sandy soils were avoided during aboriginal times as they are today, for they are not suited to agriculture and the scant vegetation supports little wildlife. There are severe limitations even for pasturage and the savanna suitable for grazing is of such small proportions as to be almost useless. Even if the soil were chemically and
Fig. 7.—Topography and vegetation associated with Cope (sandy) soils, ten miles north of Río Mar, Panamá. Native grasses cover the hills, with woody growth on the slopes and in the ravines. The edaphic savanna has been altered by fire and grazing. Cattle terraces may be seen on the slopes. October 23, 1955.

Fig. 8.—Aerial view of the Cope landscape, near Chame, Panamá. Nearer the coast one sees severe erosion that has been culturally induced by burning and overgrazing. March 17, 1956.
Fig. 9.--The Pacific coast, near Santa Clara, Coclé. The edaphic Cope savanna covers Tertiary and Quaternary sandstones, some of which is still unconsolidated. Note the scattered-tree savanna in the background. March 17, 1956.

physically suitable for crop growth, the risk of erosion is too great to justify a serious agricultural attempt. Nevertheless, a few shifting farmers manage to eke out a living on some sections of the sandy soils.

Savanna clay soils.--West of Antón the soil consists of brownish-red clay (Map VII). This clay, underlain by a claypan, becomes exceedingly hard and deeply cracked by the middle of the dry season. Scattered-tree savanna and park savanna are supported by the savanna clays, but on many broad areas the only vegetation seen is short grass (Fig. 10). The grass,
normally Guinea, completely parches after the rains cease in December. When the rains return, in April, the grass revives and in a short time furnishes fairly good pasturage. Without irrigation there is little possibility of developing agriculture on savanna clay during the dry season. Conversely, drainage is a serious problem during the rainy months; the underlying claypan is impervious and the water table rises or becomes "perched."

Fig. 10.—Guinea grass pasture on brownish-red savanna clay, near La Arena, Herrera. Scattered-tree savanna may be seen in the background. December 28, 1955.

Plants such as maize may actually suffocate from lack of oxygen due to poor aeration. Brownish-red savanna clays contain only trace quantities of phosphorus, nitrogen,
and potash, and still less manganese and magnesium. The calcium content is extremely low and soil pH ranges from 3.0 to 5.0.

Most savanna clays are associated with areas of uniform surface relief, therefore erosion is not so likely as on Copé soils. Nevertheless, if there has been too much burning, cropping, and/or grazing erosion may develop broad, shallow gullies.

Areas of brownish-red savanna clay soils represent a true edaphic savanna, with a secondary fire climax. Vegetation varies with the depth of the soil and available moisture. On thin, drouthy soil, *Anacardium occidentale* (cashew) is a dwarfed shrub, whereas it will attain a height of twenty feet under more favorable edaphic conditions. Heavier vegetation is also found at short distances up slopes, where drainage is improved and the microclimate is wetter. Plant cover will normally be denser where there has been some accumulation of friable soil washed from above. Where the typical tough clay borders such an area the line of demarcation between treeless and forested land is very sharp (Fig. 11). The break between vegetation types is further accentuated by annual burning (compare Fig. 11 with Fig. 14, the latter showing a vegetation break induced by culture).
Fig. 11--Shallow phase of the brownish-red savanna clay soil, foreground, supports grass cover. Woody vegetation grows on a well-drained, deeper phase of the same soil. Note cultural disturbances of the hill. Cultivated coconut palms may be seen on the extreme right slope of the hill. Near Parita, Herrera. January 2, 1956.

Marsh and swamp soils.---Although mapped as one general soil type (Map VII) because they share a similar environment, certain distinctions may be made between marsh and swamp soils, and their associated vegetation cover. The gradation in soils and vegetation, inland from the shore, is directly related to the frequency and extent of Pacific tides. Near the mouth of the Río Santa María, the tides average twelve feet; the spring tide is twenty-two feet, and the neap tide is six feet. Further, salinity decreases landwards, and soil acidity increases,
creating a belted arrangement of soils and vegetation (Fig. 12).

(1) Swamp: Landwards from the tidal flats along the margins of the Gulf of Parita, lie extensive stands of red mangrove (Rhizophora mangle). The soil is fine-grained alluvium, blue-black in color, and rich in organic remains. The fine clays and silts form an oozy mud; the production of hydrogen sulphide by decaying vegetation gives off a disagreeable odor. Rhizophora disappears at approximately the point where brackish water ends. This point is also usually marked by the appearance of Montrichardia arborescens, a tall aroid that grows in the soft mud of river banks. In the Rhizophora swamp grows Pellicieria rhizophora, a tree closely resembling bald cypress. This member of the tea family is locally known as palo de sal. White mangrove (Laguncularia racemosa) and black mangrove (Avicennia nitida) show up first along river banks, where fresh water from the rivers reduces salinity. On the other hand, in Bocas del Toro, where tidal ranges are slight, red mangrove is found only on the seaward fringe of the swamp, with black and white mangrove landwards. These latter were probably the first colonizers of an advancing shoreline, for they can establish themselves in soils having large amounts of quartz sand. Rhizophora requires fine mud of high organic content before it can fully develop.

(2) Marsh: Back of the mangroves extend marshes (potreros), filled with coarse sedges, grasses, and pure
stands of the large fern, *Acrostichum aureum*. Over some of the saline flats spread mats of *Sesuvium portulacastrum*, *Sporobolus virginicus*, and other salt-tolerant grasses. The marsh soil is firmer and less saline than that of the swamp, and periodic inundation is not as extreme. On firm ground above normal tide levels there is frequently a stand of *alcornoque* (*Dimorphancha megistosperma*). When flooded, though, it is by brackish water. Peaty muck gradually becomes sandier and more acid inland, passing over to sandy clays which support savanna vegetation.

![Image](image.jpg)

**Fig. 12.**—Mangrove swamp, near the mouth of the Río Santa María, seen from the air. The *Rhizophora* (foreground) averages about fifty feet in height. Back of the mangrove is the marsh; behind that, an old beach ridge that supports a moderate woody growth. The savanna lies in the distance, beyond the ridge. March 17, 1956.
Alluvial soils.—Alluvial soils have been wholly or partly deposited by overflowing rivers (Map VII). Where the land is reasonably well-drained the soil is generally rich in organic matter. It is fairly friable, supports a heavy growth of virgin forest, and is very productive agriculturally. These are the soils that support gallery forests (Fig. 13). Heavy vegetation borders streams wherever the peculiar soils of the savanna, with their perched water tables, are replaced by soils of favorable drainage. Gallery forests occupy belts of recent alluvium along water courses, where the impervious claypans of savanna soils have not yet developed.

Fig. 13.—Aerial view of the gallery forest of the Río Estancia, Coclé. A fishing hamlet may be seen in the foreground. Beyond the gallery forest is the scattered-tree savanna. March 17, 1956.
Alluvial soils are porous and well-drained, with a normal water table. This explains the varying width of the gallery forest, since young alluvial flats will not be of constant extent. Where gallery forests are not on swampy sites, they represent the true climatic climax of the central savanna. This helps to account for the correspondence of gallery forests with upland forests and the variation of both from place to place changes with rainfall.\(^80\)

A large portion of the truly desirable farmland in central Panama is alluvial. The rivers that create the rich soils have also greatly altered the savanna landscape by erosion. Erosion has been further enhanced by periodic fluctuations of the streams during the geologic life of the Isthmus. Streams are numerous in the savanna because of abundant rainfall in the mountains. Steep gradients and large volume in the upper courses make savanna rivers a powerful force in land sculpture. Most of the river alluvium is deposited in the lowlands along floodplains, although a certain amount is carried to sea. Vertical and horizontal changes in streams have been frequent and have provoked alterations in the erosive stages.

Summary of Edaphic Influences

The influences of soil on savanna formation in the central savanna may be summarized as follows:\(^81\)
(1) Natural drainage is the most important characteristic of Panamanian soils that affects the distribution of vegetation types such as forest and savanna.

(2) The chemical reaction of the soil, other than salinity, has little or no influence on the distribution of vegetation types.

(3) Savanna soils in Panama differ from forest soils in possessing features which, in interaction with topography and rainfall, affect their natural drainage unfavorably.

(4) In most cases the savanna soils exhibit the superposition of a permeable horizon upon an impermeable one. They may also consist of heavy, impermeable clays in an area of low relief; or porous sands in either high or low relief.

(5) Savanna soils normally have no continuous water table. A perched water table exists intermittently, as determined by rainfall periodicity.

(6) The savanna surface is waterlogged or flooded for periods during the rainy season and alternately dried out. Surface water may become stagnant.

(7) Upland soils are well drained because of porosity or topographic slope. If drainage is not too free these soils will support forest.

(8) Mangrove forest occurs on land subject to periodic inundation, and the water does not become stagnant.

(9) Savanna and forest exist side by side in central Panama, under the same climatic, topographic, and cultural conditions.

**Man and Vegetation**

Although the central savanna is, in the main, an edaphic product, man and fire have been responsible for
considerable alteration of the landscape. Most of the man- made savannas occur where soil drainage is favorable, especially on alluvial soils or reddish-brown clays. Although fire has been a secondary factor on all edaphic savannas in Panama, it has been the primary cause of the culturally induced ones.

There are many reasons why man burns the seasonally dry grasslands and forests. It is a favorite hunting technique, used in mid-latitude steppes as well as in the tropics. Las Casas tells us:

When the Indians hunt they set fire to the savannas or grasslands....

Another objective of burning is to destroy dead grass which accumulates during the dry season. Burning encourages a simultaneous flush of tender young growth, ready for grazing in about five weeks. Fire also sweeps the level grasslands after it has escaped from slash-burn farmers in nearby woodlands. Conversely, it spreads to woods after it has been set in the grasslands. Burning is used to prevent accidental fire later in the dry season, to reduce ticks and other pests, and to prevent encroachment of the forest. Finally, it is practiced simply because it has always been done before. The farmer is often hard-put for an explanation when asked why he burns the fields.

It is debatable whether the advantages of burning offset the disadvantages. Fire destroys the potential humus-forming material and bares the soil to erosion,
direct sunlight, and wind. Regular burning may also alter the composition of the vegetation or the structure of the soil. Plant species resistant to fire but of little value to livestock replace nutritive species. Nevertheless, burning is a cultural trait common to the Indian, Spaniard, and Negro. It was practiced in Panama, Africa, and Spain before 1492 A.D., and there seems to be no indication that it will cease. Other aspects of burning are discussed in Chapter IV, the general conclusion being that, in terms of cultural necessity and development in the hearth, it is a perfectly satisfactory method of clearing land.

There is a possibility that a culturally induced savanna will experience a change in the rainfall pattern once sufficient vegetative cover is removed. The dry season of a man-made savanna may be drier than it was when the area was wooded. Sapper noted, in Guatemala and Honduras, extensive areas transformed into grasslands which, forty years previous, had been covered by virgin forest. The transformation was due, in part, to normal soil exhaustion. The main reason, however, was explained by Sapper as a change in the microclimate. The climate of a virgin tropical forest is characterized by slight variation in diurnal temperatures and extremely humid air. There is virtually no horizontal movement of air within the forest, and no sunlight reaches the forest floor. All of this changes suddenly and dramatically with the felling of the
forest. The soil dries up to a greater degree when the sun and winds, formerly shut out by the forest, reach the ground surface. At the edges of savannas, land that has been used for cultivation is frequently invaded by grass soon after the crop is harvested. However, large clearings made in the middle of a virgin forest grow trees again within a short time. Even though sunlight enters a clearing in the forest interior, the soil dries less intensely than on the outer margins of the same forest. Seeds, blown to a central clearing from surrounding trees, are thus able to take root. 84

Removal of the virgin forest will also affect stream flow. In Panama, the larger streams completely dry up only under forest conditions. Flow resumes when forests are felled and replaced by less heavily transpiring grass or shrub vegetation. 85 This fact was first brought to my attention by aircraft pilots in Panama. Rivers are important navigational aids to flyers crossing poorly mapped jungles. In Darién Province many streams vanish during the dry season, and most pilots prefer to fly over this jungle during the wet season despite poorer weather. The major savanna rivers do not dry up at any time during the year.

The assertion is often made that savannas have always been avoided by aborigines. In central Panama the mestizo will state emphatically that the central savanna has never been farmed. Yet, colonial history and archaeology do not
entirely confirm this. Portions of the present savanna once supported people and agriculture. Settlements in pre-Columbian Panama were most always near woodland. Sometimes they were located on the edge of the savanna of that day, often in the forest. Such a pattern was founded on quite logical reasoning. Alluvial soil near rivers was more easily tilled by digging-stick farmers than heavy savanna clays found on the interfluvies. Burials were also easier to make where there was no hardpan. Burning to clear woodland provided a convenient fertilizer in ash residue. The forests offered wood, game, shade, fruits, and protection. A nearby river afforded easy transportation, and water for drinking, cooking, and bathing. If occupancy were long enough the forest would eventually be pushed back, and replaced by grass or shrub. In this manner, some savannas exist not because man avoided that specific area, but because man once lived there in large numbers.

The best soils in Panama do not, as we have seen, occur in the grasslands as they do in mid-latitudes. Agriculture continues to be pursued primarily in the hills and bottomlands. It is in these areas where man made the greatest alterations of the natural landscape in the past, and continues to do so today (Figs. 14, 15, and 16).
Fig. 14.—Three vegetation forms, near Parita, Herrera. A faragua grass pasture grows on the edaphic savanna in the foreground. Only a portion of the virgin forest remains on the hills in the background. A man-made savanna occupies the left-hand side of the hill, separated from the forest by a property line. December 28, 1955.

Fig. 15.—The Río de la Villa, Los Santos-Herrera: An example of a culturally disturbed gallery forest. Cultivated palms, Para grass, and fencing illustrates man's influence. December 28, 1955.
Fig. 16.—Near Natá, Cocle, the savanna continues to be cleared. The trees were felled with axes and later cut into firewood for home consumption. March 2, 1956.
NOTES TO CHAPTER I

1. There are no pines (Pinus sp.) in Central America south of the San Juan River in Nicaragua. Although there are no palm savannas on the Pacific coast of Panama, I have observed one near Nombre de Díos on the Atlantic side.

2. Hyparrhenia rufa (faragüa) is generally confused in the literature with Melinis minutiflora (molasses grass). The same Spanish name, yaragüa, is often applied to either grass. The first grass to be called yaragüa was H. rufa. The present confusion came about when M. minutiflora was accidentally introduced into Colombia in 1906 as part of a shipment of H. rufa seeds from Brazil. The public expected yaragüa to come up, unsuspecting that two species resulted from the single planting. Of the two, M. minutiflora was the more successful in Colombia, where it is still called yaragüa. J. J. Parsons, "Antioqueño Colonization in Western Colombia," Ibero-Americana, XXXII (1949), 133-4. Also see Chapter IV of this study.


6. J. S. Beard, "The Savanna Vegetation of Northern Tropical America," Ecological Monographs, XXIII (1953), 150. In the Guianas the term savanna is applied to areas of herbaceous swamp land, from which grasses as well as trees may be absent. In Australia, steppes are often referred to as savannas. R. G. Downes and J. R. Sleeman, The Soils of the Macquarie Region, New South Wales (Melbourne, 1955), 11.


18. C. L. White and G. T. Renner, *College Geography* (New York, 1957), 107-33. This new text divides Aw climate into wet (Monsoon Tropical) and dry (Semiárid Tropical). Despite the new names, the vegetation is said to be determined by alternating wet and dry seasons.


25. A. A. Pullé, Enumeration of the vascular plants known from Suriname (Leyden, 1906).


29. Bennett, Soil Reconnaissance of the Panama Canal Zone and Contiguous Territory, USDA, Bulletin No. 94 (Washington, 1929).


32. C. R. Van Der Merwe, Soil Groups and Sub-Groups of South Africa (Pretoria, 1941).


36. All of Beard's articles concerning savannas are listed in the Bibliography at the end of this study.


38. In addition to material acquired from the Panama Canal Company, the Republic of Panama obtains weather information in a variety of ways. Agricultural experiment stations of the Point Four Program in Panama supply certain data, along with United States military establishments. Large commercial agricultural enterprises (Chiriquí Land Co. and Santa Rosa Sugar Co.) record data for their own use, but the figures are available. A few resorts (El Valle, Río Mar, Santa Clara) maintain records. Lastly, interested individuals keep weather records for one reason or another. Missionaries offer a good example of this group. Some of the information collected through these organizations and individuals is quite accurate; some is questionable. In all cases, only a few meteorological elements are recorded outside the Canal Zone. Rainfall is always measured, and usually temperature.

39. Table II was compiled from data furnished by the Meteorological and Hydrographic Branch, Panama Canal Company.


41. "Winter" in Panama begins in the middle of April and lasts until mid-December. It is the rainy season and temperatures are lowered a degree or two once the season becomes well-established. See the following note.

42. "Summer," like "winter," does not correspond to the astronomical seasons of mid-latitudes in the same hemisphere. This designation was applied by the Spanish conquerors, who were familiar with a climate characterized by dry summers and rainy winters. Hence, the season of clear, blue-sky weather was called "summer" in the New World, despite the fact that it
occurred during the period of lowest sun. Oviedo, Sumario de la natural historia de las Indias (México, 1950), 120.


44. Crowe, "Wind and Weather in the Equatorial Zone," op. cit., No. 17 (1951), 23. Crowe considers the ITC and the Doldrums as one and the same. What I refer to as the ITC, Crowe calls ITF (Intertropical Front). ITC is used in this study to designate the front in order to be consistent with previous studies of the same subject in Panama. If there is no true front in the tropics, as Crowe claims, then the term ITC would seem more appropriate than ITF.

45. Ibid., p. 68.

46. F. W. Pope, A Study of Weather Conditions in Panama (Albrook AFB, 1952), 8-10. This study, prepared by and for the USAF in the Canal Zone, is based on pilot interviews and local weather studies. Pope, like Crowe, recognizes the existence of tropical fronts and defines them as synoptic situations.

47. Table III was compiled from data furnished by the Meteorological and Hydrographic Branch of the Panama Canal Company. Length of records for the stations are: Balboa Hts., 50 yrs.; Madden Dam, 24 yrs.; Cristóbal, 48 yrs. The same periods are used for Tables IV-VI, unless otherwise noted.


49. The Doldrums may be pulled as far as 16°-18° North during an intense low over the Caribbean Sea. On October 24, 1955, during the passage of a hurricane to the north, Balboa Heights recorded a mean wind velocity of fourteen miles per hour from the south. The southerly wind resulted in torrential rains in some parts of western Panama. At Puerto Armuelles, Chiriquí, over
eighteen inches fell between the 22nd and 27th of October. More than seventy-eight inches were recorded for the month. Esslinger, op. cit.

50. U. S. Air Force, Unpublished Local Forecasting Studies. The reports for David, Aguadulce, and Río Hato cite dust as a cause of respiratory disorders, though not the only cause. See Bibliography.

51. Esslinger, op. cit. Table IV compiled from data supplied by Meteorological and Hydrographic Branch, Panama Canal Company.

52. I never saw lightning occur during the dry season in central Panama. Only once did I witness damage caused by lightning in the wet season. On November 23, 1955, lightning struck the ferry landing opposite Balboa. Electrical equipment was severely damaged and ferry traffic across the Canal was delayed for hours.

53. Fogs in Panama are largely confined to the central mountain areas and seldom reach either coast. Serious attention would have to be given to fog if one were investigating montane forests, but it has no effect on the central savanna. During 1955, there were two light fogs near the Pacific entrance of the Panama Canal. These formed during the early morning hours but dissipated before 8:00 A.M. Esslinger, op. cit. When there is a fog it always occurs late in the wet season on the Pacific coast.

54. Table V compiled from data supplied by the Meteorological and Hydrographic Branch, Panama Canal Company.

55. The lowest humidity recorded during 1955, in the Canal Zone, was 38 per cent, at Madden Dam (March 12). Esslinger, op. cit.

56. Ibid.

57. The Atlantic coast averages eighteen days a year with no sunshine. Ibid.

58. Table VI compiled from data furnished by the Meteorological and Hydrographic Branch, Panama Canal Company, and U.S.A.F., Local Forecasting Studies for Chamá, Aguadulce, and Poore.
It is assumed that this is true for the entire Republic. However, there are only three stations on the Isthmus presently supplying evaporation readings (all in the Canal Zone). Evaporation records are from daily observations of evaporation from floating pans four feet in diameter. These are located at Madden, Gatun, and Miraflores Lakes. Records from the pans, exposed to all weather conditions, gave 1955 totals as follows: Madden, 56.39 inches (61 per cent of the annual rainfall); Gatun, 48.41 inches (42 per cent of the annual rainfall); Miraflores, 51.35 inches (58 per cent of the annual rainfall). Evaporation usually exceeds precipitation at the three stations during January, February, March, and April. Esslinger, op. cit.


One hundred inches, with a three month dry season, is approximately the Am/Aw boundary in central Panama. Ibid., and G. T. Trewartha, An Introduction to Climate (3rd ed., New York, 1954), 381.

Trewartha, op. cit., Plate I, preceding title page.


Thornthwaite's scheme was applied to one of the three stations on the Isthmus with a known evaporation rate. Madden Dam, C. Z., with more than ninety-one inches of rain a year, falls into Thornthwaite's category of semiarid steppe. Yet this area supports a forest similar to that in Fig. 6. See the Bibliography for all of Thornthwaite's publications relating to his climatic classification, especially, "The Climates of North America According to a New Classification," Geographical Review, XXI (1931), 633-55; "The Climates of the Earth," Geographical Review, XXIII (1933), 433-40; and, D. I. Blumenstock and C. W. Thornthwaite, "Climate and the World Pattern," Yearbook of Agriculture, Climate and Man (Washington, 1941), 98-127. Although Thornthwaite's "grassland climate" supports a jungle in Panama, he has recently said: "The evidence is unmistakable that there is a definite grassland climate. It is marked by a specific balance between moisture deficit and surplus which results in few periods during the year of either very dry or moist soil conditions. As a result of this environment grasses flourish. It is possible to explain the
presence of grasslands on the basis of climate alone, without bringing in other agencies such as man and fire. Grasslands are a natural phenomenon, in equilibrium with their climatic environment. “Thornthwaite and J. R. Mather, "The Water Balance," Publications in Climatology, VIII (1955), 73.

65. Thornthwaite is not content with pan evaporation rates, for they vary considerably from the true land evaporation rate. Pans, kept supplied with water, do not reveal how much evaporation is from the soil or transpiration from plants. The articles cited above and in the Bibliography explain how measurements of evapotranspiration are taken.


67. There have been a number of other attempts to classify world climates. The most prominent are those of Hettner and de Martonne. Alfred Hettner, Die Klimate der Erde (Leipzig, 1930); Emmanuel de Martonne, Traité de géographie physique (7th ed., Paris, 1948), I.

68. An isohyromene is a line connecting stations possessing wet seasons of equal length. The seven-month isohyromene links all points that have a seven-month rainy season and a five-month dry season. Wilhelm Lauer, "Humide and aride Jahrezeiten in Afrika und Südamerika und ihre Beziehung zu den Vegetations-gürteln," Bonner Geographische Abhandlungen, IX (1952), 15-98.

69. Several representative savanna stations were selected and the rainfall was arbitrarily reduced for each. Using the Köppen system, the BSh/Aw boundary would coincide approximately with the thirty-inch isohyet. Under such conditions I estimate the wet season to be about five months’ duration.

70. The physiognomy of tropical vegetation has been thoroughly studied by Beard, "The Classification of Tropical American Vegetation-Types," Ecology, XXXVI (1955), 89-100. Richards, op. cit., has made similar investigations. This study uses the following terms, modified from those suggested by Beard and Richards.

Rain Forest (Selva pluvial) - three stories of plant growth, the uppermost one usually continuous; a wet lowland formation.
Evergreen forest (Selva siempreverde) - three stories of plant growth, but the uppermost is discontinuous and canopy is formed by the second layer; a wet highland formation.

Semi-evergreen forest (Selva semi-siempreverde) - two stories of plant growth, the uppermost forming a closed canopy.

Semi-deciduous forest (Selva semidecidua) - two stories of plant growth, but the uppermost is discontinuous.

Savanna (Sabana) - more or less pure grass (open savanna, sabana abierta), widely spaced trees (scattered-tree savanna, sabana de árboles dispersados), "islands" of trees (park savanna, sabana parque), scattered gnarled trees or bushes (orchard, thorn, or dry savanna; sabana de huerto, espinosa, o seca). A savanna never has more than one story of plant growth and no canopy.

71. Parsons noted the same thing in Nicaragua and Honduras, and says: "The Miskito Coast is probably the rainiest area of its size in the New World with a savanna-type vegetation. For so extensive a tropical grassland, either with or without trees, to occur under an average rainfall of 100 to 150 inches with so abbreviated a dry season clearly contradicts once more the traditional concept of "savanna climate." J. J. Parsons, "The Miskito Pine Savanna of Nicaragua and Honduras," Annals of the Association of American Geographers, XLV (1955), 44.

72. Richards, op. cit., p. 316. For the opposite view, see Thurnthwalte's statement, quoted in Note 64 above.


74. There is no complete soil map for Panama. Only the Canal Zone and a portion of Coclé and Chiriquí provinces have been mapped in detail. Plans call for the eventual mapping of much of the central savanna. The maps are being prepared by the Dirección de Cartografía, Ministerio de Obras Públicas. Ing. Tomás Guardia, Jr. is in charge of cartographic work.

75. The series, Arraiján clay, was named by Bennett, op. cit., p. 25.
76. The soils between Chamé and the Canal Zone are chiefly Frijoles clay and Gatun clay. Ibid., pp. 12-24.

77. A portion of the Cope soils have been mapped and the name was assigned by the field party. República de Panamá, Mapa de Suelos - Llanos de Coclé, 1:50,000 (Dirección de Cartografía, Panamá, 1955), 3 sheets. These sheets will eventually be accompanied by a booklet, as yet unpublished, titled: "Los Suelos y La Agricultura de Los Llanos de Coclé," SICAP, Panamá, 1957 (?)


79. R. C. West, "Mangrove Swamps of the Pacific Coast of Colombia," Annals of the Association of American Geographers, XLVI (1956), 98-121. This is an excellent discussion of mangrove swamps, by an authority.


82. "Cuando los indios...querían cazan muchos, ponían fuego a las cabanas o yerbazales, y huyendo del fuego los conejos iban a parar donde la gente los esperaba." Las Casas, "Algunos Capítulos de la Apologética Historia," Historia de las Indias (México, 1951), III, Cap. X, 437.

83. Sapper, op. cit., pp. 5-6. There are many known examples of this in central Panama. Don Miguel A. Conte showed me a portion of his property near Penonomé that was covered with heavy jungle in 1900. Don Miguel's father fenced the land in that year and the trees were partially cleared. Maize and rice were planted for the next several years. Later the land was further cleared and converted to pasture. Today the area is a Pará grassland, with no suggestion that there was ever woodland.

84. Sapper, Ibid.

85. Rawitscher found, at Emas (near São Paulo), a direct relationship between transpiration and stream level. Conditions there are similar to those of the central savanna. Rawitscher, op. cit., p. 241.
CHAPTER II

POPULATION AND SETTLEMENT

It was upon the natural savanna landscape that men superimposed a variety of cultural landscapes. In effect, the former served as a foundation for the latter. As such it was previously considered. However, physical environment alone cannot explain why the central savanna served as a hearth for peoples who were culturally distinct. It is culture that gives significance to environment, to which may be assigned such values as favorable or unfavorable. We next consider the peoples who have occupied the hearth, for it is through human beings that culture manifests itself.

The study of savanna population and settlement may be divided into: (1) the prehistoric period, based largely on archaeological evidence, and (2) the historic period, based on archaeological findings, historical accounts, and field observation.

The Period Before 1515

Cerro Mangote

In early 1955, C. R. McGimsey III discovered the earliest culture reported from Panama. The site is
located on top of a hill called Cerro Mangote, six miles from the mouth of the Río Santa María (Map VIII). The northern slope of the hill was a campsite for a band of primitive hunters, fishers, and gatherers, who subsisted primarily on locally gathered shellfish and crabs.²

Little material culture remains at Mangote. However, it is established that the Indians wore beads made from shell or bone, and used manos, metates, pebble choppers, grinders, pounders, and bone awls.³ Plants of various sorts were probably utilized, since wild fruits abound in the area today. Burials suggest that the bodies were placed in some kind of rectangular basket, or possibly a net. The people had fire and may have practiced stone boiling. While the practice of agriculture can neither be confirmed nor denied, there is nothing to indicate the art was known. As no projectile points were located it may be assumed that there were no weapons designed especially for hunting or warfare. There is no way to determine the inventory of perishable materials which might have been used for hunting, fishing, rafts, boats, housing, baskets, clothing, and similar items. Non-material culture remains even more of a mystery.

The most prominent feature of the cultural landscape at the time the hill was occupied was stone cairns, erected haphazardly over the site. The cairns are approximately four feet tall and two to three feet in diameter. Originally, they stood above the ground surface but now lie buried beneath refuse and debris (Fig. 17). No geometric pattern
CENTRAL PANAMA

ARCHAEOLOGICAL SITES
NON-FARMING: Hunting, Fishing, & Gathering
- Cerro Mangote (preceramic)
- Monagrillo
- Sarigua

SIMPLE FARMING:
- Pre-Coclé (also beneath most Coclé sites)
- Coclé
- Non-Coclé, but contemporary in 1500 A.D.

Area of recent alluviation
Limit of shore-dwelling cultures
Limit of the Central Savanna

Sources:
is formed by the stone piles, nor is there any relationship to cardinal directions. Nothing is concealed within or beneath them, and they are not associated with burials. Their function remains unknown.

Fig. 17.—Excavating at Cerro Mangote, Cocle. To the right of the central trench, between the mestizo workman and the portion of the other man, is a cairn. Some of the uppermost rocks have tumbled into the trench. April 14, 1956.

Cerro Mangote is the first preceramic site to be found in Central America. It may be tentatively dated between 1 A.D. and 500 A.D., pending results of radiocarbon tests soon to be completed by Yale University. It is geographically significant that the first known inhabitants of what is now Panama lived almost in the middle of the central savanna.
Monagrillo

The Monagrillo site is located near the mouth of the Río Parita, adjoining the present village of Monagrillo, Herrera (Maps I and VIII). M. W. Sterling made the first excavations in the late 1940's. The aboriginal settlement was occupied 200 to 500 years after Mangote, depending on the date finally assigned to the latter. Culturally the groups were related, the only outstanding difference being pottery. If ceramics are subtracted from the Monagrillo culture, McGimsey believes that the artifact inventories of the two cultures, while not identical, closely parallel one another. The most distinctive Monagrillo artifacts, pebble choppers and grinders, are indistinguishable from those found at Mangote. Until the discovery of Cerro Mangote, Monagrillo was the oldest site reported from Panama. It is still the oldest known pottery site in the Republic.

The introduction of pottery brought little change to the Monagrillo people, and life continued along the same lines as at Mangote. There is no evidence that agriculture diffused to Monagrillo with pottery. Perhaps the introduction of pottery was not in itself so important as the possibly implied opening of channels of communication, however indirect, with the more advanced Formative cultures to the north and south. Along this line of communication probably flowed ideas and artifacts. These helped transform the relatively simple Mangote and Monagrillo cultures into the culturally complex groups encountered by the Spaniards in 1515. If it
can be established that channels of communication were already operative during the pre-Formative transition from Mangote to Monagrillo culture it would probably indicate the invention of pottery at some point along the channel rather than simply the development of a more widespread network of stimulus diffusion and trade. It is even conceivable that Monagrillo was settled by people directly from Cerro Mangote, only fifteen miles to the north.

Sarigua

The Sarigua culture has been located near Aguadulce and Parita (Maps I and VIII). Chronologically, Sarigua followed Monagrillo, with slight culture change. It is significant that this is the last shore-dwelling culture reported from the central savanna. With Sarigua there apparently began a population shift inland, to the section of the hearth where the greatest savanna civilization ultimately appeared. Many streams afford easy access to the interior (Map XX).

Wide gaps in archaeological findings do not permit investigators to set forth the exact reasons for a substantial movement of peoples up the river valleys. The introduction of agriculture seems to offer the most likely explanation, movement coinciding with the search for suitable lands.

The Coastal Landscape

The inhabitants of Cerro Mangote, Monagrillo, Sarigua,
and numerous post-Monagrillo shell-fishers, shared a common environment. The section of coast fronting the Gulf of Parita is an area of extensive tidal flats, mangrove swamps, and marshes. Gallery forests line each side of the major rivers emptying into the gulf. The forests offer adequate wildlife to a hunting population, but agriculture is almost impossible during the wet season in the bottomlands because of severe flooding.

Although most archaeological sites are today located some distance from the gulf (Map VIII), at one time the waters came much further inland. The coast has gradually advanced seaward through a process of offshore bar formation and lagoon silting. At Cerro Mangote the shoreline has advanced seaward approximately five miles since people occupied the hill. High ground, primarily igneous outcrops, was sought by the shore peoples. Not only are there seasonal inundations from rivers but also great tidal ranges in the gulf.

The hills were originally wooded and there is a possibility that they were never entirely cleared. Today the vegetation consists of several species of Mimosaceae, especially the thorny Bullhorn Acacias (A. melanoceras, A. costaricensis, and A. panamensis). Most of the hills are too small to have supported much animal life when they were inhabited. Even shellfish supplies from the tidal flats were readily exhausted. Today, variations in the middens can
be detected, which reflect the extremely localized nature of the supply.

The coastal landscape offers relative abundance to non-agricultural peoples, but it is generally undesirable for agriculture of even a primitive sort. A population movement inland would probably follow the acceptance of agriculture. There is no reason to believe that the shell-fishing cultures were ignorant of better-drained sites a few miles up the valleys.

Cocle'

The Cocle culture, encountered by the first Spanish entrada in 1515, has been examined in detail by Lothrop. Cocle represents the highest cultural level attained by Panamanian Indians before or after the Conquest. Lothrop assigns the following dates to Cocle: (1) Early Period (1330-1430 A.D.), (2) Late Period (1430-1490 A.D.), and (3) The Decline (1490-1520 A.D.). The material culture of the Cocle Indians has been faithfully described by the early Spanish explorers. Top layers of refuse in many sites contain items identical to those found in towns looted by Espinosa in 1519, thereby establishing the fact that Cocle was contemporary with the Conquest.

Cocle culture origins.—Lothrop's analysis of Cocle culture has shown that it had many and diversified relationships with distant peoples and territories. Earliest traces of the culture indicate that it was already mature, with
complex symbolism and art styles. Assuming that Coclé peoples can be accepted as a unified ethnic and linguistic group, the following hypotheses can be made:  

1. Their original home was in the Amazon valley, probably on the western frontier.  
2. They moved northward after the spread of Tiahuanaco art styles, on the same chronological plane as the sculptors of San Agustín in Colombia.  
3. In transit they acquired the Colombian metallurgical techniques.  
4. They pushed northward sufficiently far to learn the polychrome pottery techniques of Central America.  
5. They then settled in the Panamanian hearth. Once here, they proceeded to develop along independent lines which produced a highly individualistic and picturesque local culture. Later this culture was influenced by trade with Colombia, Ecuador, and Mexico.

Although the idea of a unified ethnic and linguistic group is appealing, there is a strong possibility that this was not the case. Early Spanish explorers frequently referred to the great diversity of language and physical type. There are also evidences of Arawak influences in curvilinear pottery styles. In monochrome pottery there is a reflection of the tradition of Darién, Chiriquí and the highland and Atlantic coastal areas of Costa Rica. Presumably, all of the latter are Chibchan. A third ceramic type is the polychrome tradition similar to that of Chorotega (Nicoya Peninsula) in the use of color and to Chorotega and Peru in the employment of symbolism. The ball
courts, quite similar to the ones in Hispaniola, are in no way related to those of Meso-America and were intrusive from the Antilles.  

Evidence of Coclé culture has been found along all of the major streams draining the modern provinces of Coclé, Herrera, and Los Santos, and also on various islands in the Gulf of Panama (compare Maps IX and XI). The eastern boundary has not been definitely established. It is believed that this coincided with the linguistic boundary which was once in the vicinity of Chamé. No artifacts of Coclé style have been recovered from the mountains north of the hearth. Veraguas culture seems to have extended well to the east in the Cordillera Central. The western limits of the Coclé hearth approximate the modern eastern boundary of Veraguas Province (Map IX). No Coclé pottery has been found in Costa Rica or further north in Central America. Trade items of Coclé manufacture, such as metal figurines and agate pendants, have been found in Yucatan and southern Mexico.

The Indians of pre-Hispanic Panama were located almost midway between the high civilizations to the north and south. Apparently, the main route for diffusion, migration, and invasion passed through the Isthmus. For what seems to be purely environmental reasons, the savannas of Pacific Central America were preferred as a land route to the jungles of the Atlantic coast. Most traits that diffused overland to or from central Panama followed the savanna route. Other
Sources
C. L. G. Anderson, Old Panama ... (New York, 1944), 183-209.
Oviedo, Historia general ... (Asunción, 1944), Lib. VII, VIII.
Los Causas, Historia de los Indios (México, 1951),
III, Lib. iii, Caps. LXXIX, LXX, (XXI), 61-70.
PANAMA

CULTURES OF 1500 A.D.; SPANISH ENTRADAS, EXPLORATION, SETTLEMENT BEFORE 1521 A.D.

- Cocle culture in 1500 A.D.
- Veraguas culture in 1500 A.D.
- Pre-Columbian culture, limit undefined
- Culture undetermined
- Route of Cocle diffusion
- Spanish settlement and date of settlement

SPANISH EXPLORATIONS:
- Bastidas-Balboa (1501)
- Columbus (1502-03)
- Nicolás (1509-10)
- Enzisco-Pizarro-Balboa (1510)
- Balboa (1513)
- Badejo (1515-18)

Limit of the Central Savanna
Ray
/cr
M
Uxft
Mil M pa M (Ufa (m e
re In 1500 A.D.
culture In 1500 A.D.
limit undetermined
diffusion
date of settlement
(ro - 1510)

Central Savanna

MAP IX

D A R I E N

D A R I E N
diffusion occurred over water.

The main geographic obstacle to overland diffusion from northern Central America is the east-west mountain system of Honduras. Still, some people as well as ideas crossed the highlands in both directions, passing through the Lenca Indian country. Because of the barrier, migrants seem to have favored the Pacific coast. Passage from northern Guatemala to El Salvador and southern Honduras, via the Motagua and Lempa valleys, is the easiest and shortest. Modern communications have taken advantage of the same natural routes. Though some northern traits diffused overland along the northern coast of Honduras and Nicaragua, their impact on Panamanian Pacific coastal culture was slight. Most land movements from central Mexico southward followed the Pacific route.

Sea routes between Panama and Mexico were well developed. The trip by boat from Panama (Bocas del Toro Province) to Yucatan is risky, but not at all arduous. There are dangerous reefs, occasionally a norther between December and February, and a chance of a hurricane in the latter part of the year. Thunderstorms are frequent off the coast of Nicaragua, even during the dry season. There were sea-going craft in use along this route during the Mexican period in Yucatan. Frescoes at Chichén-Itzá illustrate sea battles, as well as commerce. During the seventeenth and eighteenth centuries Mosquito Indians raided as far south as Portobelo. It is well known that Aztec traders were in the Chiriquí
Lagoon when the Spanish conquest of Central America began.

Routes to the south resemble those to the north in many ways. The land route from South America to the savanna is relatively difficult. Dense jungles and extensive swamps in the Atrato valley and along the coast of northwestern Colombia undoubtedly modified whatever traffic there was. The best route to central Panama from the south is over open water.

Coclé peoples possessed a cultural tradition of seamanship. They constructed boats capable of carrying seventy people and frequently made long trading voyages over open sea. Sails of cotton were made, and probably some of bark cloth, as well as balsa rafts and small canoes. The advanced trading activity and seafaring offer a tantalizing possibility that the people came in boats to central Panama from South America. This would explain the appearance of a fully matured culture without any known predecessors in the savanna.

There are many related features between the Coclé culture and that of the western lowlands of Ecuador. Remarkably similar are the Esmeralda and Manta Indians. Although some would have the main stream of diffusion moving from north to south, the best evidence today points to an opposite flow. The Indians inhabiting the Ecuadorean Province of Manabí were great sailors, possessing balsa rafts, sails, and fine dugout canoes. Some rafts carried cabins which held up to twenty people and thirty tons of
merchandise. They traded in cloth, emeralds, and metals, and coastwise traffic as far north as Panama was undoubtedly pursued. When the Spaniards were at Santa María de la Antigua del Darién (Map IX) they were told about llamas and the maritime peoples to the south. This might explain the llama-like petroglyphs I have seen on rocks in western Panama.

The Indians living in the hearth were in a more or less favorable position to receive diffused traits from either north or south. To determine from which direction the traits came, or by what route, is a difficult matter. Data are fragmentary and contradictory. A large amount of cultural materials in Central America is lost forever and anthropology has as yet failed to integrate much that remains.

Cocléan life.--Lothrop's work on the Coclé furnishes a great wealth of information relating to the culture occupying the hearth at the time of the Conquest. However, we may turn to the seventh and eighth volumes of Oviedo's Historia general for an eye-witness account.

Cocléan was a stratified society with a ruling class and a ruled class. A single powerful chief, or cacique, exercised nominal rule over a vast territory. Lesser chiefs (sub-chiefs) handled the immediate affairs of their individual villages and adjacent lands. Sitio Conte (Map VIII) was possibly the seat of a cacique, who commanded tribute from all his subjects. To him the people brought food, gold,
cloth, and polychrome ceramics. They carved stone, bone, and ivory, and fabricated tools, weapons, combs, musical instruments, and jewelry. Cocle metallurgy was based on gold and copper, and alloys of these two metals (tumbaga) were employed. Pure copper artifacts were not made, though some pure gold has been found.

The various articles listed above were presented to the chiefs and sub-chiefs as tribute. These are the objects with which we are familiar through historical narratives and archaeological discoveries. The Spaniards were obviously not impressed with the simple, worthless possessions of the commoners. Therefore, they failed to record them in great detail. It is apparent that the great wealth described by the conquistadores applied to only a select few. Archaeology provides us with an equally impressive account of the culture. Lothrop, among many, is of the opinion that only important personages received lavish funerals. The commoners were probably buried on top of the ground or in shallow graves, without enduring artifacts. Supporting evidence of this may be found today among modern Guaymí peoples. Thus only a small fraction of the culture was ever placed in the ground for us to uncover in modern times. This fact alone makes the pre-Columbian population figures more impressive.

The single, large (round ? ) house of the chief dominated the village. It was usually wattle-daub, had a steeply pitched roof that was thatched, and was divided into many rooms. Several wives, children, close relatives, and
servants lived under the same roof. There were also storage facilities for smoked meat and fish, and dried maize. Often the village was surrounded by a living palisade for protection, and usually contained a plaza and ball court.

The lower classes lived in small clusters of a few houses, scattered about the plains but always near forest and stream. Some of the houses were round, others were apsidal and possibly rectangular (see chap. iii). The people practiced simple farming, using a dibble, and burned their communal fields every March or April (see chap. iv). Usually there was a surplus of agricultural production, but the diet was supplemented with wild fruits and nuts, game, and a variety of sea foods. Clothing was quite basic, perhaps only a loin cloth, but entirely adequate for the climate. Pottery was well developed, monochrome in type, and ornaments were made of bone, shell, or wood. The Indian peasant was a good craftsman, and made all of his household and occupational necessities.

Tribes and Chiefs

Although the Indians living in the hearth area at the time of the Conquest all shared the Cocle cultural tradition, they were not politically unified. There were many groups who were openly hostile and often at war. Nevertheless, at the beginning of the sixteenth century, three chiefs may be singled out as dominants: Parita, Escoria, and Natá. Some
of the lesser chiefs under these three appear to have been almost autonomous. Only in times of extreme crisis does there seem to have been a moral obligation to unite. Las Casas, Martyr, Oviedo, Espinosa, and Andagoya mention fifty-five chiefs and sub-chiefs in the savanna and adjacent areas in the early 1500's. The same chroniclers use no less than fifty-eight alternate spellings for the names of the caciques. Map X represents an attempt to map the locations of the chiefs as of 1520. In some cases modern place names tell more than historical record. In others, there is no way of identifying even the approximate location.

Parita nominally ruled the area of the Azuero Peninsula and most of the coast eastward as far as Chame. While his control was lightly enforced prior to the arrival of the Europeans, most of the Azuero Indians united under his leadership to resist the Conquest. Cacique Parita lived a few miles inland on the south side of the gulf that still bears his name. Today, in the same general vicinity, may be found the Río Parita, a village called Parita, and a village known by an alternate name, París.

Escoria's village was about eighteen miles inland, on the bank of the Río Santa María, known during the first two centuries of Spanish occupation as the Río Escoria. Today the name Escoria is given a small tributary of the Río Santa María. This has led some investigators, among them Lothrop, to assume that the present Río Escoria was the original river of that name.
The third of the important chiefs, and the first encountered by the Spaniards, was Natá, whose name has been immortalized in the present town of Natá. Chief Natá's territory was separated from the land of Escoria by either the Río Estero Salado or Río Membriller (Map X). Natá ruled much of the modern Province of Coclé and his village was the largest in central Panama at the beginning of the sixteenth century.

Aboriginal Population Density

It is not a simple task to arrive at a satisfactory figure for an aboriginal population that was almost totally dissipated during the first decade of contact with Europeans. References to native population density during the first entradas of Badajoz and Espinosa (1515-1520) are few. Espinosa estimated the population of Natá to be more than 1,500 in the year 1516. Further, he described the general area of Natá as being thickly settled, with many houses, fields, and people. Oviedo suggests that some chiefs commanded on an average of 2,000 to 4,000 warriors, with three people remaining behind for each Indian fighter. Parita, with 4,000 warriors, would have had at his immediate disposal some 16,000 people, if this reasoning is correct. If each of the fifty-five savanna chiefs had controlled an average of 5,000 people, the population of the hearth would have been 275,000 people.

Oviedo points up the question of native decimation on
at least one occasion. He states that, between 1514 and 1530, Pedrarias killed or exported as slaves some 2,000,000 Indians from Castilla del Oro and Nicaragua. Such a number indicates that Oviedo was aware that the land was densely populated at the time of the Conquest, even if the estimate is too high.

Villages were certainly numerous in all parts of the central savanna, except between Chame and Chirú. None of the sixteenth century chroniclers suggests that the area of dissected, sandy soils supported many natives. The great number of archaeological sites indicates a high population west of Chirú (compare Maps VIII and XI). For every village and town in the savanna today there are a score or more unmapped archaeological sites. Of course, unmapped sites are almost useless in arriving at a population estimate. No studies have been made regarding density of house foundations or burials. Therefore, archaeology has yet to provide concrete evidence with which to establish a population estimate.

There is no doubt that the pre-Hispanic savanna could have supported a population equal to or larger than that today. The natives had obtained a reasonably high culture by the end of the fifteenth century. The productivity of Indian farming is confirmed by the fact that wherever the Spaniards went they found surplus food in the villages. The rich alluvial bottomlands were not fenced off and grazed during Indian times. Farming appears
to have been more settled and less migratory than today, for large, permanent fields were often described by the conquerors. Many of the same areas are now uninhabited or in pasturage. Sapper takes these things into account when he estimates the pre-Columbian population of Central America to be 5,000,000 to 6,000,000. The estimate is based on the productiveness of different lands and economies. Rosenblatt calculates only 800,000 people occupied the same area. Steward nearly agrees with Rosenblatt, with a figure of 736,000. Of this latter total, Steward estimates the total population for pre-Conquest Panama at only 224,600. This is broken down into 150,000 people for eastern Panama, and 74,600 people for western Panama. Miro suggests more than 300,000 for western Panama alone.

At best, most of the estimates cited above are gross guesses. Perhaps Espinosa and Oviedo are closer to the truth than the moderns. I would estimate no less than the present population of 235,000 for the central savanna. Possibly there were as many as 500,000 inhabitants in the hearth at the time of the first entrada.

The Period After 1515

The Spanish conquest of Panama began in 1501, when Rodrigo de Bastidas first sighted the Isthmus. There followed unsuccessful attempts to establish colonies at Belén (Columbus, 1503) and Nombre de Dios (Nicuesa, 1510). Chiefly through the efforts and skill of Vasco Nuñez de Balboa, the Spaniards were able to found and maintain a colony at Santa
María de la Antigua del Darién, in the latter part of 1510 (Map IX). The settlement was the first real capital of Spain on the mainland of America. In 1514, the year following his discovery of the South Sea, Balboa was superseded by Pedro Arias de Ávila (Pedrarias). Expeditions sent out from Antigua by Pedrarias resulted in the first exploration and eventual conquest and settlement of the central savanna.

**The First Entrada**

The first Spaniard to lead an expedition into the central savanna was Gonzalo de Badajoz, who sailed from Antigua to Nombre de Dios, in March 1515 (Map IX). With 130 companions he crossed the Isthmus on foot and entered the savanna from the east. Several months of successful looting ended with defeat at the hands of Parita. Badajoz and a few survivors eventually made their way back to Antigua. The period from 1516 to 1520 witnessed three important expeditions under the command of Gaspar de Espinosa. Each entrada followed much the same route as that taken by Badajoz, once west of the present Canal Zone, and the same peoples were encountered. By 1520 the Spaniards were in the savanna to stay, and by 1531 the conquest of the Coclé hearth was complete. A number of excellent historical accounts concerning these forays has come down to us from Las Casas, Martyr, and Oviedo.
Settlement Types

Six fundamental settlement types are characteristic of the savanna (Map XII). The first began with the establishment of Natá (1520) and the sixth is not yet concluded.

(1) Religious-political-military settlements.--As capital and chief city of the Isthmus for more than 400 years, Panama City's political and economic history is well-known. The city is considered here as an advance base for savanna settlement. As early as 1515 the native fishing hamlet of Panamá was visited by Antonio Tello de Guzmán and Diego de Albites, while on raiding parties for Pedrarias. The name Panamá first came into usage following this expedition (Fig. 18), and eventually replaced the older, more romantic name of Castilla del Oro for the entire province.37

![Fig. 18.—Panamá tree (Sterculia apetala). The name Panamá comes from the Cuna (Cueva). Indian name for this tree. January 29, 1956.](image-url)
CENTRAL PANAMA

SETTLEMENT TYPES
ACCORDING TO FUNCTION

PANAMA (1519)

New Panama (1671)

La Colonia (ca. 1595)

Puerto de la Chorrera (ca. 1600)

X Cortée (1535)

Villa Carmen (1533)

Villa Rosario (1524)

Cerro (ca. 1595)

Lo* Cruces (1514)

La Campaña (ca. 1920)

Concepción (1557)

Santa Fe (ca. 1557)

NATÁ (1552)

CIS (1556)

Rio Hato (ca. 1700)

Rio Chiriquí (ca. 1700)

Santo Claro (ca. 1700)

Aguadulce (ca. 1675)

Panamá (1581)

El Valle (ca. 1920)

Bejucal (ca. 1600)

Chone (ca. 1595)

Nuevo Gorgona (1947)

San Carlos (ca. 1600)

Panamá Norte (ca. 1940)
When Espinosa returned to Antigua from his second expedition to the savanna (1516), he recommended the founding of Panama City and Natá. The towns were needed as bases for the conquest and colonization of western Panama. The next year Espinosa began to fortify Panama City. It was his intention that the town would serve as the southern terminus for a line of forts across the Isthmus. The city was officially established by Pedrarias on August 15, 1519, the first European settlement on the Pacific coast of America. 

Rubio, in an analysis of the location of Panama City, cites a number of geographic factors behind the selection of the site. (1) The location is at the narrowest part of the Isthmus. (2) Lack of important topographic barriers between the city and the Atlantic coast made a trans-Isthmian land route feasible. (3) A port on the South Sea was a necessity if the conquest of western Panama was to become a reality. (4) Surrounding savannas (the eastern savanna) offered possibilities for cattle. (5) The Aw climate, though hot and humid, was healthier than the Am climate of Antigua. (6) Several offshore islands would aid in the defence of the city, as well as support a fishing industry. (7) Wood for shipbuilding and general construction purposes was readily available in the immediate area. (8) There were no large groups of hostile Indians near the proposed city.

The old Panama City remained the most important Pacific port until its destruction by Henry Morgan in 1671.
The ravished town was abandoned and a new city was built some five miles to the west.

Once a permanent settlement was effected at Panama City the conquest of the savanna was earnestly pursued. Founded on January 20, 1520, Natá is the oldest continuously inhabited Spanish settlement on the American mainland (Fig. 19), and its church is the oldest building still in use in America (Fig. 20). From 1520 to 1820, Natá was the principal seat of Spanish government in western Panama. Its jurisdiction extended over the entire area of the central savanna, an early recognition of the geographic unity of the hearth. Natá's influence was not only political, religious, military and economic; it was also geographic. Virtually every other Spanish town in the area can trace its original settlers back to the early caballeros de Natá.

At the end of the sixteenth century the King of Spain sent to Natá

one hundred distinguished gentlemen--men of illustrious background, noblemen, of recognized good reputation and faith--to the lands that have been under the rule of our Indian chiefs. These gentlemen, who were chosen in Spain in a very special manner, came to the Isthmus and, in Natá, planted their symbols of authority.10

Natá was an ideal geographic location for the Spaniards, as it had been for the Indians, although for a number of different reasons. The town is located almost midway between the Gulf of Parita and the Cordillera Central, on the north side of the Río Chico (Map I). Before emptying into the sea the small stream is joined by the Ríos Cocle'
Fig. 19. -- Memorial to Gaspar de Espinosa, founder of Nata, Cocle. The village plaza lies behind the monument. On the left is a large stone once used for crushing rock at nearby gold mines. March 2, 1956.

Fig. 20. -- The tower of San Juan de Dios de Nata, Nata, Cocle. Constructed in 1520, this is the oldest building still in use in the Western Hemisphere. March 2, 1956.
and Grande de Coolé. Nearby are several large, flat-topped basaltic hills that still offer refuge to lowland dwellers during floods. However, the Río Chico is not the constant threat that the large rivers are. Wood and gold were readily available in the hills to the northwest at one time. To the southeast the coast supplied salt, seafood, and mangrove (the latter for charcoal and tannin). Fur-bearing animals abounded around Natá at the time of the Conquest, as did birds, turtles, and some fresh-water fish. Alluvial soils in the flood plains of the three rivers offered relatively fertile and adequate areas for Indian digging-stick farming. Maize, beans, squash, and yuca were the agricultural main-stays (See chapter iv). Abundant wild food-plants augmented the diet.

In addition to the favorable conditions of location and food supply, the Spaniards found the scattered-tree savanna immediately suitable for their cavalry, and later for livestock. The central location, ease of movement via rivers or grasslands, and rather pleasant wet-and-dry climate, combined with the aforementioned factors to make Natá an ideal spot for Spanish settlement. Compared with the austerity of the poorly situated Antigua, the Natá area must have been the most desirable mainland site visited by the Spaniards up to that time.

Organized Indian resistance ended rather abruptly in 1531, when Urracá, the last of the strong caciques, died. The aborigines moved north and west into the Cordillera
Central, where their descendants still live. In 1533 there were only eighteen or twenty Spaniards and "very few" Indians in Natá.\(^{42}\) A report dated 1534 indicates that there were 700-800 Indians left in the vicinity of the town, serving their masters like slaves.\(^{43}\) A letter dated 1611 furnishes an interesting account of Natá at the beginning of the seventeenth century:

That which they call the city of Natá has 16 houses of thatch, without doors. There are no streets, or arrangement of buildings, or shops, or any other things that other towns have. They are all poor people—so much so that if an honest person arrived and did not bring his own bed the people would not be able to give him a place to sleep. There is a very good church in Natá, ably served by 2 priests. There are 10 or 12 vecinos with occupied houses. The rest are mostly Spanish, mestizos, mulattoes, and Negroes—spread out on estates and in fields which are very fertile and in cattle; some on the other side of the Río Grande [de Coclé] and the other rivers which they call Escoria [Santa María] and Río de Coclé. These are so rapid and have such a great volume in the winter [wet season] that one crosses with much danger and some of the people have been drowned. These [i.e., people on the other side of the Río Grande de Coclé and Río Coclé] go to mass in Penonomé and I have given them permission for this because it is impossible to go to Natá.... In summer [dry season] everyone comes to Natá, especially during Holy Week, Christmas, and other principal days....\(^{44}\)

Natá continued to decline, and by the early eighteenth century we find:

The city is totally abandoned, except for the priests. Some say the environment was bad, others that the people prefer to live on their haciendas or in their fields. The only ones living in town are those that have no place in the mountains to live. Only on feast days does the priest see the people. There are about 2,500 people in the
The Parish of Natá, which included almost all of modern Cocle Province, had a population of 12,803 in 1803. Today Cocle Province counts 73,103 inhabitants, with 1,530 in Natá, the latter about the same size as in 1519.

The story of Natá is rather typical of the Indian towns that were occupied and permanently settled by the Spaniards. A large native population rapidly dwindled. Disease, murder, warfare, overwork, and desertion were all contributing factors to the decline of native population. The remaining Spaniards had difficulty maintaining themselves and began importing Negro slaves in large numbers.

The Spanish conquest of the central savanna began and ended with the establishment of Spanish Natá. No towns were founded in the savanna between 1520 and 1556, the period when all interest was focused on Mexico and Peru. During these quiet years in Panama a number of settlements, such as Panama City, Natá, and Nombre de Dios, showed a marked decline in population. The old capital of Antigua disappeared altogether in 1524. A renewed effort to colonize the hearth, led by Governor Juan Ruiz de Monjaraz, followed the thirty-six year lull. This resulted in the founding of Los Santos, Parita, and Olá. The colonization movement was motivated primarily by a desire to contain the Indians in villages for the purpose of instructing them in Roman Catholic doctrines. For this reason, settlements were located at or near existing centers of Indian population.
The actual settlement of the new towns was prosecuted by the priests from Natá.

Los Santos (originally Santa Cruz) was established a mile or two from the Indian village of Cubita. In a few years the town became generally known as La Villa de Los Santos, and the Indian's Cubita River became the Río de la Villa.\(^49\) The aboriginal village did not lose its identity until 1575.\(^50\) Shortly after 1575 the Indians were resettled near the church, and by 1691 there were 5,000 people in the parish.\(^51\) In the early eighteenth century La Villa de Los Santos was described as a well-populated Spanish town, favorably located.\(^52\) The 200 houses in the town all had tile roofs, and there were two streets, a plaza, and a fine church. Fifty Spanish families lived in La Villa, and "all the rest of the people are colored of different species."\(^53\) Eventually, common usage shortened the town's name from La Villa de Los Santos to simply Los Santos. The river is still called the Río de la Villa.

Parita (originally Santa Helena) is located twelve miles northwest of Los Santos. By the 1570's the town had acquired the name of the river, which, in turn, was named for chief Parita.\(^54\) However, the Spanish Santo Domingo de Parita (the official colonial name) was not the village of the great warrior. Cacique Parita probably lived nearer the present hamlet of París, seven miles northwest. Parita remained an Indian town until near the end of the seventeenth century.\(^55\) In the late 1600's eight or ten Spanish families
from Los Santos went to live in Parita to "contain the Indians," establish trade, and improve the town. Until this time only the priests were there, living among the natives and instructing them in the faith.

The town of Olá was an Indian village before 1515, and had later (in the 1520's) served as an advanced supply point during the encounters with Urraca and other Indians of the mountains. In 1556 it was annexed to Natá for jurisdiction and was served by priests from the latter, as in the case of Los Santos and Parita. During the sixteenth, seventeenth, and eighteenth centuries, Olá was alternately known as Santiago de Olá and San Lucás de Olá. It was never a large settlement, having only twenty families in the late 1600's.

In 1581 the priests of Natá recommended to the Audiencia of Panama that a town was needed at the Indian settlement of Penonomé. The location was approved and a Spanish town was formally established by Dr. Diego de Villanueva, Fiscal of the Audiencia. Penonomé, named for an Indian chief and first visited by Badajoz in 1515, is the northernmost city of any importance in the central savanna. At the end of the seventeenth century it was the largest Indian town in Panama, with a population of over 1,000. In 1736 there were more than 1,000 Indians, and 600 Spaniards and "people of color" in the town. Today Penonomé is the capital of Coclé Province and one of the most important commercial centers in the savanna.
Ten years after the settlement of Penonomé, Pedro Fernández Cortez founded San Pedro de Montijo (now simply Montijo) as an advanced base for campaigns against the remaining Guaymí in the hills to the west. Shortly after its establishment a church was built and the population grew as people from mining camps to the north began to settle in the vicinity. Montijo remained the most important town in what is now Veraguas Province until the founding of Santiago.

The last of the important religious towns was founded in 1623, when padre Gaspar Rodríguez y Valderas established San Miguel de Atalaya (now Atalaya) and San Francisco de la Montaña de Veraguas (now San Francisco). Both of these towns were founded for purely missionary reasons and were annexed to Santiago for administrative control. In 1691 the two Indian towns had between fifty and sixty persons each, and forty-five years later Atalaya was only slightly larger. San Francisco gained a little in population during the seventeenth century when Spaniards and Negroes went there to search for gold.

Thus the settlement of Indian towns for religious, political, and military purposes was completed during the first quarter of the seventeenth century. All of the towns have survived as mestizo settlements, in the main. Within these towns one may still see the best-preserved elements of Indian culture in central Panama.
(2) **The mining settlements.**—Most mining towns were founded for the purpose of serving the Veraguas gold mines with provisions, labor, and to function as a seat of governmental and religious authority. Nata supplied the priests to all mining communities. As an outgrowth of the renewed interest in colonization that occurred in 1556, the governor of Veraguas, Francisco Vásquez, established the towns of Santa Fe and Concepción. Officially the beginning of both towns was in 1557. By 1604 there were only eighteen Spaniards in Santa Fe, and four years later there was talk of abandoning the settlement. There were only eight Spaniards remaining in 1608, for the bulk of the population had gone to the plains of the Río Santa María. In the bottomlands they raised maize and cattle to sustain themselves. Concepción suffered a similar decimation. A number of reasons have been given for the failure of Santa Fe and Concepción, including disease, location, climate, and lack of provisions. It appears, though, that the main reason was the limited supply of gold, especially when compared to the silver and gold production of Mexico, northern Central America and the Andes. Las Minas is the only savanna town that experienced a serious attempt at mining. However, gold production was so slight that the people early turned to cattle, farming, or found it necessary to move to another location.

(3) **Communication centers.**—A third type of settlement emerged as traffic increased between Panama City and the
hearth—the communications center. Some of the communities
in this group began as transshipment points; others were
founded as security positions, for pirate activity became
increasingly bothersome in the late sixteenth and early
seventeenth centuries. Villages appeared where north-south,
east-west routes crossed, or where there were major highway
junctions. A few of the route towns offered rest-stops to
mule drivers, troops, priests, officials, and settlers who
were traveling east and west through the savanna. A few
ports appeared, though most transport from the late sixteenth
to the mid-seventeenth century was overland. Pirates, and
the inability of the Spaniards to cope with the tidal flats
and extreme tides, were largely responsible for the
concentration on land routes.

Santiago de Veraguas, one of modern Panama's most
important interior cities, began as a communication center.
The literature does not mention the town's existence before
1640, and there is proof that it was not settled before
1620. Requejo identifies Santiago as a Spanish town in
1640, and fifty years later there were at least 1,000 people
in the parish. Throughout its history the city has
remained predominantly Spanish. By 1736 there were over
3,000 inhabitants, 150 houses, and two long streets.
Nevertheless, the city was not so prosperous as the large
population might suggest. Few people worked, preferring
to search for gold and the chance of striking it rich.
During the colonial period a main road led south from the
Veraguas mining areas, through Montijo, to Puerto Mutis. The main east-west route from Panama City crossed the north-south road at Santiago. Coupled with central location are such natural advantages as abundant pasture land, rich alluvial areas, and freedom from floods because of elevation.

Modern Santiago continues to be the most important cross-roads town in central Panama, halfway between Panama City and David (Map I). It is the capital of Veraguas Province, and with a population of 5,886 is second only to Chitré in size of savanna cities.

Between the central savanna and Panama City, along the one historic route of transport and communication, lie several towns that date from the early seventeenth century. Among the more important are Arraiján, La Chorrera, Capira, Bejuco, and Chame. Only the latter was a pre-Conquest Indian town, visited by Badajoz during the first entrada.

One of the few savanna towns to begin as a port is Aguadulce. It appeared on the map long after it first served as a debarkation point for men and supplies destined for the interior. Most of the original settlers, however, came from Natá, probably in the mid-seventeenth century. One other port, Mensabe, was settled in the seventeenth century by people from Los Santos. It enjoyed a flurry of commercial activity during the 1600's and 1700's when Panama City was under almost constant pirate attack.

The newest addition to the communications centers is Divisa. The tiny village appeared where the highway,
telephone, and telegraph lines branch off from the east-west trunk and extend southward into Azuero. Because of central location, the government chose Divisa for the location of the National Institutes of Agriculture and Mechanical Arts. It is reasonable to assume that the village will grow with increased highway traffic and school enrollments.

(4) Agricultural-livestock settlements.--The towns in this group grew up simultaneously with the settlements dating after 1556. Demands for food and animals were created by the increasing population not primarily engaged in such activities. People from religious (political and military), mining, and communication towns gradually migrated to the open savanna. They commenced raising cattle, horses, mules, and certain subsistence foods. Usually, the settlements were located in such a manner that pasture and farmland would be mutually accessible.

Antón and Santa María offer typical examples of the type, although both towns are also associated with a vital communication link. The communities date officially from the late seventeenth century, but clusters of people were living in the areas previous to that time. The closing years of the seventeenth century saw the colonial period of colonization and settlement in the savanna come to an end. Las Tablas (1680), Pocrí (Los Santos Province), Pesé, Ocú, Pedasí, Guararé, and Monagrillo were settled mainly by people from Los Santos before 1800. To the list may be added El Roble,
Río Hato, Río de Jesús, Macaracas, and Las Guabas. The newest town is Chitré, settled around 1800 by people from Monagrillo. 72

(5) Resort settlements.--A number of mountain and seaside resort towns have appeared since 1900. The highland communities of El Valle and La Campana do not belong to the savanna proper. It may be observed that as roads are built to connect the mountain towns to the National Highway, agriculturists are moving inland. These are primarily commercial people, interested in producing mid-latitude crops, coffee, and citrus for the Canal Zone-Panama City market.

The main coastal resorts, Santa Clara and Río Mar, have taken advantage of several geographic factors. Fundamental to the location of seaside towns is the broad expanse of sandy beach, extending from Punta Chame to Puerto Obaldía (Map XII). Proximity to the highway and a long dry season favor this area as a bathing resort.

(6) Planned settlements.--The old village of Gorgona (Canal Zone) was relocated as Nueva Gorgona, before the former was flooded by artificial Lake Gatun. The planned town was not very successful; apparently the people were displeased with a physical and cultural environment quite dissimilar to that of the Atlantic watershed. Another relocated village, Las Cruces, was established east of the savanna, with no more success than that of Nueva Gorgona. During the depression of the 1930's Panama founded two
agricultural colonies near the eastern edge of the savanna. Colonia Villa Carmen (1933) and Colonia Villa Rosario (1934) were settled with unemployed urban folk. The settlements provided for a grant of ten hectares (about twenty-five acres) of land to each family. Only a few of the original settlers remain on the land today.

**Population spread from the hearth.**—Once control of the hearth was assured, Spanish settlement pushed west, into Chiriquí. The earliest permanent western towns date from the 1590's; most were settled in the eighteenth century. Remedios (1589) and Alanje (1591) are two of the most ancient. David seems to have begun as a mission about 1602, but is not mentioned as a town until the mid-eighteenth century. Expansion to the west continues, but not so rapidly as movement to the trans-Isthmian area. Over 20 per cent of Panama City's population has come from the central savanna. A constant flow of interianos moves to the east every year, hoping for better conditions in the capital. The more fortunate ones find positions or return, while the others add to the swelling urban slums.

The western spread of peoples from the hearth has apparently been reversed. Now cultural traits are being carried from rural areas to the more cosmopolitan centers. It remains to be seen what effect, if any, this immigration will have on localities outside the savanna.
Settlement Forms

The caserío.—The typical interiano lives in a village, or caserío, of less than 250 people but more than fifty.74 The Panamanian caserío is defined as "any clustering of people that may be clearly distinguished from a similar clustering and which has a definite name assigned to it."75 It normally lacks facilities associated with urban areas and has a population of less than 1,500. Natá is an exception; it has 1,530 persons but is classed as a caserío because it lacks the necessary urban services. Typically, a caserío's working population is devoted to agrarian activities. In the savanna 201,985 people live in caseríos, or 87 per cent of the total savanna population.

The small clusters of houses that form the savanna village take three basic forms: (1) compact, or cluster, with no definite shape and no true streets; (2) scattered, or semi-dispersed, with grazing or agricultural land between houses; and (3) line, or elongated.

Compact, or cluster, villages.—Compact settlements are the most common form today in the savanna, and the oldest of the three basic types. The Cocle village probably bore a strong resemblance to this sort, which is amorphous and rarely possesses any geometric arrangement (Fig. 21). This form seems to have originated in central Panama, whence it diffused east to about the present Canal Zone, and west into the Chiriquí savanna. Among the characteristics of a compact village are: houses number from three to fifty; farmland is
normally within walking distance; location is near, but never on a stream, apparently because of seasonal flooding; and the village is joined to others by trails.

Most compact villages are agricultural in function, the inhabitants walking to their fields every day. If readily accessible lands play out the caserío is often abandoned or moved. The agricultural village is permanent only so long as there are available lands to be farmed. They are literally here today, gone tomorrow, and the duplication of names coupled with frequent village relocation causes the national government much concern. Small cluster villages have no commercial facilities and no utilities. Rarely is there a store of any kind and usually no market, all trading being carried on in the chief city of the corregimiento (smallest political subdivision). This is often a caserío also, but large enough to support a few commercial activities and is permanent. It also differs from the small cluster village in that there is a police detachment, maybe a post office, and the mayor's office.

Semi-dispersed villages.—Scattered settlement is associated with pastoral activities, though agriculture is seldom no less important. Facilities vary with size, as in the case of cluster villages. A caserío like El Caño (Fig. 22) is large enough to have a store or two and be the chief village in the corregimiento. As "capital" of the corregimiento, El Caño has the mayor and police unit, as well as a post office. Because it is bisected by the
National Highway there is newspaper delivery, access to merchandise of all sorts, and good transportation to the city.

Semi-dispersed agglomerations have appeared since the introduction of cattle to the savanna. Many of the residents are employed on nearby haciendas during part of the year but also practice subsistence farming in the hills. Although scattered villages are normally situated near stream and woods, the pattern of settlement is frequently determined by fences erected by the cattlemen. Often private grazing land cuts through the middle of a village. Thus a totally disarranged form has appeared.

True dispersion occurs in only a few places. In the highlands settlement will be dispersed where cropland is extremely limited. Under such conditions the farmer chooses to live near the farm. The Spaniard and the Indian were familiar with this sort of highland settlement. Some isolated dwellings are found today in the mangrove swamps where charcoal is produced, and on some of the cattle ranches.

Line villages.—The line village is a product of the main lines of transport and communication, and is a post-Conquest development. Line settlement in the savanna has come about through a spontaneous clustering of people near primary routes (Fig. 23). In a few instances it developed from a planned town that never materialized (Fig. 24). Facilities and functions of the line village vary with size,
but most are usually geared to traffic flowing through them. Commercial activities are more numerous than in other type *caseríos* of the same size. Even so, many inhabitants engage in farming or cattle. The line village is presently undergoing a great change as paved highways push through the hearth. Restaurants, filling stations, and occasionally inns are springing up, offering more and more people a chance to give up subsistence agriculture. Of the three *caserío* types the line village is the most permanent, cosmopolitan, and apparently possesses the greatest chance for growth.

The *ciudades*.--The *ciudad*, or city, is "any agglomerated settlement whose population is primarily commercial in orientation, and which has such services as electricity, sewerage lines, paved streets, water mains, telephone and telegraph, post office, and secondary schools." 77 In addition to these facilities it must have a population of 1,500 or more. Eight savanna towns, having a combined population of 30,714, fall into this category (Map XIV). 78

Whether located on the site of a former Indian village or built on virgin ground, the savanna town was planned. To be sure the plan varies from town to town, but basically the grid pattern was employed. Stanislawski has shown that grid-pattern towns in the New World were not cultural imports from Spain, where the grid vanished with the Romans. 79 More than twenty years of American exploration had gone on before Spain felt a need for some form of systematic town arrangement. Spanish officials turned to Roman and Greek sources,
and instructions given to Pedrarias (in 1514) were based on them.

One of the most important things to observe is that...the places chosen for settlement...be healthy and not swampy, good for unloading goods [if ports]; if inland to be on a river if possible...good water and air, close to arable land....In view of these things necessary for settlements, and seeking the best site in these terms for the town, then divide the plots for houses, these to be according to the status of the persons, and from the beginning it should be according to a definite arrangement; for the manner of setting up house plots will determine the pattern of the town, both in the position of the plaza and the church and in the street pattern, for new towns may be built to plan without difficulty. If not started with form, they will never attain it. 80

The planned savanna town was laid out with two streets, more or less parallel, and between them was placed the church and plaza (Fig. 24). For some unknown reason most towns in central Panama deviate from the royal instructions on two important points. (1) The church is usually placed on the plaza. The instructions state:

The cathedral of inland towns should not be placed at the plaza, but at some distance ...and so that it can be seen from all sides, because it lends greater adornment and authority, and arranging it in such fashion that it is raised above the ground level so that it will be approached by steps. 81

Santiago is the only savanna town that has the church located in a conspicuous place, some distance from the plaza. In the other cities the church may be oriented in a variety of ways with respect to the plaza. In Los Santos and Chitré the church is on the plaza but does not face it (Fig. 25). In Aguadulce the church is on the plaza it faces (Fig. 26).
Fig. 25.--The cathedral in Chitre, Herrera, does not face the plaza. December 28, 1955.

Fig. 26.--The church in Aguadulce, Cocle, faces the plaza. December 27, 1955.
In Penonomé the church faces the plaza but is located across the street from it. Natá's church is also across the street from the plaza but is not centered on it (Fig. 27).

Fig. 27.--The plaza of Natá, Coclé. The church is immediately behind the photographer, facing the plaza but not centered on it. March 2, 1956.

(2) Only one large Panamanian town, Los Santos, is oriented with the four corners of the plaza to the cardinal directions, as stipulated in the Spanish regulations. This may mean that the other towns were built with the local prevailing winds in mind, which usually blow from the northeast or southwest.

The plan of Penonomé (Fig. 28) is typical of all ciudades in the Panamanian interior. Originally, two parallel streets bounded the plaza and church. Cross
Residential Buildings
Commercial Buildings
Public Buildings
1. Provincial capitol
2. Police station and jail
3. Post, telephone and telegraph office
4. Market
5. Elementary school
6. Courthouse
7. High school
8. Hospital
9. T.B. preventorium

Scale Approximate

Fig. 28.
streets and additional parallel streets were added as the
town outgrew the plan. Extensions of the city followed
arterial roads, and it shall be interesting to watch for an
expected development along the new highway by-pass. Some
public buildings are adjacent to the plaza, but no attempt
is made to place new constructions in the center of town.
The market is never on the plaza (see chap. v). In many
respects the savanna urban center functions much as a small
town in an agricultural section of the United States. The
ciudades are thoroughly European, with Spanish character-
istics predominating. However, some modern North American
elements, such as drug stores, filling stations, tin roofs,
and baseball parks are encroaching on the traditional forms.

Population Characteristics

Distribution and Density.--Approximately 29 per cent,
or 232,699, of the Republic's total population lives in the
central savanna (Map XIII). As previously stated, 87 per
cent of these people may be classed as rural, though most
live in small clusters and are seldom dispersed. It is esti-
mated that 80 per cent of this population is mestizo, 10 to
15 per cent white, and about 5 per cent Negro. The white
population is greatest where Spanish settlement of the
hearth was most aggressive, especially in the Azuero Pen-
insula. Here the population density is highest (Map XIV),
attaining 128 inhabitants per square kilometer in the
District of Chitré. The savanna averages 14.3 persons per
square kilometer, compared to 10.8 for the Republic. In the
One dot equals 100 persons

Limit of the Central Savanna

MAP XIII

Radii of circles calculated from square roots of population figures. $R = \sqrt{\frac{P}{10}}$ at original scale of 1:1,000,000.
main, population is concentrated in the lowlands, along the rivers, and where pasturage is abundant (compare Maps II, VII, XIII, and XIV). Few people, and fewer whites, live in the highlands that rim the hearth. Likewise, the coastal marshes and swamps are generally avoided. The general distribution is probably not too unlike that of pre-Conquest days (Map XI), though the highland population was probably greater before the decimation of the Indians.

The Indian.--There are no indigenous peoples in the savanna today, although 6 per cent (48,654) of the Panamanian population is pure Indian (Map XV). 85 The remaining Indians live, for the most part, in those portions of the Republic intentionally neglected by the Spaniards during the Conquest. In central Panama, Indian extinction began in 1515. The decline in numbers was unwittingly furthered by the Spaniards when Indians were enslaved or placed in encomienda.

The encomienda had its beginnings in feudal Spain, and was revived as a colonial labor institution in the gold fields of Hispaniola. Simply stated, the encomienda was a means for the Crown to give Indians to deserving Spaniards, who, in turn, became encomenderos. The grant gave the Spaniards the right to exact labor or tribute from the natives. The Indian received, in exchange, rations, housing, protection, a token wage, and instruction in the Catholic faith. The system was not one of slavery, but merely an expression of sixteenth-century Spanish justice, whereby the Indians were treated as children who could not care for
RACIAL DISTRIBUTION OF MODERN INDIANS
1950

RACIAL PERCENTAGE, BY DISTRICT

- 70% and over
- 40-69%
- 20-39%
- 19% and under
- No Indian population

Limit of the Central Savanna

MAP XV
themselves. Warring Indians (indios de guerra), however, were placed in legal bondage when captured. Thus two systems of labor coexisted in the colonies in the sixteenth century.

The encomienda failed in central Panama mainly because of the fantastic Indian mortality rate, due to long hours of work (by Indian standards), susceptibility to European diseases, and meager food rations. Further, the native was not able to accept his sudden confinement, and often attempted escape or suicide. Numerous contradictory laws were approved by the Crown in an effort to correct the evils of encomiendas and slavery. Attempts were even made to import Indian slaves in Panama in 1567. The effort to replenish the local population apparently failed, and slavery and the encomienda virtually disappeared from the savanna before 1570.

The Negro.—The decline of native population in central Panama was so sudden and disastrous after the settlement of Natá (1520) that the Spaniards turned to Negro labor. Amid alternating policies in Spain concerning slavery, Negroes began to enter Panama in increasing numbers after 1519. An ordinance of the City of Panama (in 1572) prescribed the following functions of Negro slaves: (1) to make rozas of maize, (2) to cut wood for construction, (3) to drive mule trains, (4) to navigate boats on the Chagres River, (5) to navigate ships on the South Sea, (6) to tend cattle herds, (7) to work the farms, (8) to work the pearl fisheries,
(9) to fish, and (10) to "make this land profitable." Negro labor was especially important in the Veraguas mines, where the encomienda had previously failed. It was necessary to take slaves from the ten functions listed above to supply the miners with workers.\(^92\) This left the stockmen unable to maintain their herds in many instances.

As early as 1567 the Negroes began running away from the labor gangs.\(^93\) These escaped slaves (cimarrones) occasionally raided the pack trains or stole from the towns.\(^94\) In 1590 Panama City was described as:

...very weak because the people are poor and miserable. More than 3,000 slaves, domestic enemies waiting for the chance to be free... are in the city...and the city has no defense.\(^95\)

Slavery was never so important in the savanna proper as in marginal regions. Present Negro racial traits in central Panama stem from the large numbers of slaves that were sent to the Veraguas mines during the sixteenth century. Other Negroes were employed near Montijo and Río de Jesús as woodcutters during the seventeenth century. Most slaves in the savanna were engaged either in cattle herding or some form of transport. They drove mules, handled cargo in the ports and at transshipment points, and worked on boats. It is along the coast today where one finds the greatest concentration of Negro types. Relatively few Negroes are found away from the coast, indicating that the Veraguas slaves have been absorbed in the mestizo population or migrated to the coastal areas soon after the mines were abandoned.
The central savanna has experienced no immigration of West Indian Negroes. On the other hand, West Indians form large cultural units today in the trans-Isthmian area, where they came during the nineteenth and twentieth centuries to work on the railroad or canal projects. Others are found in the banana plantations of Chiriquí and Bocas del Toro provinces. West Indian Negroes continue to speak English, attend Protestant churches, and consider themselves to be culturally Anglican. The descendants of slaves in the savanna are thoroughly Hispanicized and culturally unlike the West Indians.

The north Spaniard.—It is generally assumed that the present savanna white population has resulted almost entirely from the small group of original settlers. Supposedly they were maintained by clannish intermarriage, or marriage with a few Europeans who came to Panama to work on the railroad or canal. The north Spanish element is frequently overlooked. People of northern Spanish origin came to central Panama by sea, possibly as early as the late sixteenth century. The descendants of these people form much of the white population in the Azuero Peninsula today, especially in the vicinity of Las Tablas.

There is some evidence that a Cantabrian fleet from Peru was forced by the pirate Drake to land near Pocri, Los Santos. The event might have been repeated as pirate activity increased during the seventeenth century. The Gulf of Panama was often blockaded for months at a time. Ships
running from Peru to Panama City were forced to unload cargo as far west as Los Santos. Undoubtedly some ships were stranded in Azuero ports because of the pirate menace, or possibly had difficulty with the extreme tidal range and extensive flats. There is no written account of the settlement of Las Tablas, but local tradition says the founder was a Spanish naval captain named Barahona.97 In 1680 Capitán Jacinto de Barahona was Grand Admiral of the South Sea, and he eventually died trying to prevent the complete blockading of Panama City. Most of Barahona's sailors were Biscayans, and there were probably some women aboard the ships. Perhaps these were the settlers of Las Tablas.

It is not known how many north Spaniards came into central Panama from Peru, or how many remained. But it is apparent that the number staying was sufficient to maintain a relatively pure race. The area was largely devoid of all native peoples by the mid-sixteenth century. This meant that there were few opportunities for a mestizo class to arise in the lower part of the Azuero Peninsula. The north Spaniards arrived after the encomienda was a dead issue, and were compelled to work for themselves. Even more significant is the fact that the Biscayans represented a tradition of small bourgeois and small landowners (parvifundia) in Spain. They brought a cultural tradition to Panama that favored small-scale land ownership.
This was quite unlike the system of large estates (latifundia), typical of central and southern Spain, that had developed in Coclé and Veraguas provinces. The modern provinces of Herrera and Los Santos are still strongholds of the white rural population in Panama (also see chapter iv).

The mestizo.—Racial mixing began in the savanna with the Badajoz expedition of 1515, and continued until conquered and conqueror were almost racially indistinguishable by the seventeenth century. White genes were more important than the number of Spaniards would indicate, chiefly because of promiscuity. Nonetheless, the legitimate family remained white. Custom, and even law, which permitted male promiscuity made possible the maintenance of Spanish culture and the white race on one hand, and a lighter racial coloring of the native on the other. The pure Indians that were not destroyed early in the Conquest soon were absorbed by the process of race mixing. The bulk of the present rural population had its genesis in the mestizos produced by extramarital Spanish-Indian unions during the first hundred years of Spanish colonization (Figs. 29-32). Some Negro elements joined the racial stream in the sixteenth century (Fig. 32), but Negro traits appear to be diminishing as a common type, the mestizo, emerges. Today the inhabitants of the hearth, like the cultures, are neither pure Spanish nor pure Indian. Rather, a new race has appeared to sponsor the new culture.
Fig. 29.--Typical savanna children, between Santiago and Atalaya, Veraguas. The boy on horseback is a mestizo from the country, while the other three are whites from town. November 24, 1955.

Fig. 30.--School children, Santiago, Veraguas. Though showing some evidence of Indian heritage, these children are basically Caucasian. November 25, 1955.
Fig. 31.—Mestizo mother and children, three miles east of Santiago, Veraguas. November 24, 1955.

Fig. 32.—Racial types, near Chitré, Herrera. The group displays evidence of white-Indian-Negro mixing. March 17, 1956.
Population growth.--The first relatively authentic reference to colonial population density is contained in a document dated 1793. In that year there were 71,888 inhabitants of Panama; the document indicates that 30,000 lived in cities and towns and the rest were rural. There is no clarification of these figures, but it may be assumed that the total population under effective Spanish control was counted.

If it is difficult to estimate the aboriginal population density (see pp. 80-4), it is virtually impossible to estimate the lowest point in the population decline after the Conquest began. Apparently the population dropped below 71,888 sometime between 1515 and 1793. It is possible that the savanna population reached as low as 5,000 inhabitants between 1531 and 1575. Most reports from Panama during the sixteenth century state that the Natá area was the most densely populated; yet in 1561 there were only about 1,500 Indians in the entire parish. In that year the parish of Natá covered approximately one-third of the central savanna. By 1567-69 there were only five or six Indian towns in Panama, the largest with no more than sixty huts (about 250 people). None of the Spanish settlements in the savanna had more than 100 white residents at that same time, and it is likely that the bottom of the savanna (and Panamanian) population curve was attained in 1567-69. Figure 33 represents an attempt to illustrate graphically the decline and growth of population in central Panama and in Panama as a whole.
Fig. 33.— Population growth and decline in Panama and the Central Savanna.

Sources: See Note 101.
1. C. R. McGimsey, "Cerro Mangote: A Preceramic Site in Panama," American Antiquity, XXII (1956), 151-61. This article reports the findings of the six-day preliminary investigation. I was present during the detailed second investigation of March and April, 1956, which lasted six weeks. Although as yet unpublished, the latter work fully confirms the first.

2. The shell is chiefly crab (Menippe frontalis) and oyster (Ostrea chilensis and O. mexicana). Ibid., pp. 153-4.


4. The first excavation yielded only five sherds, all from a polychrome jar and all on or near the surface. McGimsey, op. cit., p. 159. There is no doubt that the sherds came in after Mangote was abandoned. In fact, there is a large pre-Coclé polychrome pottery site on adjacent Cerro Girón. Five surface sherds mean very little when it is known that other middens in the area yield more than that in a cubic foot. Thousands of cubic feet were excavated with no further discoveries. The location of the site, the diet, the artifact inventory (especially the pebble tools), and the lack of pottery in positive association all point to the site's preceramic nature.

5. There are other differences between the two cultures besides a lack of pottery in one. Stone vessels, pestles, rectangular manos, and well-chipped flakes do not occur at Mangote. Round pebble manos are not a part of Monagrillo culture. McGimsey, op. cit., pp. 159-60.


9. A. Hyatt Verrill, who claims to be the discoverer of Coclé culture (1924), takes exception to Lothrop's findings. Verrill holds to the romantic idea that more than 4,000 years have elapsed since a high culture flourished in the savannas. A. H. Verrill and R. Verrill, America's Ancient Civilizations (New York, 1953), 125-6.

   This reasoning is based on an assumption that the volcano Guacamayo (near Penonomé) erupted and destroyed Coclé culture ca. 2000 B.C. Verrill concludes that lava flows buried the entire central savanna—he calls it "an American Pompeii"—requiring at least 4,000 years for weathering to produce the four to twelve feet of soil now covering many sites. Ibid., p. 127.

   There is no scientific basis for this notion. Geological evidence indicates that the last volcanic eruption in Panama occurred during the Pleistocene, probably at the Volcán de Chiriquí. Karl Sapper, "Die mittelamerikanischen Vulkane," Petermanns Mitteilungen: Ergänzungsband Nr. 178, XXXVIII (1913), 127. At least one authority believes that the El Valle volcano (twelve miles east of Penonomé) erupted very late in the Pleistocene, after the Volcán de Chiriquí. However, this still falls far short of Verrill's estimate. Charles Schuchert, Historical Geology of the Antillean-Caribbean Region, (New York, 1935), 567.

   All of the sites visited by Verrill, which account for only a small fraction of the total, are located in bottoms of large rivers that seasonally flood and frequently shift channels. There is nothing extraordinary about a thick mantle of alluvium over them. It is this alluvium that covers all of the Coclé sites, not weathered lava.


11. The aboriginal inhabitants of the central savanna probably spoke a variety of Chibchan dialects, which once extended from Nicaragua to Ecuador. Modern Guaymí, the only important Chibchan survival, is spoken by Indians of western Panama today. There are two published dictionaries for the language. A. L. Pina, Vocabulario Castellano-Guaymí (Paris, 1892); and E. S. Alphonse, Guaymí Grammar and Dictionary, Bureau of American Ethnology, Bulletin No. 162 (Washington, 1956).
Historical accounts make it clear that western Panama was not a linguistic unit. Oviedo states that the Cueva (Cuna) language extended from Darién Province to Chame, which was the easternmost point controlled by chief Parita. But, "from Chame onwards (westward) toward Natá and beyond, there is a great diversity of languages...and in a small extension of territory they are so different that some Indians do not understand others who are their neighbors to the west." Gonzalo Fernández de Oviedo y Valdés, Historia General y Natural de las Indias, Islas y Tierra-Firme del Mar Océano (Asunción, 1944), XI, Lib. V, Cap. I, 210. Andagoya writes: "Chirú is inhabited by a well-disposed people with a language of their own....The languages of Escoria and Natá are different, and each chief has a different language, so that they require interpreters." Fasqual de Andagoya, "Narrative of the proceedings of Pedrarias Davila in the Provinces of Tierra Firme or Castilla del Oro, and the discovery of the South Sea and the coasts of Peru and Nicaragua," Hakluyt Society, XXXIV (1865), 24-31. Trans. and ed. by C. R. Markham.

Espinosa also commented on the great variety of tongues spoken in the savanna, pointing out that the peoples of Escoria, Quema, and Esquequá each had its own language. Gaspar de Espinosa, "Relación e proceso quel Licenciado Gaspar Despinosa, Alcalde Mayor, hizo en el viaje...desde esta Cibdad de Panamá a las provincias de Paris e Natá, e a las otras provincias comarcanas," Doc. Inéditos de Indias, XX (1873), 33, 38; and, "Relación por Gaspar de Espinosa, Alcalde Mayor de Castilla de Oro, etc....," Doc. Inéditos de Colombia, II (1892), 474.

So little skeletal material has been recovered from Panama that we must depend on historical records for a discussion of physical type. Lothrop adequately reviews the literature on this subject. It is apparent that physical variety in western Panama was almost as great as linguistic. Lothrop, VII, op. cit., pp. 12-3.

15. Ibid., p. 241.
16. Lothrop, "The Sigua," Eighth American Scientific Congress Proceedings, II (1942); and "Archaeology of


20. Ibid., p. 250.


22. Ibid., VII, Lib. X, Cap. XIII, 187. Oviedo defines the boundaries of Farita's influence as Punta de Güera (Cape Mala) and Punta Chame.


24. Lothrop says the Río Santa María was the boundary because of his confusion with the location of the original Río Escoría (now Río Santa María). Lothrop, "Coclé," VIII, op. cit., p. 225.


26. Espinosa, 1892, op. cit., p. 466. Espinosa says, "There were so many houses that I believe there was no one who was not astonished and afraid at the sight of such a large population."


35. The Espinosa expeditions were as follows: (1) 1516, when he occupied Natá from April to July; (2) 1519, when Natá was again occupied, in the early autumn; and (3) 1520, the year Governor Pedrarias granted a license for a Spanish town on the site of Natá. (Panama City was founded during the second expedition.)


37. There is no general agreement as to the meaning of the word "Panamá." Most historians believe that it means "abundance of fish" or "water abounding in
fish." I find this hypothesis difficult to accept because the language spoken in the Panama City area at the time of the Conquest was Cuna (Cueva), or a closely related dialect (see note 11). The only Cuna word now used to mean "abounding in fish" is haboga. The word is still retained in the form of Taboga, an island located twelve miles southeast of Old Panama City, in a bay that truly "abounds in fish." The modern Guaymi word for "abounding in fish" is ware (from wa, meaning "fish") and is clearly unrelated.

However, the nut tree Sterculia apetala, a member of the Cacao family, is still locally known by the Cunas as the panama tree. The Indian hamlet of Panama was located in a grove of these trees. I believe the tree gave its name to the Indian town, which in turn became the Spanish city of Panama. The city eventually gave its name to the entire colony. See Angel Rubio, Esquema para un Análisis de Geografía Urbana de la Primitiva Ciudad de Panamá (Panamá, 1947), 4.

38. When Pedrarias moved the capital to Panama City, he left Oviedo to govern Antigua. Oviedo managed the affairs of Antigua until July, 1523, and by September, 1524, the former capital was completely abandoned.


40. Coclé Avanza. Edición Extraordinaria, dedicated to the First Centennial of the Province of Coclé: 1855-1955 (Panamá, September 1955). Prominent families of central Panama today, descended from the original caballeros de Nata, include: Gómez, Miró, de la Guardia, Xaén or Jaén, Ayala, Crimaldo, Vega, Ortiz, Trujillo, Dominick, Aguilara, Vieto, Ponce, Urrutia, Sandoval, Díaz, Victoria, Lasso de la Vega, Arinó, López, Urriola, and Bermúdez. These families were later united in marriage to: Arosemena, Arias, Chiarí, Araúz, Conte, Méndez, and Valdés.

41. Urracá, though the most renowned, was not the only chief that struggled against the Spanish invaders. Oviedo, op. cit., VII, Lib. X, Cap. XXIII, 283-9.

42. RAH, Colección Muñoz, v. 79, Lic. Gama to the Crown, 28 July 1533. This letter also reports only 32 or 33 Spaniards and 500 Indians in Panama City, and 17 or 18 Spaniards and a few Indians in Aclá, on the Atlantic coast. Fray Pablo writes (Ibid., v. 86, 1552) that the Indians in Panama City, Nombre de Dios, Nata, and Aclá were mostly from Peru, Nicaragua, Venezuela, and Santa Marta—implying that local Indians were no longer available for one reason or another.
...I have lived with Indians near Natá for 10 years. There were a great number of these Indians at the time of the Spanish Conquest. There has been such a decline that there are only 1,500 or 1,600 [in the entire parish]
...I count them at confession. These are in the power of their owners who are residents of Natá, and they serve like captive slaves and each day there are less. Three-and-a-half years ago, more or less, your Majesty ordered that these people be freed and put in villages.

44. AGI, Panamá 100, Bishop of Panama to the King, 14 June 1611.
45. AGI, Panamá 222, Relación from the Bishop of Panama, 15 May 1736.
46. RAH, Colección Mata Linares, v. 70, Information from the Bishop of Panama on a visit to his diocese in the Province of Chiriquí, 30 July 1803.
48. AGI, Panamá 30, Fray Pedro de Santa María to the King, Nombre de Dios, 15 February 1561.
49. The town was known officially as La Villa de Los Santos by 1568, while the river continued to be called the Río Cubita for a few more years. RAH, Colección Muñoz, v. 66, f. 286, Foundation of La Villa de Los Santos, 1568.
51. AGI, Panamá 101, Relación from the Bishop of Panama, 1691.
52. AGI, Panamá 222, Relación from the Bishop of Panama, 15 May 1736.
53. Ibid.
54. Juan López de Velasco, Geografía y descripción universal de las Indias (Madrid, 1894).

55. AGI, Panamá 222, Relación from the Bishop of Panama, 15 May 1736.

56. Ibid.

57. AGI, Panamá 101, op. cit.

58. Ibid.

59. AGI, Panamá 222, op. cit.

60. AGI, Panamá 101, op. cit.

61. AGI, Panamá 222, op. cit.

62. An earlier attempt to found a town called Concepción was made in 1535, by Felipe Gutiérrez. It was located in Veraguas, near the mouth of the Río Concepción and lasted but a few months.

63. AGI, Panamá 100, Bishop of Panama to the King, 14 June 1611. Eight of the eighteen Spaniards were encomenderos. This report also states that Santa Fe had a caja real and a fundición of gold.

64. AGI, Panamá 15, Oidores of the Audiencia to the King, 8 July 1608.

65. Ibid.


67. Juan Requejo Salcedo, "Relación Histórica y Geográfica de la Provincia de Panamá (1640)," Relaciones Históricas y Geográficas de América Central (Madrid, 1908), 36; AGI, Panamá 101, Relación from the Bishop of Panama, 1691.

68. AGI, Panamá 222, Relación from the Bishop of Panama, 15 May 1736.

69. Ibid.

70. República de Panamá, op. cit., Lugares Poblados, p. 3.

71. RAH, Colección Mata Linores, v. 70, op. cit.
Chitré did not exist before the nineteenth century. The Distrito Parroquial de Chitré was created October 19, 1848, though it was recommended earlier by General Tomás Herrera. Chitré became the capital of the new Province of Herrera in 1915. The present church was begun as late as 1894. Today Chitré is one of the most modern and progressive towns in the Republic. With a population of over 8,000 (1956 estimate) it is the sixth largest city in the country.


74. República de Panamá, op. cit. Nomenclatura y Localización de los Lugares Poblados, pp. 1-83.

75. Ibid., Lugares Poblados, p. vii.

76. Ibid., Nomenclatura y Localización de los Lugares Poblados, p. iii. The Census Bureau in Panama says that the caserío is almost a "wild creature." It will "spring up in the forest where you least expect it, and vanish as mysteriously."

77. Ibid., Lugares Poblados, p. vii.


Population of Savanna Towns over 1,000 (1950 Census)

CIUDADES

<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chitré, Herrera</td>
<td>7,398</td>
</tr>
<tr>
<td>Santiago, Veraguas</td>
<td>5,886</td>
</tr>
<tr>
<td>Aguadulce, Coclé</td>
<td>4,397</td>
</tr>
<tr>
<td>Penonomé, Coclé</td>
<td>3,515</td>
</tr>
<tr>
<td>Las Tablas, Los Santos</td>
<td>2,662</td>
</tr>
<tr>
<td>Los Santos, Los Santos</td>
<td>2,608</td>
</tr>
<tr>
<td>Monagrillo, Herrera</td>
<td>2,372</td>
</tr>
<tr>
<td>Antón, Coclé</td>
<td>1,876</td>
</tr>
</tbody>
</table>

CASERÍOS

<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natá, Coclé</td>
<td>1,530</td>
</tr>
<tr>
<td>Pesé, Herrera</td>
<td>1,323</td>
</tr>
<tr>
<td>Parita, Herrera</td>
<td>1,221</td>
</tr>
<tr>
<td>Ocú, Herrera</td>
<td>1,121</td>
</tr>
<tr>
<td>Río de Jesús, Veraguas</td>
<td>1,020</td>
</tr>
</tbody>
</table>


82. Ibid., p. 103.

83. M. M. Alba C., Geografía Descriptiva de la República de Panamá, 4th ed. (Panamá, 1954), 142. The Republic distinguished between whites, Negroes, and mestizos in the 1940 Census, but not in 1950. Below is given the racial percentages according to the 1940 Census and Alba's 1950 estimate. The estimate is based on official sources.

<table>
<thead>
<tr>
<th>Race</th>
<th>1940 Census</th>
<th>1950 Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>12.2%</td>
<td>14.63%</td>
</tr>
<tr>
<td>Negro</td>
<td>14.6%</td>
<td>14.81%</td>
</tr>
<tr>
<td>Mestizo</td>
<td>71.8%</td>
<td>67.40%</td>
</tr>
<tr>
<td>Others (Chinese, Japanese, Malayans, etc.)</td>
<td>1.4%</td>
<td>3.16%</td>
</tr>
</tbody>
</table>

The bulk of the Republic's Negro population is in the vicinity of the terminal cities of Panama and Colón, and the plantation districts of Bocas del Toro and Chiriquí provinces. The number of urban whites and Negroes lowers the mestizo percentage when calculated on a national basis. In the rural areas, however, the mestizo's percentage would be considerably higher.

84. República de Panamá, op. cit., Características Generales, p. 10.


86. For an analysis of the encomienda system, see Lesley B. Simpson, The Encomienda in New Spain (Berkeley and Los Angeles, 1950); and Silvio A. Zavala, La Encomienda Indiana (Madrid, 1935).
In 1536 the Law of Succession granted F. Pizarro the right to grant encomiendas for two lives. In 1542 the New Laws prohibited Indian slavery (but the New Laws were never administered in Peru). Shortly after 1545 permission was given to grant encomiendas for two lives throughout the colonies. The third life was granted in 1529.

Things were further confused in New Spain. Cortéz at first granted encomiendas on a provisional basis, but was superseded by an Audiencia that could legally give them. The Audiencia exercised its power so badly that it was followed by a second Audiencia, which could not re-grant an encomienda after the original possessor died. However, the Crown permitted the widow to inherit the encomienda, and everyone else passed them on with tacit permission. Viceroy Mendoza arrived without power to give Indians, but soon the Laws of Succession were passed. Mendoza failed to execute even the New Laws (prohibiting slavery), and tacit permission again became the means of passing encomiendas to another. In 1559, by tacit permission, a third life was granted. In 1576 the question of a fourth life came up and was debated until 1607, when a third and fourth life became law. By 1629 a fifth life had been granted. Finally, Charles III annulled the whole system. Panama partook the fortunes of Mexico or Peru, and a grant of the fifth life in New Spain was a general grant for the whole Indies.

Neither the chiefs nor the Indians are natives but were purchased and brought from Maragrita Island, Cubagna, Marazapan, and some from Nicaragua."

In this reign there are six Indian towns and in all of them there are no more than 250 huts of thatch. The Indians pay no tribute, are not in encomienda, and are so poor that they have nothing to pay the priest." Also, Requejo Salcedo, op. cit., p. 169. "There are no encomiendas of Indians in this entire realm...." There were, however, a few encomiendas in the mining area of Veraguas in the early seventeenth century. See note 63 above.

There were Negro slaves at Antigua, and one of them, Nuflo de Olano, shared in the discovery of the South Sea (1513).
91. AGI, Panamá 30, Ordinances of the City of Panama, concerning Negro slaves, 1572.

92. AGI, Panamá 14, Alonso de Sotomayor to the King, 10 November 1597. "...it is necessary to recruit vecinos and Negroes from Natá and Villa de Los Santos... if the mines are to be reopened."

93. AGI, Panamá 30, Cabildo of Panama to the King, 25 June 1567. This report expresses concern over the murdering and robbing by escaped slaves.

94. The cimarrones were also called los huidos, or the "run-away.'

95. AGI, Panamá 14, Oidores to the King, 10 June 1590.


98. Alba C., op. cit., p. 149.

99. See notes 42, 43, and 89 above.

100. AGI, Panamá 13, Lic. Saraza to the King, 26 June 1569. "In this realm there are five small Indian towns of which the largest does not have 60 huts. They pay no tribute...." AGI, Panamá 15, Oidores to the King, 24 July 1602. "...Indian settlements in the vicinity of Panama City have declined so much that in all the district there are not more than 3 very small towns, and in these about 70 people, counting women, old folks, and invalids."

CHAPTER III

HOUSE TYPES

The house types of central Panama are typically Panamanian, as much so as the mestizo inhabitants. From the hearth the Cocléan dwelling diffused east and west, from western Chiriquí to the hills near the present Pacific entrance to the Panama Canal (Map IX). In the trans-Isthmian area the Coclé house gave way generally to Cuna types; still further east was the distinctive Chocó house complex. House types from the central savanna extended into the cordillera, but did not reach the Atlantic coast of Veraguas and Bocas del Toro. Cuna types occurred along the entire north coast of Panama.

The invading Spaniards found the houses of the central savanna more attractive than those encountered in the Antilles and in other parts of Panama. This was purely a reflection of Iberian culture, which shared an amazing number of similar house-traits with the savanna aborigines. Further, the Spaniard found the savanna environment more suited to his cultural patterns than the wet, densely forested areas of Darién and the Atlantic watershed.

The entire Coclé hearth was conquered and settled in less than fifteen years, and native routes of diffusion
passed into Iberian hands (see chap. v). From the former Indian hearth now spread Spanish colonial culture, or the slowly evolving Spanish-American (mestizo) culture. No serious Spanish attempt at colonization was made east of the present Canal Zone after the savanna was discovered, except for the Atlantic terminals of the interoceanic routes. Nor were major settlements made north of the Cordillera Central. For this reason, Spanish house elements were largely confined to the former areas of Coclé influence; the Cuna and Chocó houses remain more or less apart. The savanna house did cross the cordillera as the defeated Guaymí (Cocléans) retreated from the Iberians.

Most rural Panamanians live in a house of Coclé-Spanish-savanna origin. The only major exceptions are the non-Hispanic West Indian Negroes, the Cunas, the Chocos, and the more worldly people living between Panama City and Colón.

Four important factors influence the present house types in central Panama: (1) cultural heritage, (2) local climate, (3) available construction materials, and (4) subsistence patterns. These four factors manifest themselves in a variety of house forms and associated features of the house complex. Even so, two basic house types may be distinguished; the Indian, and the Spanish. These two types have been modified sufficiently to produce several sub-types, each clearly distinguishable as to origin and function.
The Indian Dwelling

The savanna aborigines possessed two fundamental house types at the beginning of the sixteenth century. One is described by Oviedo:

There is a different kind of house in Natá, round, like a very tall tower, and quite roomy and secure, because the wind and breezes, which blow with great violence during a large part of the year, are thus unable to catch upon them as with square houses or those of some other form. They are of good, sound wood, and more beautiful within than all the other kinds of houses I have described; and they place on the point of the conical roof something made of ceramics that looks like a candlestick, the neck of which is very tall. . . . The straw with which they thatch the house is very good; and both inside and outside the walls are lined with well-arranged small canes and the houses of this type contain many apartments.

Oviedo appears to be describing a more or less unique house, although his use of the plural suggests that there was more than one in Natá. There is no reason to believe that the average house contained many rooms or was lavishly built. Possibly this was the house of chief Natá. Other round houses in the village might have included the council house and the shaman's dwelling. Although the circular house with a conical roof no longer occurs in the savanna it may be found among the modern Guaymí. The original specialized functions have disappeared, for they are no longer recognized by modern users of round houses in Veraguas, Chiriquí, and Bocas del Toro provinces.

The second basic house type of the Indians was a hip-roofed (four-shed) bohío, with either an apsidal or
rectangular (possibly square) ground plan (Figs. 34 and 40). Both bohío sub-types survive in the savanna. The rectangular house is widespread throughout the area, while apsidal dwellings are more or less restricted to towns that were once centers of Indian population. Regardless of ground plan or wall construction, the bohío has a thatched roof that is steeply pitched, and the hip is usually rounded (Fig. 35). The two main sheds rest on a ridge pole which defines the long axis of the house (Figs. 36 and 37). Usually there is a single doorway, which may be flush with the wall in the middle of the long axis or placed in a niche about a foot deep. The inset doorway of the bohío is an aboriginal trait that has persisted.  

Wall materials in the bohío may vary considerably. In the distritos (provincial subdivisions) fronting the Gulf of Parita, quincha (wattle-daub) construction predominates (Map XVI). Progressing from the level savanna to more hilly lands north, west, or east, quincha gives way generally to houses of cane or cane-and-thatch wall construction (Fig. 38). Cane houses are made of vertical, heavy canes, placed in the ground and tied together. Sometimes they are interlaced with leaves or straw to form a thatched wall. The roof is identical to that of the quincha dwellings. For this reason, it is impossible to correlate roof types and wall types. Map XVII gives the distribution of wall, roof, and floor construction. As a rule, all houses with cane walls, and most houses with wooden or no walls, will have thatched
Districts are named for their capitals

Limit of the Central Savanna

Wattle-daub
Cane
Concrete or brick
Wood
No Walls
Other

MAP XVI

Sources:
CENTRAL PANAMA

ROOF, WALL, AND FLOOR CONSTRUCTION
Limit of the Central Savanna

Miles

Kilometers

MAP XVII

Source:
Fig. 34.—Bohío of quincha, paja, and teja (wattle-daub, straw, and tile), Cañazas, Veraguas. The penthouse on the left side of the bohío is a modification of the original dwelling type. April 15, 1956.

Fig. 35.—Mestizo mother and baby stand in front of two bohíos. Note smooth, rounded hip of the roof. Cañazas, Veraguas, April 15, 1956.
Fig. 36.—Bohío frame. Cañazas, Veraguas. April 15, 1956.

Fig. 37.—Bohío frame.
roofs. *Quincha* houses may have either thatched or tile roofs. Houses without walls or with widely spaced canes are rare in the savanna. However, they are the most frequent type found today among the Guaymi. Often cane wall houses will have a plastered wall on the windward side. Wooden *bohíos* occur in regions of heavy forest and near the Canal Zone (Map XVI and Fig. 39). The latter houses are made from scrap lumber readily available from nearby military posts. Wooden houses are not aboriginal to Panama.

The *bohíos* generally contain one room that serves as a living room, bedroom, kitchen, domestic workshop, and stable (Fig. 40). Some *bohíos* have an embryonic separation
of functions. A wall of palm or cane, extending out from one wall, sets off a small sleeping area (aposento) or the cooking space (Fig. 41). More frequently the construction of the jorón (storage loft) is the only functional division. The jorón is a small "second floor," built close to the roof, of cane or bamboo, and serves as a bedroom and granary at the same time. It is reached by a notched log identical to the type found among the Chocó of Darién and Colombia. This trait of the South American forest Indians apparently diffused as far north as Honduras during aboriginal times.

Hanging from the inside wall is a suspended shelf, or zarzo, where wooden and china plates are kept, along with other eating utensils. A little cupboard (talanquera) is
Fig. 40.—Floor plan of typical bohío (apsidal).  

Fig. 41.—Floor plan of typical bohío (rectangular).
usually fastened to one of the walls. A wooden pilón and mano for pounding grain is always found outside the house, near the kitchen. Close by will be the stone metate and mano for grinding grains. Bateas, or trays, for winnowing lean against the inside walls (see chap. iv for a discussion of tools and utensils). Sleeping accommodations are of pre-Hispanic type in most bohíos. Benches made of cane often serve as beds. Sometimes a hammock (hamaca or chinchorro) is used, and now and then one sees a skin of deer, cow, or peccary spread on the floor, with an underpadding of cow-hide. Canvas cots, introduced by the Spaniards, are used in some rural homes and most town homes today. The pillow, however, is apparently unknown outside the larger towns, in spite of the fact that the savanna abounds in various species of cotton trees. This excellent stuffing is used by townspeople for cushions, pillows, and mattresses. There are seldom any chairs. A person normally rests on a hammock, balsa stool, or packing crate. Squatting is probably the most common manner of "sitting." Tables may be of inverted boxes, held in place by stakes driven in the dirt floor, or blocks of wood or cane put together over stakes. There is seldom any means of waste disposal, never any electricity, and no glass in the one or two tiny windows. Floors are nearly always of dirt (Map XVII).
The Detached Kitchen of the Bohío

Bohío kitchen facilities may be inside the main house, semi-detached, or completely detached. The indoor kitchen occupies a corner of the one main room, though it may be partially separated by a low wall that does not extend all the way to the ceiling. Sometimes the cooking area is surrounded by walls that are more open than in the rest of the house (Fig. 38). The semi-detached kitchen is an extension of the dwelling (Fig. 34), often called a pent-house. As in the case of the indoor kitchen it is sometimes set off from the main house by a cane wall. Usually the penthouse has a Spanish tile roof, though it may be of galvanized tin, a recent Anglo-American introduction. Detached kitchens are frequently open on three sides, and sometimes on all four. Even if not completely open there will be more air space in the walls than in the main house. Unlike the tile or tin roof penthouses, detached kitchens are always hip-roofed structures covered with thatch (Fig. 42).

It cannot be said with certainty whether or not physical separation of the kitchen is aboriginal to central Panama. Separate kitchens occur today among the Guaymi, and north to Yucatan. Nevertheless, the Panamanian Cuna and Chocó Indians rely on an indoor hearth, which also is found north and south of Panama. The semi-detached kitchen, on the other hand, is not as widespread as either internal or external varieties. It appears as though the development
Fig. 42.--A quincha-and-thatch bohío with a detached, cane-and-thatch kitchen. Widely spaced canes permit freer circulation of air in the kitchen, which is behind the one-room house. Cañazas, Veraguas. April 15, 1956.

of a penthouse addition is post-Conquest in Middle America. It could have resulted from a Spanish attempt to bring the separate kitchen back to the house, or to remove an internal kitchen (see discussion of detached kitchens and the Spanish house, below).

An analysis of the bohío kitchen complex does not bring us closer to an answer. All three kitchen forms possess the same association of traits, except the tile roof of the penthouse. This trait alone suggests a Spanish origin for the semi-detached kitchen. Floor hearths have disappeared from the savanna and an elevated fogón is the typical stove (Fig. 43). The three-stone pot rest is
Fig. 43. — Typical fogón (stove) of rural Panama. The three-stone pot rest is characteristic, Charcoal supplies the fuel requirements. Camarón, Panamá. January 2, 1956.

found with every fogón, though skillful arrangement can make seven stones do the work of nine (Fig. 43). The seven-stone, "three burner" model is the most common type encountered in the savanna. The use of three stones, or three logs (Cuna and Paya Indians), is a trait that was aboriginal in North and South America. But a fact generally overlooked is that it was known to Spain before the Conquest. It is still used in Valencia, in association with a raised fogón similar to the type in Panama. Moreover, there is archaeological evidence that a raised hearth was pre-Conquest in Yucatan. There is a possibility that a raised hearth was pre-Hispanic to the savanna. Even if not, the present
fogón could be a post-Conquest introduction from Mexico.
It is no longer safe to say that three stones are typically
Indian and elevated stoves are typically European.
Apparently both peoples possessed the traits.

Two other important elements of the kitchen complex
are the outdoor oven (Fig. 44) and the tinaja, or water
storage jar (Fig. 45). Both of these are of Spanish origin
and are still common to southern Spain. They may be traced
to North Africa and to the Middle East. The oven is not
always enclosed at the bottom (as in Fig. 44) but may rest
on four posts like a table. Round bottom tinajas must be
placed in some kind of rack in order to stand. Often they
rest in wooden stands called tinajeros, in exactly the same
manner as today in Valencia, Murcia, and Andalucía.

Fig. 44.--Oven, or hornillo, near Cañazas,
Veraguas. The oven rests on a clay platform.
April 15, 1956.
Diffusion of the Indian Dwelling to Central Panama

The pre-Conquest savanna inhabitants were culturally more South American than Meso-American, as Lothrop has pointed out. The round house, described by Oviedo, is apparently of South American origin. The apsidal and square (or rectangular) houses, both of hip-roofed construction, occur in Ecuador and Peru, and Yucatan and Honduras. Wattle-daub is distributed in a like manner. It is impossible to say whether apsidal and rectangular houses are distinct types or whether either might have had its genesis in the other. For that matter, a rectangular cane house may take on an apsidal appearance by the simple process of
careless construction. It might also have resulted from the introduction of the ridge pole into an existing round dwelling. There is always a slight chance that an apsidal, pre-Hispanic house was "squared-off" by Spaniards during the sixteenth century. The problem of the true home of the various elements in the bohío may, unfortunately, never be resolved. Our knowledge of pre-Conquest inhabitants to the north and south is too fragmentary to form absolute statements that will endure all criticism.

If the apsidal house is aboriginal then it is either from Ecuador-Peru or from the Mayan area. The Mayas had hip-roofed, apsidal, wattle-daub dwellings as early as the tenth century. The houses not only persist in Yucatan today but have diffused at least as far as the Paya Indians in northern Honduras. The Paya house bears a remarkable resemblance to the single-room bohíos of the Panamanian savanna. They have a jorón for storing food and sleeping, a central hearth containing three logs, bench beds, and hammocks.

Mexican penetrations as far south as Lake Nicaragua (Nicarao Indians), the Río San Juan (Desaguadero Indians), and Chiriquí Lagoon (Sigua Indians) are well known. All of the Nahuatl-speaking groups moving overland passed through Maya territory on the journey south, finally stopping at a point close to the western boundary of the Guaymí. The apsidal house (Yucatan) or the rectangular house (Guatemala-Mexico) could have diffused to Panama between the time of the
Toltec-Chichimec migrations of the twelfth century and the Aztec colonies and trading missions of the late fifteenth and early sixteenth centuries.

Connections with South America have already been discussed (see chap. ii, Coclé cultural origins). Because Coclé peoples probably came to Panama from western South America I would favor Ecuador as the origin of the hip-roofed bohío of the savanna. With this trait came sailing, boat types, language, and a host of other traits enumerated by Lothrop. This is not to say that there was not a possible modification of the savanna dwelling by later diffusion from Meso-America and acculturation from Spaniards. The inescapable fact remains that in western South America there is a tradition of hip-roofed construction, and wattle-daub, apsidal, rectangular, square, and round houses. Ever present is the possibility of multiple origin and subsequent secondary diffusion.

There may be found in Spain today a square bohío, similar to the one in central Panama. The Spanish bohío is concentrated in the highlands of Asturias, and a related dwelling occurs in the vicinity of Laguna de la Janda, a few miles southeast of Cádiz, Andalucía. Apparently the Spanish bohío is unrelated to the one in Panama and other parts of tropical America. Although almost identical in outward appearance and somewhat similar in floor plan, it differs considerably in construction techniques and materials. The house is significant in that it is found in an area of Spain
that contributed so many men to the early exploring parties. This means that native houses encountered in the savanna were not foreign to every Spaniard. There is always the possibility that the Spaniard altered a native apsidal or round house to make it look like the Spanish bohío.

**The Spanish Dwelling**

The first Spanish settlers in central Panama carried with them a tradition of village life. In villages such as Natá and Los Santos they constructed their first houses. Culture tended to dictate the house type and the settlement form. Traits of Spanish origin may be readily identified in savanna town houses. They include: (1) a two-shed roof, with lateral center beam; (2) semicircular tiles for roofing, as common in Andalucía, Extremadura, Castilla, and La Mancha; (3) wood in the general structure of the frame and roof; (4) contiguous dwellings, close to the street, with rear patios and gardens; (5) adobe (sun-dried brick) or packed-earth (tierra apisonada, tapia) walls, in the Mediterranean tradition; (6) tile or terra cotta floors; (7) coloring of the exterior walls; and, (8) small windows and few exits.

Many savanna houses possess all of these traits today, which offers sufficient proof as to the origin of the dwelling type. Other houses indicate that modifications have been made. Alterations of the basic Spanish house type have come about either as a response to local environmental conditions or from contact with the indigenous culture. The tile roof
has remained on two-shed houses (Fig. 46). In no case has it been applied to the hip-roofed dwelling, except on the low kitchen extension with gently sloping roof (Fig. 34). In central Panama tiles are usually laid on the roofs, with no fastenings of any kind; they would slide off a steeply pitched roof unless some modification were made (Fig. 47). Furthermore, thatch is a perfectly adequate roofing material if the pitch of the roof is steep enough to prevent leakage. It is this desire to keep out water that prevents the use of thatch on roofs of low inclination. Occasionally the recently introduced galvanized tin roof replaces tile on the traditional two-shed Spanish house.

The chimney, so characteristic of houses in all sections of Spain, is not represented in any form in savanna houses. This appears to be a logical adaptation to tropical climate. Another environmental condition affecting some savanna dwellings is constant wind of high velocity during the dry season. As long as solid walls are retained the Spanish house needs no modification to cope with the problem of strong winds. On the other hand, where Spanish-style dwellings have been built with cane-and-thatch walls, the windward side is generally sealed with quincha. As already mentioned, this is an aboriginal trait associated with the bohío.

The tile-roof, mud-wall, Mediterranean house is a good tropical dwelling needing little modification to be comfortable. Alterations of any house because of local
Fig. 46.—A typical Spanish house of quincha and teja (wattle-daub and tile), one mile south of Chitre, Herrera. December 28, 1955.

Fig. 47.—Tile detail of the Spanish house. Tiles are laid on the roof with no fastenings. Five miles west of Parita, Herrera. December 28, 1955.
environmental conditions are purely for comfort and are not survival factors. Not every house is modified, to be sure, but most savanna homes reflect certain changes in form that cannot always be attributed to diffusion or acculturation.

An important modification of the basic form is the extension of the tile roof to form a porch across the entire front (Fig. 48). The porch roof is usually supported by three columns that rest on pillars. While not unknown in Spain, the roof extension in front of a one-story house is not common. Apparently it is a local modification of the Spanish practice, first extensively employed in the colonial towns. In central Panama town houses form continuous lines and a common extended roof covers the walk in front, offering relief from the sun and rain (Fig. 49). There is no evidence that the first town houses of central Panama were so constructed (Fig. 50). Although contiguous, like houses in southern Spain, the extended roof was probably absent during the first few decades of savanna colonization.

Although roof extensions of the Panamanian type are almost never seen in Spain, there is a tradition of arcades and covered balconies. Often the inner patio of the house in southern Spain has a covered walk. Apparently there are many Spanish antecedents of the roof extension, however obscure they may seem at first. Nevertheless, a porch formed by an extension of the roof is not characteristic of most parts of Latin America today. It occurs chiefly in
Fig. 48.--Detail of a typical porch extension in a rural Spanish house. Looking through the porch one may see an identical roof. Heavy, hewn timbers support the lighter frame and tile roof. Cañazas, Veraguas. April 15, 1956.

Fig. 49.--Town houses of Chitré, Herrera. Each family unit is painted a different color. December 28, 1955.
Pig. 50.--Wooden Spanish town houses, Santiago, Veraguas. The use of wood today is rare in the savanna, but was important during the colonial period in some areas. The houses in the picture were built ca. 1800. Note the absence of an extended roof on the house to the left. November 25, 1955.

Central America and southern Mexico, where local modification of a basic Spanish house type seems to be the only explanation for its existence.

The Detached Kitchen of the Spanish House

Physical separation of the kitchen from the main structure is the most significant modification of the Spanish house in central Panama. In rural homes the kitchen is usually detached or semi-detached, and is seldom found as an integral part of the main unit (Fig. 51). When the
kitchen is found within the main house it may be assumed that this is in the Spanish tradition and not a parallel of the Indian indoor hearth. Most people employing the Spanish house type in the savanna accepted its functions and general plan, and the first Spanish houses in Panama possessed internal kitchens. The latter is especially evident in the towns, where most cooking areas are located within the dwelling.

The town house is derived from the patio house of Andalucía, whereas the Andalucian patio is of Moorish origin. In southern Spain the house, instead of looking upon the street, faces an interior court, or patio. It
is the center of family activity during warmer months. The activity is normally transferred to the indoor kitchen during the winter when, even in Andalucía, the weather becomes quite cold. In northern and mountainous Spain, where winters are longer and colder and even summers cool, indoor kitchens are focal points for social life throughout the year. Once the Spanish patio was introduced to Panama it became widespread in the towns. North Spaniards seem to have accepted the southern Spanish tradition of outdoor living, for there is little to suggest Asturian or Galician influence in savanna house types.

The true patio, however, did not follow the Spanish house to the rural areas. For one reason, the rural house was never the elaborate structure found in the towns. People with financial means did not move to isolated places away from their friends. The house that developed among the poorer country folk is a simple affair, built of locally available materials and often in the Indian fashion. It was in the rural areas that the detached and semi-detached kitchens first appeared. These forms can be attributed only to three possible causes: (1) a local innovation, unrelated to the indoor kitchens of Spanish town houses or Indian bahíos; (2) a modification of the plan of the town house; or (3) acceptance of an Indian trait. It is difficult, if not impossible, to say exactly how the kitchen came to be removed. I suspect detachment is due, in part, to all three reasons suggested above.
The rural kitchen was probably constructed first as a semi-detached building of less substantial material. This permitted freer circulation of air than in the main house and kept smoke from the living areas. Its thatched roof, borrowed from the Indian but still two-shed, could be replaced as it became smoked or perhaps caught fire. Maybe there was an attempt to duplicate the kitchen of the town house, which was often on the side of the patio, at the end of an L-shaped dwelling. The simple rectangular rural house is too low in the rear to permit continuance of the roof over the kitchen. It may have been necessary to build a separate structure to house the kitchen, if it was removed in effect from a line of rooms built back of the larger village dwellings.

The completely detached kitchen could have been an attempt to build a covered "patio" in the rear of the house. For purely economic reasons the Indian bohío style was adapted as the most practical way to build a large, covered area that could serve as a kitchen-dining room-workshop. There remains the possibility that the aboriginal kitchen in the savanna was separate from the house. If so, the present detached kitchen of the Spanish house is simply a trait borrowed from the natives. Semi-detachment would then be a Spanish attempt to recombine house and kitchen when it occurs as part of the Spanish house complex. With the bohío it has been suggested previously that semi-detached kitchens
might have been an Indian attempt to take the kitchen back outdoors. In any event, it seems fairly safe to assume that the removal of the kitchen occurred in the rural areas first, as a local variation more or less related to the town house and closely related to the bohío. A certain parallel exists between the Spanish and Indian dwellings and their related kitchen forms (Fig. 52). About the only definite statement that can be made is that indoor kitchens are most common today in Spain and among tropical forest Indians of Central and South America. Semi-detachment seems to be a post-Conquest development in both Spanish and Indian dwellings in central Panama. Complete detachment of the kitchen was known before 1500 in parts of Spain and Central America, though it is not certain whether this had any influence on present savanna dwellings.

In the Spanish Province of Valencia there is a form of detached kitchen, associated with the barraca dwelling. It would simplify matters considerably if it could be proven that the Spanish detached kitchen diffused to the savanna. This does not seem likely since there is nothing in Panama resembling the barraca, nor does the Panamanian kitchen have any similarity to the Valencian form. However, the coastal regions of Valencia possess a small version of the barraca. The floor plan is similar to the Spanish savanna house plan and room dimensions are almost identical. Though called a fishing barraca in
Fig. 52.—Evolution of the Spanish and Indian savanna dwelling.
Spain it is unlike the true barraca associated with the larger portion of Valencia. The fishing barraca has a roof of rice straw thatch and walls of mud or cane. Associated traits include rice and its culture, tinajas (Fig. 45), ovens like those in the savanna (Fig. 44), and a fogón with three-stone pot rest (Fig. 43). Most of these traits are found in other parts of southern Spain but the separate kitchen is exclusively Valencian. Because Valencia is the major rice-producing region of Spain it might be possible to believe a number of Valencians came to Panama during the sixteenth century; for Panama was growing rice earlier than any other area in the New World (see chap. iv), and several Valencian traits are found in the Panamanian rice complex. It is difficult to imagine why the Spanish house would come from Andalucía and the kitchen from Valencia, but it is not impossible, assuming a significant migration of Valencians after the Spanish house was established.

House Construction

Construction techniques, as well as house types, have been modified through the blending of Indian-Spanish culture. The Spaniard was compelled to use local materials in many instances and frequently adopted Indian methods for utilizing them. The Indian, on the other hand, accepted certain elements from the Spanish house complex, but modified them to suit his own cultural taste. Adobe and pressed earth (tapia) construction, so characteristic of southern Spain,
gave way generally to the aboriginal quincha (wattle-daub) method. Quincha construction was a native technique that could be readily applied to the Mediterranean dwelling. It required little expense as most of the materials were locally available. Quincha construction is rapid in that a junta (communal work party) can complete a dwelling in a day or less. Nails, a scarce item during colonial days and still expensive in the savanna, were not needed. The wall frame could be made of canes and bound with vines, as in the aboriginal hip-roofed bohíó (Fig. 53). Although the heavier hewn rafters and beams of the Spanish house were generally maintained, they were secured in the Indian fashion (Figs. 48, 54, 55). The tile roof remained on the Spanish house,

Fig. 53.—Jungle vines replace nails in the savanna house, whether Spanish or bohíó. Pictured are Philodendron sp., near Arraiján, Panamá. May 6, 1956.
Fig. 54.--Detail of a porch roof of the Spanish house, five miles west of Parita, Herrera. Compare the manner of securing the rafters with Figs. 36, 37, and 48. December 28, 1955.

Fig. 55.--Method of securing corner post and beams in a hip-roofed, detached kitchen. Camarón, Panamá. January 2, 1956.
as much for structural reasons as cultural. The pitch would have to be greatly increased to keep a thatch roof from leaking if placed on the two-shed dwelling. Spanish tile floors were rarely duplicated in the savanna (Map XVII). Rural Spanish houses often have earthen floors and the lack of tile in Panama is no indication of cultural loss. In the towns, especially among the wealthy, tile and terra cotta persisted. Today concrete floors are becoming increasingly important.

The Junta

The junta is a communal work party that performs some particular task requiring more labor than any one campesino could hire. House construction is only one of many jobs handled by the junta (see chap. iv). Communal labor was an important aspect of pre-Columbian Indian society. Although there is no existing account of aboriginal house building techniques the Indian probably employed group labor. However, Indian communal work parties are not the only antecedents of the Panamanian junta. There exists in Spain, particularly to the north, a system of communal labor. Furthermore, the Negro slave had an African tradition of communal labor for many purposes, including house building. The modern junta has its roots in all three systems, but is probably more Spanish than anything else. It is impossible to say what elements of the junta are
purely Indian. A study of the present Guaymí junta reveals little because so many Spanish traits have diffused to them in the past four centuries. There is no reason to believe that Guaymí construct cane-and-thatch houses much differently than before the Conquest. Even so, it would be insufficient to dismiss the Panamanian junta as merely something "typically Indian," for it is also typically Spanish and typically Negro.

Regardless of the type of house to be constructed, the junta functions in approximately the same manner. The prospective builder gathers the necessary materials to erect the frame, such as termite-resistant woods (discussed in chap. iv). Vines are collected from the woods for tying the frame together. Wild cane, as well as pressed sugar cane, will be woven and tied to the frame to form walls. They may be left in that manner, thatched, or plastered with quincha. If thatch is to be used on the roof the builder will gather palm or rice straw. If quincha is to be employed he will take additional steps, such as arranging for the use of an oxcart to haul water for making the paste (Fig. 56). The builder's wife and her neighbors busy themselves preparing food and drink, and when all is in order the campesino notifies his friends. Often the entire village is invited to the junta and people begin arriving at a specified time.

Juntas begin slowly as men alternate between erecting the frame and exchanging news or sipping chicha (Fig. 57). The women are usually at the nearest home gossiping and
Fig. 56.--Oxen pulling cart with two large cans of water is always an indication that a junta de embarra ("junta of clay") is about to begin. Behind the oxcart is a quincha bohío and its detached cane kitchen. Note the living fence posts. Cañazas, Veraguas. April 15, 1956.

Fig. 57.--Sr. Manuel Echevarría stands in the frame of his semi-detached kitchen, displaying a bottle of seco. The cheap rum is preferred to chicha. Behind him may be seen the hip-roofed, detached kitchen of his neighbor's Spanish house. Cañazas, Veraguas. April 15, 1956.
adding last-minute touches to the banquet. If the campesino has been careful to gather all of the necessary materials the work begins to move rapidly as more friends arrive and join the labor. The caña y paja (cane-and-thatch) dwelling is usually completed when the last thatch has been placed on the hip-roofed frame. Quincha construction usually takes longer. Tile, if used, is placed on the house before plastering. Quincha is prepared by mixing water with clay found on the site. Men work the clay and water with their feet, supporting each other to keep from falling (Fig. 58). The trampling is accompanied by

Fig. 58.--Preparing quincha. Two men work the mud and water with their feet. Straw (lower right) will be added to the mixture. The barrel on the left contains water, and the man next to it has picked up some quincha to test its consistency. Cañazas, Veraguas. April 15, 1956.
singing, swearing, and shouting. A peculiar shout, or yodel, is also typical of all juntas in central Panama. Actually the sound, called saloma, is more like a bark than anything else. The name comes from the Spanish verb salomar, meaning "to sing out." It is used in Spain for any form of manual labor where some sense of rhythm is beneficial, especially by sailors working oars or sails. Again we have a suggestion of a maritime origin for some groups in central Panama. Occasionally one of the men will fall into the mud, a source of great amusement for everyone.

Straw and dry animal dung from nearby piles are added to the mixture (Fig. 58). Two men in unison kick a heap of mud from the work area (Fig. 59); a third man picks up the

![Image](image.png)

**Fig. 59.**—Men on right wait for batch of quincha being kicked from work area. Cañazas, Veraguas. April 15, 1956.
wad and carries it to the house (Figs. 60, 61). Before the piles of quincha carried to the structure have begun to harden, the actual task of plastering commences. The mud-and-straw mixture is slapped against the frame from inside the house (Fig. 62) and smoothed with bare fists (Fig. 63). The fists are kept wet by constant dipping in a water bucket and adequately replace trowels.

The work progresses rapidly, and great quantities of food and chicha are consumed (Fig. 64), the latter producing

Fig. 60.--This semi-detached kitchen is to be plastered. The man coming out of the door on the right has been carrying quincha (piles on ground) from the work area. Another man sweeps the area around the frame. Cañazas, Veraguas. April 15, 1956.
Fig. 61. -- Spanish house was completed the previous day. Kitchen frame may be seen to the rear. Cañazas, Veraguas. April 15, 1956.

Fig. 62. -- Plastering a wall with quincha. Cañazas, Veraguas. April 15, 1956.
Fig. 63.--Wet fist adequately performs the function of a trowel. Cañazas, Veraguas, April 15, 1956.

Fig. 64.--Campesino holds can of chicha after finishing wall section (to man's right). New wall will crack upon drying like the house it joins. These will be patched in two or three days. Cañazas, Veraguas. April 15, 1956.
more and more tumbles into the mud as the day wears on. By late afternoon the plastering will be finished, if the work force was large enough and if everyone stuck to his job. Finishing touches will be added after the quincha dries for several days, during which time it will crack in many places (Figs. 61, 64). These are patched with more quincha, which sometimes is lightened to a gray color by the addition of ashes and even lime. Whitening is a Spanish trait of Moorish origin and it is not known if the aborigines also colored the exteriors of their structures. Colored mud (usually gray) is called tiza, from the Spanish word tizo, meaning "half-burnt charcoal, or ashes."

Fig. 65.--Sr. Echevarría, the owner, explains that his kitchen frame is made of nance (Brysonima crassifolia), a termite-resistant wood. The space between the roof and the man's elbow will be left open as an air space. Note the method of securing the frame with vines. Cañazas, Veraguas. April 15, 1956.
No nails are used in most rural structures (Fig. 65), though they are sometimes used in the door frames of larger Spanish houses. The only material that has to be purchased is tile, when it is employed. There is no glass, rarely metal hinges, and no need for mortar, bricks, or similar materials. Windows are scarce, often only two in a five-room house, and they are consistently no larger than eighteen by twenty-four inches.

Internal arrangement of rooms has multiple variations, though in the bohío there are seldom more than two, plus the elevated jorón (Figs. 40, 41). Excluding a detached kitchen, two-shed Spanish dwellings have anywhere from three to five rooms, four being the more common number (Figs. 66-69).

When the house is completed the fiesta moves into high gear. An improvised orchestra of drums, guitar, and violin provides music for the tamborito (national dance). Singing, dancing and merrymaking last as long as enough people are able to stand. When sheer exhaustion or chicha takes its toll the celebration ends. Many of the celebrants that night sleep on the ground, wearily trudging home at dawn.

**Distribution and the Related House Complex**

There is a noticeable concentration of the Spanish-style dwelling in the flat, relatively open savanna, especially in the Azuero Peninsula (Map XVIII). In portions of the savanna not well-suited to livestock the quincha-and-thatch bohío is the characteristic dwelling. The all-thatch
Fig. 66.—
Floor plan of Spanish house.

1 cm. = 1 m.

Fig. 67.—
Floor plan of Spanish house.

1 cm. = 1 m.
Fig. 68.—Floor plan of Spanish house. 1 cm. = 1 m.

Fig. 69.—Typical huerta-house assemblage. 1 cm. = 2.2 m.
bohío is most typical of higher, heavily forested regions. There are a number of inter-relationships between the dwelling, natural environment, land use, settlement pattern, and racial type. The two-shed, tile Spanish house is a permanent dwelling, associated with the Republic's chief cattle-producing areas. It is found in those sections of the country first inhabited by Spaniards who were primarily engaged in livestock and associated activities. The house type is the most common form found among small landowners, and it is not very well adaptable to migratory, roza farming. Typically, the owners today are mestizo, but most whites in central Panama construct the same kind of house. The greater the distance from centers of white population, the fewer Spanish houses encountered.

It is the occupants of the Spanish houses who possess a few head of cattle, erect barbed wire fences around their homes to keep livestock out, and have a few luxuries not generally enjoyed by the bulk of the rural population. Usually there are one or two out-buildings in the complex of the tile roof dwelling, such as an outhouse (servicio), shed for the cane press, and shelters for chickens and stock. The outdoor oven is always a part of the Spanish house complex, and sometimes an elevated jorón. The latter, though aboriginal to Mexico, is a Spanish introduction in the savanna. Elevated granaries, or hórreos, are typical of Galicia and Asturias in Spain, and extend into Santander, León, and Murcia. The word jorón is from the Murcian word
horón, meaning "storage place for wheat." The elevated granary is not part of the Andalucian house complex, but joined it in central Panama.

Permanent fruit trees, a mark of the settled farmer, surround the house, and a garden lies to the rear (see chap. iv). If the farmer practices roza agriculture he usually possesses a second dwelling, which is normally a cane-and-thatch bohío. The temporary dwelling, located near the fields, is often occupied during the dry season if farming is being carried on in bottomlands. When rains start and streams rise the bohío is abandoned and the campesino returns to his substantial residence. The maintenance of two dwellings is a trait common to the aboriginal inhabitants of the savanna and it is still a custom of the Guaymí. The Spaniard was also familiar with a system involving two dwellings, although the motives were unlike those of the Indian. In mountainous Spain temporary abodes are built in the highland pastures and are used in the summer when animals are taken from the valleys to higher elevations. Not only is there a parallel between maintenance of two separate houses but also both systems involve a change in residence between dry and wet seasons.

The substantial quincha-and-thatch bohío is not too unlike the Spanish house in function. It frequently has the same arrangement of out-buildings, fences, gardens, and trees. However, the bohío is not the common house among whiter elements of the rural population; they prefer the
Spanish house. Also, occupants of the bohío usually own less land than occupants of the Spanish house. Quincha- and-thatch dwellings are most common along the Pacific coast between the Río Santa María and Punta Chame.

Further removed from the open savanna lie the thatch and cane-and-thatch bohíos characteristic of the regions of shifting agriculture. The houses rarely last more than five years and are usually abandoned in three or four, when the farmer moves on in search of new land to cultivate. There is normally no fencing, seldom an out-building other than a detached kitchen, and no means of waste disposal. The thatched bohío is the typical house of the strongly Indian, mestizo people who never own the land they cultivate. This was the highland dwelling of pre-Conquest time, as opposed to the permanent quincha houses of the village-dwelling Indians. It bears a close relationship to the environment and the agricultural system in that it is wrought entirely from the natural landscape and is temporary. Today in the Guaymí region west of the savanna cane-and-thatch houses predominate. Although a house without walls is a rarity in the savanna it is common among the Indians. Structures without walls do occur as detached kitchens and village recreational centers (Fig. 70).

Conclusion.—Spanish house types were superimposed on a region that had a large, settled native population. The latter occupied thatched bohíos that were either of quincha or cane wall construction. The Spanish house predominates
Fig. 70.—A tambo, or open building, may be seen in the background. It is the community building for Cañazas, Veraguas. The man is standing in a typical Spanish gate. April 15, 1956.

today in areas where the aboriginal inhabitants were early conquered and driven out—areas that coincide with the best pasture lands. The Indian quincha technique was adopted by the Spaniards as an adjustment to a local condition of environment and culture. Where Spanish settlement was lightest the Indian dwelling persisted. The Indian of western Panama today represents a degradation from the relatively high Coclé civilization that once occupied the lowlands. It would seem quite incorrect to assume that his present flimsy houses of thatch are
typical of the aboriginal village dwellings once found in
the savanna and so vividly described by the chroniclers.

**Recent Trends**

The rural dwelling of Panama has recently been
subjected to government scrutiny, the objective being an
eventual improvement in *campesino* living conditions. The
Instituto de Fomento Económico (IFE, Institute of Economic
Development), through its Departamento de Urbanización y
Rehabilitación (DUR, Department of Urbanization and
Rehabilitation), has already taken positive steps. A
Programa de Vivienda Rural (Rural Dwelling Program) is now
well under way (Fig. 71). The attitude of the government
is almost unique in its basic premises. Rather than
attempting to revolutionize Panama's rural dwellings, IFE
is showing the *campesino* how to incorporate modern features
of sanitation and convenience into the traditional house.
Geography, sociology, and architecture have joined forces in
order to effect an improvement in living conditions with as
little social friction as possible. The program agrees with
the thinking of Sauer, who says:

> The native (i.e., Caribbean) economy depends in
numerous ways on trees and shrubs and will
continue to do so because they may be most
useful and least expensive. I neither think
nor hope that the functionally admirable
native house, the *bohío*, will give way
generally to concrete-block construction and
roofs of tin or aluminum. The palms that
provide so characteristic an accent to Caribbean landscapes do so because they are good primary structural and household materials.  

Nor is it the desire of IFE to mass-produce concrete-block homes, with radical design and plan, as has been done in Puerto Rico and Antigua. There is no doubt that the spread of infection and disease in the savanna is associated chiefly with poor housing, overcrowding, and lack of even elemental utilities. But it is the general belief by all who have studied the question that no sweeping innovations are necessary or desirable. The campesino would probably reject them anyhow, even if the Republic

![Signs](image)

**Fig. 71.**--Signs like this are part of the Republic's publicity campaign to gain public support for improved rural housing. Coclé, Coclé. March 2, 1956.
could afford such a program. Perhaps there will be changes in savanna living conditions in the near future but there will be no accompanying change of rural settlement patterns or house types. These things have been established and are intimately associated with the natural and cultural landscape. The campesino will continue to build for himself, an admirable trait passed on to him by both Indian and Spanish forebears.
NOTES TO CHAPTER III

1. Gonzalo Fernández de Oviedo y Valdés, Historia General y Natural de las Indias, Islas y Tierra-Firme del Mar Océano (Asunción, 1944), VIII, Lib. X, Cap. XXVII, C.


WALLS:
- Cane: 737
- Leaves: 182
- Wood: 220
- Concrete: 0
- Quincha: 57
- No walls: 1,320

ROOFS:
- Thatch: 2,503
- Tin: 9
- Tile: 4

FLOORS:
- Earth: 2,488
- Wood: 6
- Tile, concrete, etc.: 0
- Cane, skin, etc.: 22


5. J. M. Casas Torres, La Vivienda y Los Nucleos de Población Rurales de la Huerta de Valencia (Madrid, 1944), 94.


7. Casas Torres, op. cit., pp. 98, 117, and 123.

8. John Murra, "The Historic Tribes of Ecuador," Handbook of South American Indians, II (1946), 785-821; Günter Tessmann, Die Indianer Nordost-Perus (Hamburg,
1930), Kartogramm 6, 7, and 8, following page 856; John Gillim, "Quichua-Speaking Indians of Northern Ecuador," American Anthropologist, XXXVIII (1936), 550. See also: J. E. S. Thompson, The Rise and Fall of Maya Civilization (Norman, 1954), 229; and Doris Stone, "Archaeology of the North Coast of Honduras," Memoirs of the Peabody Museum of Archaeology and Ethnology, IX (1941), No. 1, 95.

9. Ibid.

10. Tessmann thinks that the hip-roofed, apsidal house in Peru is an evolution of the conical-roofed, round house. The rectangular (or square) house, with a hip roof, is a variation of the apsidal house. Tessmann, op. cit., pp. 9 and 645-6.

11. Thompson, op. cit., Plate 17 (facing p. 226), and p. 229.


Stone points out that Paya influence extended at least into Costa Rica, and pottery traits may be traced to Veraguas and, in a few instances, to South America. The Paya stone metates (usually four-legged jaguar effigies) are quite similar to those I have seen from Veraguas. Stone, op. cit., p. 95.


14. Leonardo Martín E., España: El País y Los Habitantes (México, 1940), 393 and Plate CVIII. Also see: Federico García M., La Casa Popular en España (Madrid, 1930), 15.

15. García, Ibid., pp. 52-57.

16. Manuel de Terán, Geografía de España y Portugal, Vol. V, by Orlando Ribeiro (5 vols., Barcelona, 1955), 198. Baroja says: "The patio and corral are typical elements of the Mediterranean house, and have been so since prehistoric times, but became especially important after the Roman Empire." J. Caro Baroja, Los Pueblos de España: Ensayo de Etnología (Barcelona, 1946), 316 and 397.


22. Terón, *op. cit.*, Vol. V, p. 187. Tapia construction was introduced to Spain by the Moors and employed primarily in one-story structures. The dwellings are always rectangular in plan, with a two-shed roof, regardless of other variations. Such houses in Spain are constructed, as in Panama, for humans only.


25. In the savanna, an open, thatched tambo usually serves as the village recreational center. There is a possibility that the tambo has its roots in Andalucía, where covered, community patios are common. From there it could have been carried to Panama City. A city version of the tambo, called ranchería, could then have diffused to the savanna. Though constructed in the Indian fashion, its function seems to indicate that the tambo is not aboriginal to Panama and totally unrelated to the houses without walls.

CHAPTER IV

RURAL ECONOMIES

Rural economies in central Panama reflect the cultural heritage of the inhabitants in much the same way as do settlement types and forms, and house types. The Coclé economy, built primarily upon simple farming, dominated the hearth before the Conquest. With the Spaniards came, among other things, new tools, techniques, food plants, and a livestock complex. These items were spread over the aboriginal cultural landscape, and certain native traits were thereby submerged and many eventually vanished. Nonetheless, numerous Indian economic elements were accepted, modified and maintained by the conquerors.

Today the savanna economies are based to a large degree on a primitive, subsistence agriculture that is shifting, extensive, and self-sufficient. Over 98 per cent of the farms possess no animal or mechanical power, the chief agricultural tools being the digging-stick and the machete.¹ More than half of the 39,084 agricultural units in central Panama are less than five hectares (12.35 acres) in size, and usually only two or three hectares are cultivated at any one time. In contrast to this are large, mechanized farms producing commercial products, of which seven are larger
than 1,000 hectares (2,471 acres). An extensive livestock
industry occupies 15.87 per cent of the total arable land
in the hearth, whereas farming utilizes only 5.93 per
cent of the total. As a rule, subsistence farmers do not
operate under the terms of a money economy like commercial
producers. The former produce virtually everything they
use, and use almost all that they produce.

Agriculture
Subsistence Agriculture

The roza. — The shifting, slash-burn agriculture of
the central savanna is called roza farming. In Panama the
roza is a temporary field, usually some distance from the
farmstead, and located on relatively fertile hill lands or
bottomlands. Essentially, roza farming consists of clearing
a site of its heavy vegetation, using the land for a year or
two, and then moving on to repeat the process in a new
location. Most savanna farmers prefer a five-year interval
before returning to a site that has been farmed. Today,
however, an increasing population and decreasing woodlands
often force the campesino to return to land that has been
idle only two or three years.

The roza system of Panama appears to be more Spanish
than Indian. The name is derived from the Spanish verb
rozar, meaning "to weed," and the system is called rozada
in Spain. Today in mountainous Spain, especially in
Aliste and Zamora, the rozada field is prepared every few
years. Men and women participate in clearing the land, employing a *junta* similar to the one in Panama (see below). Work is competitive, labor is communal and there is much drinking and merrymaking associated with the Spanish *junta*. Although the aborigines made use of communal labor and shifting agriculture, their system was not identical to the Spanish *rozada* or Panamanian *roza*. The Indian system was at best fire-field agriculture, employing fire as the primary tool in clearing land. Without *machetes* and steel axes the Indian could do little more than deaden or pull down some of the trees and burn the rest. Apparently, the men handled the clearing; the women and children helped with planting and harvesting.

The *roza* is a complex system of clearing, planting, and harvesting, and has seven distinct phases with a well-defined division of labor. 4 (1) *La socuela* consists of chopping down the underbrush and small trees with *machetes*, a job handled by men and boys (Fig. 72). (2) *La derriba*, or the felling of larger trees with axes, is a task performed by men only (Fig. 73). (3) *La quema* is the burning of the cut brush and wood by men and boys. Normally this occurs during the latter part of the dry season. (4) *Las cercas de fagina* are fences of sticks. They are made of inclined trunks supported by stakes, although some are of barbed wire. This is done by the men and boys to keep cattle out of the newly cleared field. (5) *El balseo*, or the setting of little bonfires, is to destroy briars that were not
Fig. 72.—A roza field, north of Penonomé, Cochlé. The restrojo (second-growth) has been cleared with machetes. The field is now ready for burning. March 9, 1956.

Fig. 73.—La derriba, or felling large trees with axes, seen from the air near Campana, Panamá. March 17, 1956.
completely consumed by the quema. Again, men and boys perform this step. (6) La siembra, the planting, is usually done in April. Seeds are carried to the roza field in little baskets (sembraderas) and the entire family works together in the planting. (7) La cosecha, or harvest, is a family job. These seven operations are carried out from sunrise to sunset on every day they are done, although a great amount of time is spent going from the dwellings to the fields and return. Often the distance is as much as six or seven miles and seldom are there enough horses or oxcarts for everyone. Nevertheless, the long hours are not without their compensations, for whenever a large number of Panamanians get together there will inevitably be a fiesta. As in Spain, clearing, planting, and harvesting are times to which the people look forward.

Once the Indian acquired Spanish tools the fire-field system could be easily converted into the roza. All of the terms associated with the roza are of Spanish origin and the division of labor is like that of the Spanish rozada. The associated junta is Spanish in most of its elements. Except for the simple digging-stick, all of the tools associated with the roza are Spanish. The single most important roza crop, rice, is a Spanish introduction; the many related songs, shouts (salomas), and ceremonials are mainly from Spain.

The junta and the peonada.—Cooperative labor in the savanna is the basis for two typical campesino institutions,
the junta and the peonada. Both are a fiesta of sorts, providing an opportunity for dancing, singing, romance, news gathering, and small business transactions. Nonetheless, the two may be clearly distinguished. (1) The junta usually lasts only one day and provides a method of obtaining labor for building a house, killing snakes, or clearing a small piece of land. The labor received by an individual who sponsors the junta need not be returned. (2) The peonada is a method of providing labor for tasks that require longer than one day, and usually fewer people participate than in the junta. Peonadas usually center around activities basic to the roza system, such as a major land-clearing operation and harvesting. The sponsor of the peonada is morally obligated to return the service by serving at some later date each farmer that helped him. Neither institution involves an exchange of money, but the junta participants are rewarded with food, drink, music, and dancing. These are furnished by the campesino for whom the service is rendered. An element common to juntas and peonadas in Spain and central Panama is that of competition. In both countries judges are appointed to supervise the communal labor, and the winners earn some degree of local fame and prestige for their efforts. The junta and peonada form a true complex of cultural traits. As in the case of the roza, with which both communal labor systems are intimately bound, a sufficient number of traits are common
to the savanna and Spain to suggest an Iberian origin for the entire complex. Once carried to the New World there was some modification through diffusion from related systems of the Indian and the Negro.

The economic and social significance of cooperative labor in the savanna should not be underestimated. Much of a youth's social and home training is achieved by attending numerous juntas and peonadas held during any given year (see chap. iii, The junta).

The huerta.—Unlike the temporary roza field, the huerta, or garden, is a permanent plot. It is normally located adjacent to the dwelling and cultivated entirely by the family (Fig. 69). Although roots and tubers are grown in both the roza and huerta, other crop types are quite distinct. The major subsistence seed crops, all annuals (rice, maize, and beans), are typically roza plants. The huerta is generally reserved for the perennials which may be gathered as needed. The average small garden contains a stand of sugar cane and various fruit and nut trees scattered about the plot. There may also be condiments, a few leafy vegetables, perhaps several calabash trees, tobacco, pineapple, onions, and tomatoes. Yuca, yams, and other tubers are planted in sections of the garden that will later be planted in surface crops.

The accessibility and small size of the huerta permit more intensive cultivation, and therefore grass is not as bothersome as in the roza. Accidental fertilization by
farm animals and humans creates a relatively rich soil and huerta yields exceed comparable produce grown in the roza. Usually the campesina (farmer's wife) tends the garden though her husband plants and harvests the sugar cane. Occasionally the wife makes selective planting of certain vegetables, sometimes producing a new variety.

Agricultural implements.—The only aboriginal implement employed in savanna agriculture is the chuzo, or digging-stick (Fig. 74). With the Spaniards came the metal blade for the simple stick. The flat straight blade is about eight inches long, and when attached to a wooden handle is called a coa. This word, from the Island Arawak for digging-stick, has spread through most of Middle America and the Indies since the Conquest. The machete (literally "cutlass") is a Spanish introduction, though today the standard Collins machete of United States manufacture is almost universal in tropical America. The large knife is known in central Panama as el colina.

Two implements apparently came to Panama with rice, when that grain was introduced during the late sixteenth or early seventeenth centuries (see Rice). The champa is a blunt-pointed, slightly curved machete. The tool is used for cutting any grass, including rice and weeds. In the Spanish rice country of Valencia the same implement is called carbellot, though known by other names in different parts of Spain where it is also used to harvest wheat.
Fig. 74.— Agricultural implements.
Closely associated with the *champa* is the *gancho*. The Valencian name has been retained, as well as the function of the implement. A *gancho* is a crooked stick that has been stripped of its bark, and is held in one hand while the *champa* or *machete* is grasped with the other. A plant to be cut is hooked with the *gancho* and slashed with the knife.

The plow was never successfully introduced to Panama by the Spaniards and is virtually unknown in the savanna today. Most campesinos feel that their present tools are adequate for *roza* and *huerta* farming. Still, the implements do not permit sufficient cultivation to overcome encroaching grasses in the *roza*. On the other hand, erosional problems are less serious than they would be if deep cultivation of the soil was possible. It would not be correct to say that the Spaniards did little to modify Indian agriculture. The introduction of the *machete* alone was a revolutionary event in the sixteenth century. It meant that more cultivation was possible than ever before and it signaled the true beginning of slash-burn agriculture in Panama.

**Burning.**—The general lack of tools for clearing land before the Conquest made burning more or less mandatory. The *machete* did not cause burning to cease; it merely made it easier. In the long run, burning may be ruinous to the farmer. It destroys the organic materials which are the basis of soil fertility and creates a hard
surface cap that prevents the entry of moisture into the subsoil. However, burning leaves a mineral residue of ash (principally calcium salts and oxides, phosphorus, and potassium) that is of immediate use to the growth and development of young plants. An excessive concentration of these minerals, though, will interfere with the germinative process of the seed.

Burning, and grass and weed invasion, are often cited as the prime causes of decreasing soil fertility in the savanna. Even so, the campesino sometimes changes plots before grass has become a problem and where burning has not yet disturbed the soil structure. As yields decrease, because of constant cropping without cultivation, fertilization, or rotation, new land is sought. Second-growth vegetation is removed time and again, and the land is successively cropped. This indicates that the soil itself has not become exhausted but that aeration and oxidation are necessary to maintain it in a productive condition. Low productivity and decreasing yields on roza lands cannot be explained by any single factor, but rather by a combination of them. Included are: (1) too little moisture during part of the year and too much during the remainder, (2) winds and floods, (3) plagues and diseases of plants and animals, (4) tropical diseases endemic to the campesino, (5) scarcity of lands in the regions with roads, (6) lack of transport facilities where there are roads, (7) not
enough hands for the fields, (8) poor cultivation practices, especially the inability to cope with grass and weeds, (9) lack of agricultural implements, and (10) burning.9

Land Tenure and Distribution

Most of the campesinos in central Panama do not own the land they farm. According to the 1950 census only 15.38 per cent of the farms are owner-operated (propietarios), 62.28 per cent are operated by squatters (usufructuarios), 10.25 per cent are rented (arrendatarios) from private owners, and 11.97 per cent are operated under mixed tenure (mixto) arrangements.10

In the savanna those who own large tracts of land do not farm it. Less than 20 per cent of the privately owned land is under cultivation.11 Although the large landowners have nearly all of the level, accessible open savanna along the National Highway, they do not possess all of the good agricultural land. A great proportion of the savanna is not well suited to agriculture (see Note 2) and only hill land and bottomland is what might be termed fertile. It would be ignoring history to say that the Spaniards forced farmers out of the savanna. Woodland agriculture is Indian agriculture; dozens of sixteenth and seventeenth century reports to the King of Spain indicate this.
...it (central Panama) is not like Spain where cultivation is carried on near the towns, but in order to plant maize...they go to the mountains to make their **rozas**---at 2, 3, 4, 6, and 12 leagues from the towns...12

Indians were pushed from the fertile wooded bottomlands within the savanna areas to a large degree, but open, relatively treeless savanna was always considered sterile. The poorly drained savanna would not be cultivated today if it were returned to the small subsistence farmers. Wooded areas continue to suggest better drainage and soil structure, and the campesino recognizes the immediate value of the ash residue resulting from burning. A simple statement like, "80 per cent of the privately-owned savanna is idle," is misleading. It obscures the fact that, aside from grazing, much of the untilled land offers little hope for anything else at the moment.

Although there are a few large landowners with several thousand hectares of land, the average holding of the **proprietario** is only thirty-four hectares (eighty-four acres). Total annual income from a farm of this size averages $275 and the dwelling is valued at less than $200.13 The owners have animals, wells, and fairly substantial tile-and-**quincha** houses. They usually possess a number of fruit trees and an adequate garden. A small landowner may have a few luxuries, such as a radio, gun, team of oxen, and in a few cases an automobile.
An arrendatario, or renter, normally farms less than five hectares (12.35 acres), although he may originally clear that much land. The average income on a farm of this type will be about $145. A little more than $100 will be invested in a more-or-less-permanent dwelling that lacks the finer touches found in the houses of the propietarios. Renters own their crops but not the land. The latter may be paid for in a number of ways: cash, crops, labor, or any combination of these. Agriculture is typically roza and dwellings are not moved unless absolutely necessary.

The usufructuarios, like the renters, own the crops they produce but not the land. They practice a true roza agriculture and accumulate little or no wealth. Their houses are flimsy, rarely permanent, and generally cane-and-thatch. Although a small, temporary huerta is established near the dwelling, there is an absence of fruit and nut trees so typical of settled farmers. The trees, as well as animals, are expensive and require care over an extended period of time; time the squatter does not have.

Lastly, the peones or jornaleros (day workers) comprise a distinct group in rural Panama. This class seeks work wherever and whenever it can be found, and is the most migratory group in the savanna. They seldom establish families and usually live with other single men at the place of temporary employment. A peón owns no land or crops and possesses little more than the clothes he wears and a machete.
Private versus communal ownership.—Most Panamanian and North American agricultural technicians, sociologists, and geographers are disturbed because 85 per cent of the savanna farms are not owned by their operators. The many well-meaning, but poorly informed, people who have suggested reforms in land holdings have largely overlooked the communal traditions of Spain and pre-Conquest Panama. The campesino has inherited a Spanish-Indian belief that land belongs to all the people and not to individuals. The individual may use the land, as he does air or water, but he may not own an exclusive title to it.

For over twenty-nine years the Panamanian government has been willing, even trying, to give tracts of fifteen to twenty acres to farmers. And yet, the typical farmer refuses ownership and insists on renting national lands (tierras baldías) or using them without paying rent. Only a little more than 25 per cent of the total land area in the Republic is legally registered. Of this, about two-thirds is owned by fifty landlords, while the remaining one-third is divided among 12,000 or so farmers.

Historical background of land distribution.—Before the coming of the Spaniards land was held in common, probably by villages. While independent use was permitted, the village reserved the right to reapportion land from time to time. Certain crops appear to have been communal, also, and were probably divided at harvest time. The Spaniards brought to Panama two systems of land distribution. One was communal,
similar to the Indian, while the other was private. There are still many interesting examples of communal land holdings in Zamora and León, Spain. In some sections of Spain drawings are held once a year for lands, and communal harvests are not uncommon. It is not known how much of the Spanish communal agricultural practice, if any, came to central Panama. But it is another interesting parallel between Spain and Panama of the fifteenth century.

Whenever a Spanish town was established in the savanna during the sixteenth century, a certain amount of land was set apart for the Spaniards' exclusive use. Plots within the town were assigned for dwellings. Pasture lands outside of town were communal, but communal use did not extend to agricultural lands. The latter were given in caballerías and peonías. The caballería was originally the land assigned to a cavalry soldier; the peonía, the land assigned to a foot-soldier. Not more than five peonías, or three caballerías could be allotted to any one person. In the instructions given to Pedrarias a caballería was defined as an area of land in which 200,000 mounds (montones) of yuca could be set out; a peonía, that area which contained 100,000 mounds. This was roughly an area of ninety acres for the caballería and forty-five acres for the peonía.

This peculiar means of apportioning land had its origin on the island of Hispaniola, where the chief sustenance of the people was yuca. Yuca, along with the sweet potato, was grown in artificial mounds about eighteen inches high and
eight to ten feet in circumference. There is no record of any other system of land distribution for cattle lands, other than the communal pastures. Livestock came to Panama from the Indies with agriculture and its accompanying land system. For this reason it is believed that some agricultural caballerías and peonías were used for grazing. Lands were also granted to persons who wished to go directly from Spain to Panama; presumably the grants were based on the montón system. It was not until the seventeenth century that the government began selling land. There is today no visible trace of the old system of caballerías and peonías. Apparently the system disappeared with the advent of sales to private individuals in the seventeenth century.

The Spanish colonial agriculturists and ranchers disposed of the Indian communal lands without becoming proprietors themselves. In many cases they merely occupied the land, with or without legal sanction from the Crown. Questions of land distribution and ownership in central Panama during the early colonial period never received the attention and refinement that occurred in Mexico and Peru.

During the Colombian period (1821-1903) the legislation dealing with land titles is contradictory. In 1844 (Law No. 12) it was ordered that communal lands be appropriated and distributed by purchases made from the Spanish government. The law of October 30, 1856, concerning the adjudication of "privileged" (exempted) land, had the same tendency. On the other hand, the Law No. 15 (1856) is manifestly in favor of
collective agrarian property.

On establishing the Republic of Panama (1903), "the State refuses to recognize the titles of agrarian properties acquired during four centuries." Private and communal property lost its title. The educated landowners were able to comply with the terms set forth and had their titles revalidated. The campesino population attempted to regain their lands, but were generally unaware of all the technicalities necessary to accomplish this. Most of them lost what little they had. The principal reasons why it is hard today for the campesino to acquire a land title, if he has the desire, are: (1) shifting cultivation, (2) the large amount of illiteracy within the rural population, (3) monopoly of transport facilities by persons who are not farmers, (4) practices of communal property and collective use of the land, and the double heritage of Spanish-Indian culture, and (5) expropriation effected by the State when the Republic was created.

The Patromonio Familiar (Homestead).—Despite the failures of the government to encourage land ownership in recent years a determined effort to create a nation of small landholders continues. Law No. 22, of March 20, 1941 (complemented by Law No. 139, of August 6, 1941), created the Patromonio Familiar, or Homestead. A homestead is composed of properties up to a value of $1,000, including ten hectares (24.71 acres) of land, the dwelling, agricultural implements, and domestic animals. A family is not permitted to have more
than one homestead. The holding may not be mortgaged, nor withdrawn from public use. The property and its legal and natural profits will be forfeited if allowed to go unused. The Patrimonio Familiar is not taxed and use continues after the death of the father and mother if there remain one or more minor children. All homesteads are established on land already held by the Republic and are administered by the Colonization Section of the Ministry of Agriculture and Commerce. Rubio has examined the Patrimonio Familiar in some detail and notes certain shortcomings. (1) The ten hectares given by the government are worth about $5.00. (2) The average campesino dwelling is worth only about $45. (3) The average annual income from such properties amounts to approximately $14. (4) If everything is totaled, including a bumper harvest, the campesino has less than $200. (5) In central Panama the stable family (father, mother, children) is almost non-existent. (6) Bureaucratic procedures required to obtain such a parcel all but negate the whole program. Added to the paper work involved there is the expense of having ten hectares surveyed. This costs thirty times more than the land is worth! Moreover, the applicant must bear the cost and he must also pay any lawyer fees that might arise. Rubio might have added a seventh point. There is no urgent general wish on the part of the campesino to make changes in the present system of "squatting" or to live very differently. The idea of collective ownership is too deeply imbedded in the campesino mind to permit public
support of the program. Perhaps a government-supported revival of certain pre-Conquest concepts might better serve the country than the course being charted at present.

Subsistence Roza Crops

The roza fields supply savanna farmers with their basic seed and root crops. These include plants native to the Isthmus at the time of the Conquest as well as certain introduced varieties. Most of the roza crops were mainstays of the aboriginal diet and are planted, harvested, and prepared in much the same way as in pre-Hispanic times. Two important foods were introduced to central Panama; the yam, by the Negroes, and rice, by the Spaniards. Roza plants may be separated into two basic classes, the seed plants and the tuberous plants, each of which is discussed below.

**Rice (Oryza sativa).**—Rice (arroz) is the most important subsistence food grown in Panama and is the basic item in the national diet. Over 86 per cent of all farms in the Republic produced the crop in 1950. However, only 32 per cent of the producing farms sold any of the grain, the remainder being used for home consumption. The central savanna produced approximately 50 per cent of the 1950 crop, averaging about forty quintals (one quintal equals 101.4 pounds) per hectare (2.471 acres). In 1953 Panama became self-sufficient in rice for the first time in the nation's history. Self-sufficiency was attained because of an increase in irrigated rice grown by the large, mechanized
producers (Fig. 75). Despite this, the bulk of the production is still in the hands of the small subsistence farmers who depend on upland (non-irrigated) varieties.

Fig. 75.—Irrigated rice (var. Zenith) growing in the bottomlands of the Río Santa María, near Divisa, Herrera. April 15, 1956.

Upland rice has been raised in Panama at least since the beginning of the seventeenth century, having been introduced by the Spaniards shortly after their control was firmly established in the central provinces. Today a number of varieties are grown. Rice is planted near the end of May, when the wet season weather has become well established, and harvested in mid-October. A second crop may be planted in the early autumn and is ready for harvest by the beginning of
the dry season (January), although yields are usually lower than those of the first planting. Irrigation would increase yields up to 75 per cent but it is a costly technique and wholly out of reach of the campesino. 31

Weed and grass control is one of the most difficult and expensive operations involved in the production of upland rice in the savanna. The farmer makes every effort to select a piece of land that is as free as possible of undesirable growth. He then takes the additional step of burning during the dry season. On virgin land the competition from weeds and grasses is usually a minor problem during the first year rice is planted. But after approximately two or three years the problem of undesirable plants becomes so serious that it may be expedient to abandon the area. The inadequacy of the present system of weed and grass control undoubtedly is the greatest single factor causing low yields, poor quality, and high cost of upland rice production in central Panama. 32

After a field is selected, cleared, and burned the campesino waits until the beginning of the first rains in April or May. If he gambles by planting in anticipation of the rains he may be forced to replant his entire field. Rice is planted with a chuzo or coa so that the sprouts will come up about twenty inches apart. While the rice is growing the field is weeded with a machete two or three times. When harvested it is cut with champas, machetes, or any of a variety of elemental cutting tools, such as deer bone knives
and broken automobile springs. Then the rice is tied together in *manotadas* ("handfuls") and stacked in little pyramids that are left in the sun for a few days. Later the *manotadas* are carried on the shoulder in big baskets (*motetes*) to the *jorón* (see chap. iii). Most rice is consumed at home but any excess will be marketed in the nearest village. There the grain is sold to a rice mill operator, if one is available, or to a mill agent who is usually a local merchant. 33

The average Panamanian consumes about 150 pounds of rice a year. 34 It is eaten every day, and usually three times a day. In the afternoon the *campesina* boils enough rice to fill the round-bottomed iron kettle, or *paila*. Rice may be served with beans as *guacho*, or with jerked beef or fresh game. Whatever is left is warmed over for breakfast; the husband carries a gourd-full to the fields. An *interiano* who has not eaten rice at least once during the day has not eaten.

**Commercial rice.**—Because rice is the basic subsistence crop in most parts of the Republic, the government has made every effort in the past few years to increase production. Self-sufficiency in the grain finally came with mechanization. The large mechanized producers are located adjacent to the National Highway, with the Antón area (Coclé Province) being by far the major growing area. 35 Some of the large rice growers have their own mills, driers, and warehouses. They
harvest, dry, and store grain during August and September or December and January. It is later milled and moved to the wholesale warehouses direct from the mill. Large producers who do not own a mill sell their crop direct to private or government mills, where it is dried and stored for milling at a later date. Many so-called large producers are, in fact, merely large suppliers. White landowners often make verbal contracts with neighboring campesinos for any surplus the latter may have. In this manner the landowner is able to accumulate a storeroom of rice by securing a few pounds from each of a number of roza farmers. Eventually the grain is sold to a mill operator at a handsome profit.

Very little of the commercial production is by means of irrigation, though yields are considerably higher where this is practiced. Impermeable soils in the savanna would seem to favor irrigation. Poor soil drainage, coupled with accessibility to the National Highway, influences many producers to raise upland rice on the savanna during the wet months. Although the alluvial lands produce higher yields, the cost of getting to many of the bottomland areas no doubt prevents or discourages their use. Also, drainage becomes more of a problem than irrigation during part of the year. Even the large rice producers are not equipped to handle a flooding river.

Maize (Zea mays).--Maize (maíz) is the second most important subsistence crop in Panama, and before the
introduction of rice was the leading subsistence food. Slightly more than 50 per cent of all maize grown in the Republic is raised in the central savanna, but little of this reaches the market. The large majority of the campesinos raise only enough for the needs of the family. Some is used for chicken feed, hog feed, and seed. About 65 per cent of the farms produce a second crop. Planting and harvesting dates for both maize crops coincide with those for rice. Yields are extremely low for native varieties, averaging 20.4 quintals per hectare (about 800 pounds, or 8.75 bushels, per acre). Not only are maize yields lower than those of rice but storage is also more difficult. The decline in maize acreage might be halted with the introduction of high-yielding varieties such as Tiquisate. Originally developed in Guatemala by Iowa State University, this variety produces approximately 75 per cent more pounds per hectare than the best criollo maize.

High-yielding, non-irrigated varieties are still to be accepted in most rural areas where native types and planting methods are much the same as they were before the Conquest. It is impossible to say how many native varieties are now cultivated in western Panama. A short period of field work in central Veraguas Province netted more than a dozen different types. Dent and pop corns are not native to Panama and have not been introduced to any significant degree. These two types are apparently of Meso-American
origin. South American flint corns have been identified with the first agricultural peoples known to the savanna; it may be assumed that maize diffused to Panama from the south. Modern criollo varieties do not appear to be ancient and none resemble those grown in northern Central America and Mexico.

Maize is harvested in the same cooperative manner as rice and stored, on the cob, in the jorón. Fresh corn is eaten only at harvest time when tender green corn dishes are served. For the remainder of the year the various dishes are made from dried corn in storage. Especially important are chicha (corn beer), tortillas (or changas), and tamales (or bollos). The manufacture of chicha is aboriginal to central Panama and probably came to the savanna with maize. The drink consists basically of ground kernels boiled in water and set aside to ferment. Frequently the women chew a few of the grains, which are added to the mixture to speed fermentation. Sometimes the grains are soaked in water until they begin to sprout, before grinding. Chicha is ready to drink on the second day, reaches full maturity on the fifth, and turns to vinegar in a week or more. It is a bitter drink and mildly intoxicating, but if flavored with molasses (as is usually the custom) it is quite palatable. This Indian drink is the principal refreshment at all campesino fiestas. It takes precedence over the preferred, but more expensive, guarapo. Guarapo,
a fermented cane-juice intoxicant, and seco, a low-grade, cheap rum, are discussed later.

Changas, or tortillas, are prepared in the traditional Indian fashion of grinding partially cooked maize into a paste. White- and yellow-grain maize varieties are chosen for changas. Apparently it is only an esthetic notion that does not permit the purple-grain varieties to be used for this purpose. The changas are baked on clay griddles and eaten three times a day by many campesino families. Often a typical breakfast in the savanna consists of a changa, café con leche, and a little rice left from the night before. A small changa, half-moon in shape and with ruffled edges, is called a quimba. It is generally associated with young lovers and a special little ceremony goes with the serving of the quimba. Quimbas are only served by romantically inclined girls to lovers or prospective lovers. Suggestive verses are usually a part of the ceremony.

Bollos, also pre-Spanish, are similar to the Mexican tamal. Meats, peppers (and today cheese), are wrapped in corn dough, wrapped again with a banana or bijao (Calathea sp.) leaf, and boiled. Of all the native corn dishes this one is most appealing to North Americans. Panamanians along the National Highway have created a thriving business selling bollos to passing gringos. A bollo may be kept for weeks, and during Indian times they were carried on all long journeys.
Beans (Fabaceae).—Legumes were cultivated in Panama during aboriginal times for their edible seeds. The domesticated plants include *Phaseolus vulgaris* (common bean, *frijol*; kidney, navy, string or snap bean) and *P. lunatus* (lima bean, *haba*, *quimbolite*). Beans, especially *frijoles*, continue to serve as a staple in the campesino's diet. It is the red kidney beans that are mixed with rice and meat to form the porridge-like *guacho*, a favorite evening meal. Almost all beans grown in central Panama are for home consumption, and they are not cultivated as widely as rice or maize. Intercropping of beans and rice, and beans and maize, is a characteristic of *roza* agriculture. Beans will be planted in one hole, rice or corn in the next. Beans are never planted in the same hole with either grain. The savanna accounts for less than 15 percent of the total production in the Republic, and in recent years the country imported more beans than the central provinces produced.

An introduced plant, common in certain areas but especially among the strongly Negroid peoples of the coastal savanna, is *guandí*, or the common pigeon pea (*Cajanus bicolor* or *C. cajan*). This bush has spread to the more-Spanish elements who call it *frijol de palo*. The seeds are edible and part or all of the plant may be fed to cattle. Among the Negro West Indians of the Canal Zone and Atlantic coastal regions the pea is known as the *goonga* pea.
(Congo pea?). It seems to be most closely associated with the Negro, who probably first brought the plant to the Isthmus from Africa in the sixteenth century. Almost exclusively utilized by the Negroes is the common black-eyed pea (Dolichos spaerospermus). Another Negro introduction, the cowpea (Vigna unguiculata or V. sinensis), sometimes erroneously called the black-eyed pea, has gained acceptance among the mestizos.

Yuca (Manihot palmata).—Yuca, or sweet manioc, was the most important root crop grown in central Panama before the Conquest. It continues in this capacity despite the introduction of other tubers (Fig. 76). The savanna produced approximately 30 per cent of Panama's yuca in 1950. Yuca, a native to tropical America, was encountered by the Spaniards throughout the West Indies, Middle America, and northern South America in the late fifteenth and early sixteenth centuries. From the Arawaks the Spaniards obtained the name yuca. Of the two well-recognized species, M. palmata var. Aipú (sweet) and M. utilissima (bitter), only the former has ever been cultivated in Panama. Oviedo noted the absence of the poisonous tuber in Panama; apparently it never diffused north of southern Colombia. However, M. utilissima was found throughout the West Indies before 1500, where bread made from it was called kasabi (cazabe, cassava) by the Arawak. In South America the Tupí-Guarani peoples knew the poisonous root as mandioca (manioc).
There is no evidence that yuca was ever cultivated in artificial mounds in the savanna as in the Islands. The roza farmer today plants yuca by cutting the stem (trunk) into pieces about six inches long. A hole is made in the ground with a coa or chuzo and the cutting is inserted, leaving about two inches sticking out. There is always a semblance of rows since the campesino plants more or less in a line. Rarely, a shallow trench will be opened and the cuttings laid end to end. These are completely covered. Yuca is used in soups (potajes) and stews.
(sancochog), or it may be fried, boiled, or roasted like potatoes. Cassava bread, made from poisonous manioc, is unknown to Panama.

More often than not, yuca is confused in the literature with yucca, a wholly unrelated plant. Yucca, a member of the family Liliaceae, is locally known in central Panama as palmito. It is abundant in Mexico and southwestern United States where it is called "Spanish-dagger" and "Spanish-bayonet," and even erroneously "cactus." The tender flowers of the plant are cooked and eaten in Panama, usually fried with eggs. Yuca (manioc) belongs to the family Euphorbiaceae and there should be no reason to confuse the two.

Yams (Dioscoreaceae sp.).--The yam (ñame, yampá) is an African root that was introduced into America by Negro slaves during the early sixteenth century. Oviedo describes the introduction into the West Indies and most botanists agree that it is not pre-Hispanic in the New World. D. trifida is the common subsistence yam of central Panama, although D. alata and D. cayenensis are also occasionally grown. There are a few species of Dioscorea native to Panama, but they do not have edible roots. Sauer believes that D. trifida may be native to the American tropics, but there is little or no evidence to support the claim. It goes against historic as well as botanic findings. The savanna produced about 4% per cent
of the total yam production of the Republic in 1950, and most small farms grow the root in the roza. It ranks second to yuca as a root crop in central Panama and serves virtually the same dietary function.

Other tubers, including peanuts.—In addition to the native yuca and the introduced yam the campesino raises otoés (Xanthosoma violaceum), sweet potatoes (Ipomoea batatas, locally called camotes), and peanuts (Arachis hypogaea, or maní). Oto, the most important subsistence plant of the three, was described by Oviedo as native to the West Indies, where it was called yahutia. Oto is known as yautía today in the Islands, a modification of the original Arawak word, while West Indian Negroes in Panama usually refer to the tuber as badú. The great variety of local names applied to the root in Central America and the Antilles suggests that it was widely cultivated before the Conquest. In its general appearance oto is like the taro, or dasheen (Colocasia antiquorum) of the Pacific islands. The large root is good to eat when thoroughly cooked, as well as the leaves which are prepared like greens. Cooking is essential because the raw roots and leaves contain minute crystals that will irritate the mouth and throat. This poisonous quality is also true of taro, which likewise must be cooked to become edible.

Sweet potatoes, while not a staple like oto and the major tubers, have more market value and are grown for this
purpose, with domestic uses negligible. It is unlikely that the sweet potato was aboriginal in Panama, but probably came in with the Spaniards from Hispaniola before 1520. The Arawak name, batata, has not survived in Panama, being replaced by the Nahuatl camote. The latter name is now more or less standard throughout Central America.

The peanut, although a leguminous rather than a tuberous plant, is commonly associated with that class of plants propagated by means of shoots and developing under-ground. Like the sweet potato and bitter manioc, it was well-distributed throughout the Indies before the arrival of the Spaniards but was not cultivated in Panama. Although the Arawak name, manî, is accepted in Panama today there is no evidence that the plant was ever successfully introduced from the West Indies during the colonial period.

Peanuts grow well in the dry savanna and today there is a demand for them as a source of vegetable oil. A Panamanian oil company is now prepared to spend up to $2,000,000 a year for this purpose. Gradually the peanut is becoming a significant cash crop in some savanna sections, especially in the vicinity of Chamé and Capira. This recent trend toward a cash crop for the subsistence farmer has been inspired by the government and the oil company. The reluctance of the campesino to add the legume to his crop inventory is an indication that it is not familiar to him. However, as soon as the roza farmer learns that he need not
stop raising his traditional subsistence crops in order to have a readily marketable commodity, the peanut becomes more attractive. After seed crops are harvested in August the peanut may be planted on the same plot. Harvesting occurs during the dry season. Discarded vines may be used for feeding cattle, or, if buried, will improve the soil because of their nitrogen-fixing ability. A two-crop legume planting, beans for subsistence and peanuts for cash, seems like the first real break with tradition in the agriculture of the central savanna.

Subsistence Huerta Crops

Subsistence plants, raised in dooryard gardens of permanently established farmers, possess certain qualities that distinguish them from roza crops. Most of the huerta plants are perennials and may be left in the garden until needed. They require either closer attention or relatively longer periods of time to fruit than do the roza annuals. Careful supervision by the campesina, coupled with unintentional fertilization by humans and animals, usually produces high yields. A large, well-established huerta is the mark of central Panama's closest equivalent to an upper-middle-class farmer.

Sugar Cane (*Saccharum officinarum*).—It cannot be said with certainty when sugar cane first came to Panama. The cane entered after 1514 and before 1533. Sugar cane, or *caña rayada*, has become the single most important commercial
field crop in the savanna. Nevertheless, it remains a basic item for the farmer who produces only enough cane for domestic needs. Yields (subsistence and commercial production averaged) are considered low by agricultural experts in Panama, but they compare favorably with the commercial averages for Louisiana.

Cane production in central Panama is closely related to the rainfall regime. Panamanian cane requires abundant moisture during the first few weeks of growth. For this reason it is planted in late May, after the rains have become dependable. Low amounts of moisture are desired during the months of December, January, and February, when maturity is approached and the juices begin to concentrate. If the rainy season extends into January the growth of the cane is prolonged and tonnage per hectare increases while sugar per hectare decreases. The cane-growing areas of the savanna more nearly fit the climatic requirements for high quality sugar cane than any other portion of the Republic.

The interianos plant cane close to the dwelling for two principal reasons. (1) Cane must be processed and it is not feasible to maintain the necessary equipment at the temporary roza. (2) Any commercial by-products are usually easier to handle from the house than from the roza. The former is most often nearer the transport routes than the latter. Many farmers possess a sugar-cane press, or trapiche, which is operated by horse and may have either an
iron or wooden cylinder. This machine was introduced by
the Spaniards during the colonial era, and possibly has
its origin in India, whence it diffused with sugar cane to
the west.

Molasses (miel) is a principal by-product of
subsistence sugar production. The juice (zurimba) obtained
by grinding in the trapiche (sometimes called rompepecho)
may be boiled down into a syrup (molasses), or coarse,
brown sugar (raspadura). The clay kettles (ollas), as well
as the ovens (hornillos), both necessary to the process of
making syrup and sugar, are manufactured by the family.
Nevertheless, metal pots (pailas) are often used today.
Fresh zurimba is frequently drunk, though most rural folk
prefer to ferment it, producing an intoxicant called guarapo.
These drinks seldom reach the market, for it is important
to the family that enough remain on hand for friends, juntas,
and other social occasions. Molasses, on the other hand, is
usually produced in great enough quantity for about half to
be sold.⁵⁸ Some of it reaches Panama City and Colón, though
most is consumed in the local area. Panela (brown sugar
cake) is made from the unrefined sugar and is seldom marketed
in the Herrera-Los Santos communities. Where cane production
is abundant in Coclé, Panamá, and Veraguas, a large percentage
of the sweets is sold.⁵⁹ The Antón region of Coclé sends
panela to the Panama City market in quantity, and Penonomé
and Santiago are important secondary producing areas.
Commercial sugar cane production.—Other than rice, sugar cane is the only important commercial field crop in the central savanna. Sugar cane was a purely domestic activity until the first decade of the present century. Nevertheless, a little production had begun as early as the 1850's in the vicinity of Chepo and Arraiján. The first sugar mill was not established in the country until 1910, when Delvalle Henríquez began a small operation in Aguadulce. After more than 400 years of cane production, Panama has become self-sufficient and now exports a small amount. Production is centered in the central savanna, especially in Coclé Province. Here there are two sugar mills that manufacture all of the refined sugar in the Republic (Fig. 77). Black strap molasses and alcohol are by-products of the sugar refined in Coclé. The two mills own large fields, mostly irrigated, and produce 30 to 40 per cent of all cane ground. The remaining 60 to 70 per cent is purchased from small producers for about $6.25 per ton flat rate. This system of buying makes no allowance for differences in quality.

Between 2,000 and 2,500 farmers sell cane to the mills every year, but only a few contribute a significant amount. Most of the labor is by hand, the machete remaining the principal harvesting tool. In the bottomlands, where most of the non-irrigated cane is produced, the crop must be collected before the rains come. By mid-April the fields turn
Fig. 77.—Aerial view of irrigated sugar cane fields of the Santa Rosa Sugar Company, near Aguadulce, Cocle. The original scattered-tree savanna has been removed. March 17, 1956.

into lakes and the cane is lost. Although the companies furnish trucks to haul the cut cane many of the producing areas are so inaccessible that ox carts are found to be more practical. At one time a narrow-gauge cane railroad ran from one of the mills to the fields along the lower Río Santa María. Today this railroad lies abandoned.

Gourds and squashes (Cucurbitaceae).—There are eighteen genera in this large family, most of which may be successfully cultivated in central Panama. However, only four genera are major subsistence plants in the region, all of them dating from pre-Hispanic times. The chayote (Sechium edule) is a remarkable plant in that all parts of
it may be eaten. The flowers and young branches are cooked like greens, and the fruits (which are about the size of large pears) are usually boiled, though they may be baked. The tuberous roots are prepared and eaten like sweet potatoes, to which they bear a striking resemblance. Chayote is a vine that is commonly grown on trellises or poles and seemingly does well in the hot, low lands of Panama. In northern Central America the plant is known as huisquil or güisquil; chocho in Jamaica; and the roots are alternately called chinta, chintla, or raíz. The name chayote is Nahuatl and there is a possibility that it diffused to Panama from Meso-America shortly before the coming of the Spaniards. It grows well in Louisiana, where it is called the malecon or vegetable pear, and may have come from Mexico at an early date. Chayote is not found in the wild state in central Panama.

There are two varieties of native "squash" (Cucurbita moschata), both known locally as sapuyo, sapayo, or calabazo (calabash). North of Panama the Nahuatl ayote is generally applied to the species. The white, short-necked variety is most frequently known as sapayo. The long-necked, white-and-orange (sometimes sprinkled with green) type is called pura oro. The North American summer squashes and pumpkins (both varieties of C. pepo) are not grown by the campesinos. The African watermelon (Citrullus vulgaris), or sandía, is raised by most small farmers for home
consumption. It appears to have been introduced by the slave trade early in the colonial period, along with several other African plants. The bottle-shaped calabash gourd (*Lagenaria leucantha*) is one plant that is common to both the Old and New World. It probably originated in the Old World, crossing the Atlantic Ocean by waves and currents at an ancient date. It is used to fashion water jugs, dippers, bowls, and a variety of containers. *L. leucantha* is not related to the similar calabash *Crescentia cujete*, though the latter is known by the same name (*calabazo*) and has many of the same uses.

**Miscellaneous native huerta food crops.**—Of an almost infinite variety of huerta food plants, several of the more important are deserving of attention. The peppers (*Capsicum* sp.) are aboriginal to Panama, but only one species, *C. annuum*, is cultivated. Belonging to this species are the common red peppers, known locally as *chile* (from the Nahuatl) and *ají* (from the Arawak). *C. frutescens* occurs wild in the jungles of Panama and cayenne pepper is regarded as a garden variety of the species. *C. annuum* is widely grown in the *huertas* of central Panama as an herbaceous annual, and is the principal condiment in the area.67

The *interiano* usually raises a small amount of tobacco (*Nicotiana* sp.) for home consumption. Wild tobacco (*N. rustica*?) is still collected along the Atlantic coast by Cuna Indians. The use of tobacco among all Panamanian
Indians, coupled with medicinal fumigation in some sections of the savanna, strongly suggests that the weed is pre-Hispanic to the Isthmus. It is clearly aboriginal to the West Indies.

Tomatoes (*Lycopersicium esculentum*), though domesticated in Panama before the Conquest, are enjoying a revived popularity. They may be readily marketed as a cash crop to a tomato sauce plant, recently established at Natá. Some of the *tomate* production remains at home, forming a part of the subsistence diet. Wild tomatoes, called *tomatillos*, with a fruit about the size of a cherry, may still be found in Panama, attesting to the antiquity of this plant. They are, however, usually associated with old fields and no detailed studies of the varieties have been made. Wild cherry-tomatoes will be selected for their size and brought to the *huerta*, where larger garden varieties develop.

Tomato cultivation in the savanna never even closely approximated that of northern Middle America during pre-Conquest days. Possibly the plant diffused to the south at a relatively late date.

A native parsley (*Eryngium foetidum*), known as culantro in the savanna, is used for flavoring soups and as a treatment for worms and "fits." Amaranth (*Amaranthus dubius* or *A. cruentus*) is much used for greens, but there is no evidence that amaranth seeds have ever been used. All species are called *bledo* by the Spanish-speaking Panamanians,
and calalú by the English-speaking Negroes. The latter name is most probably West Indian in origin and is used almost exclusively by Negroes in and around the Canal Zone and along the Atlantic coast. The plant is the quelite of Mexico and Guatemala and seems to have diffused south from there. English-speaking whites commonly refer to all species as simply amaranth or blood amaranth. Some arrowroot (Maranta arundinacea), or ságí, is cultivated in the huertas as a tuberous root. A few of the roots found in the rozas, such as the African yam and the native yuca and òtò, are also grown in the huertas.

Miscellaneous native huerta non-food plants.—The important medicinal plant Cephaelis ipecacuanha (ipeca, ipecac) is grown in every Panamanian huerta. It is especially significant because ipecac is considered the best expectorant and emetic obtainable. It is also used as a specific for amoebic dysentery and has enjoyed popularity on the world market. Previously mentioned as a treatment for worms and "fits" was Eryngium foetidum (culantro). Other plants gathered for medicinal purposes are discussed in the section on Gathering, below.

Three of the five major dye-yielding plants of pre-Hispanic Panama are grown in most savanna huertas. Achiote (Bixa orellana), known in central Panama as achote, grows wild as a shrub or tree, seven- to thirty-feet high, but is an important domesticate. Reddish-orange dye comes from the
thin skin covering the seeds, and is especially important for coloring foods. Often it is used to relieve (or prevent) bites from gnats, mosquitos, and other pests. The aborigines employed the dyes for coloring textiles, ceramics, and implements, and particularly for painting the body. It is still used among the campesinos as a body paint; certain color combinations painted over an area of internal pain (on the forehead in case of a headache) are supposed to bring relief.

At least four species of Indigofera yield a blue dye, but I. suffruticosa is the common añil, grown throughout the Republic. Blue is perhaps the most important color in the savanna today, and is associated especially with religion and magic. This is not difficult to understand; blue was a ceremonial Indian color, and the Spaniards acquired a liking of the color from the Moors. Houses are frequently trimmed with blue, and blue crosses are painted on buildings, fences, and rocks to ward off evil spirits. Blue is also a "lucky" color. Local legend has it that if blue lights are seen floating in the air at night gold will be found directly beneath them.

Black dye may be obtained by extracting the juice of the unripe fruit of Genipa americana (jagua), which become black when exposed to air. Additional pigments come from wild plants, such as certain species of Inga, which yield a black color. Light yellow pigments come from Chlorophoro
\textit{tinctoria} (mora, fustic), another forest species. \textit{Rhizophora mangle} (red mangrove) gives a red dye from young shoots, and olive, brown, or gray colors from the bark. Other plants were undoubtedly employed by the savanna Indians, for early descriptions report that they used a multitude of colors. They painted their bodies and decorated their belongings, and probably colored some foods.

\textbf{Introduced Huerta Crops}

Although a number of garden plants have been introduced into Panama from Europe and Africa, few enjoyed widespread popularity among the Hispanic peoples of central Panama. Notable among the popular huerta plants is the onion (\textit{Allium cepa}), raised by most campesinos for family consumption. Onions are used quite freely, almost daily, especially with meat dishes. This common bulb entered Panama with colonial Spaniards, as did cabbage (\textit{Brassica oleracea}), or \textit{col}. Whereas cabbage enjoys some popularity, lettuce (\textit{Lactuca sativa}), or \textit{lechuga}, is rarely seen in the savanna huertas. The \textit{interiano} does not eat raw vegetables as a rule, but finds cabbage adaptable to his \textit{sancochos}. Other Spanish introductions, such as celery (\textit{Apium graveolens}, \textit{apio}), carrots (\textit{Daucus carota}, \textit{zanhoria}), turnips (\textit{Brassica rapa} or \textit{B. napobrassica}, \textit{nabo}), and beets (\textit{Beta vulgaris}, \textit{remolacha}) are not subsistence crops in the savanna.
The okra (*Hibiscus esculentus*), known in Panama as ñajú, is a Negro subsistence vegetable, rarely, if ever, eaten in the central provinces. It is rather common in the Negro centers near the Canal Zone but, for one reason or another, is not important to Negroid peoples of the interior. Okra is probably a recent introduction to Panama, coming from the West Indies during the nineteenth century. Eggplant (*Solanum melongera*) is another African import that is not generally grown by the campesinos. Even so, it enjoys commercial popularity in the Canal Zone and is important to the West Indian Negroes. Known as berenjena in Spanish-speaking areas, there are several farms in Los Santos and Herrera that raise the plant for the Panama City-Canal Zone market. Its subsistence distribution follows that of okra.

Native Tree Crops Associated with the Huerta

Discussed in this section are tree crops that have been cultivated in the hearth since pre-Hispanic times. Included is the pineapple which, though not a tree, is more properly associated with the perennial fruits and nuts than with the vegetables. One cultivated herb (the plantain) may or may not be aboriginal to Panama and is described under the section dealing with introduced trees, below.

As has already been pointed out, the establishment of trees is a time-consuming process. It is not feasible to cultivate valuable trees in a _roza_ that is to be burned and
planted once or twice and then abandoned. Most fruit and nut trees found in old rozas were accidentally established by men and animals. But when such trees are found producing in old rozas they are usually protected. The trees are seldom planted in solid stands, but rather scattered about the huerta. Vegetables and other plants normally grow in patches between the trees.

Coconuts (Cocos nucifera).—The coconut (cocoteró) was a cultivated palm along the Pacific shore of Panama in aboriginal times, especially in the vicinity of Chimán (eastern Panamá Province) and around the Gulf of Montijo. The latter area produces over 30 per cent of the Republic’s total today, while the savanna accounts for more than 50 per cent of the national coconut production. It may be inferred from Oviedo’s writings that the palm was widespread along the Pacific coast of Central America before 1525. He describes vast groves of coconuts in Panama, Costa Rica, Nicaragua, and the Cocos Islands, and he was one of the first Spaniards to visit these areas.

The meat of the nut (coco) is rarely eaten in central Panama or used as a fat for frying, although it is employed in the manufacture of domestic sweets. The green nuts (pipas) are preferred for their liquid and are frequently taken to the fields where they will provide the campesino with a cool drink during the heat of the day. Although the coconut palm has dozens of practical uses in many parts of
the world, its subsistence value in Panama is chiefly for the liquid. A growing demand for copra, though, might alter this. Transportation facilities from the producing areas of Veraguas to the markets are so poor that today Philippine coconuts are able to undersell the domestic nut in Panama City. Few subsistence coconuts will be diverted to a market of this nature.

Pejibaye (Guilielma utilis).—The pejibaye, a palm with hard, dark wood and a spiny trunk, was the only palm other than the coconut to be domesticated in pre-Columbian Panama. It is still esteemed for its excellent wood and fruit. The hard wood is used for bows and arrows among Panamanian Indians today. The fruit may be boiled to taste like sweet potatoes or roasted to taste like chesnuts. Although still planted in the savanna as a staple subsistence food it is especially important in the mountains. There is, in Panama at least, a direct relationship between the pejibaye and the Guaymí. Cultivation is heaviest where the numbers of Guaymí traits are greatest. It has been suggested that Guaymí culture is associated with two important subsistence plants—pejibaye and yuca.

In general, the palm has lost its ability to produce fertile seeds and is reproduced by planting sprout cuttings. The tree bears fruit in September and the season continues for about ten weeks, during the height of the rainy season. At that time Panama City is flooded with pejibaye
nuts from the interior. They are sold on every street corner by vendors with large trays. There is a more or less dependable market for the nuts. Many campesinos near the National Highway sell them to passing truck drivers, who in turn resell them in Panama City. Panamanians make no use of the nuts other than eating them as mentioned above; they make no special dishes or intoxicating drinks as in some other tropical countries. Pejibaye is unknown in Panama in the wild state and probably does not occur wild anywhere in tropical America. The name "pejibaye" is generally unfamiliar to Panamanians. Most savanna inhabitants call it pixvae, while the West Indians prefer piva. There is a variety of other spellings, including: pixabay, pixbae, pexibae, pisba, and pifa.

Avocado (Persea americana).—Oviedo wrote of the avocado (aguacate) as a tree that grew wild throughout the Isthmus. The Indians recognized the avocado during the early stages of growth and protected it, sometimes planting it near their villages. The "alligator pear" (or perales of Oviedo) continues to be an important savanna subsistence food. Although still collected from wild trees by some people, avocados are usually domesticated and form part of the huerta complex. Central Panama produces 47 percent of the Republic's total avocado crop, mostly for home use. Fruits are ready for harvest in April and are generally available through July.
Papaya (Carica papaya).—This fruit, usually called pawpaw outside the Spanish-speaking countries, is another subsistence fruit of some significance. The tree occurs wild in Panama but the fruit is not so large or tasty as the domesticated varieties. The juicy, light-orange fruit (resembling a cantaloupe in color and taste) is one of the finest of tropical fruits.

Cacao (Theobroma cacao).—There is some question as to the pre-Columbian southern limits of cacao. Some students believe that the Nicoya Peninsula (Costa Rica) marked the equatorward boundary. Such reasoning is based on the early descriptions of Oviedo, and more especially on his failure to mention cacao in the vicinity of Antigua. Meso-Americans were unquestionably the only people to use cacao on a large scale for the preparation of a beverage before the Conquest. Campesinos today do not cultivate cacao for chocolate, but often market a few pounds of the pods which eventually reach a foreign chocolate manufacturer.

For this reason the tree is commonly seen in the huerta.

Intimately associated with cacao is the madre de cacao (Gliricidia sepium), or mother-of-cacao. Not only does the tree serve as a shade tree for cacao, but also shades coffee and is frequently planted for hedges. The favorable effect of G. sepium upon the growth of cacao results from the beneficial nitrogen-fixing bacteria which form nodules upon the roots, as with many leguminous plants.
The hard wood, which has many uses, is reddish-brown, takes a good polish, is close-grained, tough, and very durable. Leaves and seeds are often used for poisoning rats, mice, and other savanna rodents, hence a colloquial name, mata-ratón. The pink flowers are sometimes fried and eaten, the campesinos claiming that they possess a pleasant flavor. Leaves are applied as poultices to relieve sores, cuts, and bruises. The tree, like cacao, diffused to Panama from the north, probably before the arrival of the Spaniards.

Pineapple (Ananas sativus).—From its home on the tableland of Minas Gerais the pineapple (piña) diffused north at an early date. The specific name is from the island Arawak, anáná, still the common French, German, and Portuguese word for pineapple. Piña was cultivated in the savanna before the Conquest and is well suited to the Aw climate of the Pacific coast. A close cousin of the cultivated pineapple, locally known as piro (Bromelia karatus), grows wild in Panama. The yellow or red fruit is similar to the domestic pineapple in taste and may be eaten raw or cooked, or made into a beverage that resembles lemonade. The very young, tender sprouts in the center of the piro may be cooked as greens. Other names for the wild pineapple include, piñuela, piña de cerco, and motate. Throughout tropical America the piro grows in association with the domesticated pineapple.
Miscellaneous fruits and nuts.—The genus *Annona* is represented by four important species, all relished as a fresh fruit and occasionally converted into various drinks. The group includes: (1) *A. muricata* (guanábana, soursop); (2) *A. reticulata* (mamón, custard-apple); (3) *A. squamosa* (sweetsop); and (4) *A. cherimola* (chirimoya).

The Sapodilla family numbers six genera in Panama, the most important being *Chrysophyllum cainito* (caimito, star-apple) and *Achras zapota* (níspero, sapodilla). *A. zapota*, and several other species are a major source of chicle. It is sometimes erroneously called sapote (zapote). This is confusing, as there are two other sapotes in the savanna, none of which is related to the other. The true sapote (or zapote) is *Calocarpum mammosum*, usually known locally as zapote de tierra, which distinguishes it from zapote de Cartagena (*Mammea americana*). The latter fruit is called mamey by most English-speaking people, a name often used in some Spanish-speaking countries.

Two other important cultivated fruits, also confused in the literature, are basic to the campesinos. *Inga gracilipes* (ice-cream bean), called guava in Panama, is one of the most conspicuous trees of the family Mimosa in Panama. The heavy pods, which contain a sweet, pulpy pith, are quite distinct from the fruit known in English as "guava." The latter, a word derived from the Arawak,
is *Psidium guajava*, familiar to North Americans in jellies and paste. The fruit is called *guayaba* in most areas of Spanish speech, while the tree is *guayabo*. *P. guajava* is relished by some stock animals and became widespread in tropical America after the introduction of cattle and swine.

*Anacardium occidentale* (*marañón*, cashew nut) grows wild in the savanna, though it has been cultivated for centuries in the *huertas*. The popular nuts are roasted and eaten, but the nut is irritating to the skin on touch and great care must be exercised when roasting. The smoke will harm the eyes and permanent blindness may result. Fish poisons made from the cashew have been reported from some areas of the American tropics, though there is no evidence that this is practiced in Panama today.

One of the most drought-resistant plants is *Spondias mombin* (*jobo* or *ciruela*). *S. lutea* is quite similar, yielding a pleasant fruit that is known by the same local names. The *jobo* is well adapted to the long dry season of the savanna and will thrive and produce where other trees shed their leaves and wilt.

**Introduced Tree Crops Associated with the Huerta**

Several trees, and at least one herb, introduced by the colonial Spaniards have been fully accepted by the inhabitants of the hearth and have become basic subsistence items. Five major introductions are grown in the *huertas* of central Panama. All of them have become important
commercial commodities in certain localized areas within
the Republic, though not in all cases within the savanna.

Plantains (Musa paradisiaca) and bananas (Musa
sapientum).—The plantain (plátano) and the banana (guineo
or banano) are not trees, but herbs. However, they are
treated at this point because of their popular association
with the cultivated trees. These two herbs furnish fruits
that are important in the native subsistence diet, although
millions of bunches of bananas are produced commercially in
parts of Panama. Despite the fact that western Chiriquí
Province is the primary banana-producing area, the central
savanna accounts for 20 per cent of the national total.
Nonetheless, less than 10 per cent of this total is
marketed, with over 90 per cent remaining at home. The
same is true for the plantain, 27 per cent of which comes
from central Panama, yet only about 10 per cent is sold.

Both of the popular species of Musa have been
subsistence mainstays for centuries. Whereas there seems to
be little doubt that the banana was introduced to America
in 1516, the plantain is not so simple to understand. The
plantain remains a most important crop among the Guaymí,
Cuna and Chocó Indians today. It is raised in areas where
the banana is virtually insignificant and appears to be
intimately associated with Indian economy, not Spanish.
I suspect, as does Sauer, that the plantain is pre-Columbian
in Panama and other parts of tropical America.
Throughout Panama the banana is eaten as a raw, fresh fruit, while the plantain is customarily fried or baked. A favorite dish, called goyora, is fried, green plantain served with raspadura (unrefined, coarse brown sugar). Leaves from both the banana and plantain are used for wrapping various foods, such as bollo, and bienmesabe (a sweet made from milk and sugar).

Mango (Mangifera indica).—The mango, an Asiatic fruit tree brought to the Isthmus by the Spaniards, has become so widespread that it now has the appearance of a wild plant. Every huerta contains one or more of these fine fruit trees. Mangos are in season from February to April and comprise one of the main dry-season crops. About 50,000 mangos are marketed each year out of an estimated production of 75,000,000 fruit, revealing the subsistence nature of the tree. The wild (escaped) trees in Panama bear a poor quality fruit, but the domesticated varieties yield either a green or red-tinged fruit that is sweet and juicy and may be eaten raw or cooked.

An interesting cultural relationship may be observed in the association of mango trees and transport routes. The trans-Isthmian Camino Real, as well as the Cruces Trail, may be located today simply by following the mango trees that grow to either side of the old roads. Apparently the fruit has long been a favorite of travelers and construction workers. Mangos line the modern Panama National Highway and
the Boyd-Roosevelt (Trans-Isthmian) Highway.

*Citrus* (*Citrus sp.*)—Though not a native to the New World, citrus was introduced to Panama during the early days at Santa María de la Antigua del Darién, between 1514 and 1524. It has become a notable domestic crop in the savanna, and near Capira and Campana it has become an important commercial crop as well. The sweet orange (*C. sinensis*), or common *naranja del país*, is the chief species cultivated in the savanna, and accounts for 35 percent of oranges grown in Panama. Oranges are available year-round, but the main season for the savanna orange is from January to April. Other species of citrus are of lesser importance, and among them only *C. aurantifolia* (lime) may be ranked as a subsistence crop. The lime in Panama is known as *limón*, the Spanish word *lima* not being used for any species of citrus. Minor trees, grown here and there by a few farmers, include: *C. limonia* (lemon), called *limón real*; *C. limetta* (sweet lime), or *limón dulce*; *C. aurantium* (sour orange), known as either *naranja ácida* or *naranja ágria*; *C. grandis* (grapefruit), or *toronja*, which is not liked by the campesinos because it is too sour; and *C. medica* (citron), locally known as *toronja* or *cidra*. This last fruit resembles the grapefruit and, though not eaten in Panama, the rind is frequently used in making candies. In Chiriquí Province commercial orange production has steadily grown since the Washington Navel tree was
introduced in 1930. Only today are the growers near Panama City attempting to improve their orchards in a bid for the large Canal Zone citrus market. With proper packing and shipping facilities, orange and other citrus production in the savanna could become an important cash business.

Coffee (Coffea arabica).—Over 50 per cent of all coffee grown in Panama comes from the central savanna, where most of it is used at home. Panama is not self-sufficient in coffee production, for the campesino does not have enough surplus to market in the larger cities.

This Old World crop, known as café in all Spanish-speaking countries, grows in the shade of the Gliricidia sepium (madre de cacao) in the low, hot savanna. 91 Erythrina sp., or gallito, is sometimes used as a shade tree, as well as some species of Inga. Especially important is I. gracilipes (guava). Madre de cacao is perhaps the best shade tree of those mentioned. During the dry season the gallito will have many branches blown off by the strong northeasterly winds and coffee trees may be damaged.

Animal Husbandry

Livestock first entered the New World in 1496, during the second voyage of Columbus. In 1514 Governor Pedrarias brought twelve mares and one horse to Santa María de la Antigua del Darién. Espinosa and his company rode the
first horses into the central savanna in 1517. Horses and cattle were brought to Natá soon after its establishment in 1520. By the mid-sixteenth century stock raising had become a major activity. Documents of that era describe Panama as possessing the most abundant pasture land in the Indies, which, along with water, was communal. Large estates began to appear in the central provinces. They supplied meat to the Veraguas mining camps and horses and mules to trans-Isthmian pack trains (see chap. v). The savanna of western Coclé and eastern Veraguas was especially important as a producer for the mines. The heavily wooded and wetter mountains were not well suited to stock and virtually all provisions had to be carried in by mules. Herds of animals were early established on the savanna nearest the mines, such as the Sitio de Escoria (Naranjal). In many instances miners abandoned the mountains and settled in the savanna, augmenting the pastoral population already there. In a few years there was no market remaining in the highlands. The larger owners were compelled to drive their animals to a savanna port, or even overland, in order to get them to the Panama City market.

During the colonial period there was no attempt to improve breeds, control diseases, or fence properties. Animals were grazed on natural savanna grasses, such as Pharos latifolius (pega-pega), Arundinella deppeana (native foxtail), and Thrasya sp. Browse plants constituted a significant source of feed for stock, and continue to do so
to a lesser degree on natural pasturage. They also represent a major source of moisture, and appear to be nature's answer to the problem of parched dry-season grasses. A principal browse plant in central Panama is Prosopis juliflora. Many legumes and other plants participate in the feeding of stock roaming free on the savanna. However, it would require detailed botanical observation to differentiate them all from those which are rejected by the animals. 95

Despite heavy losses due to disease, poor transport facilities, and bad management, Panama was more or less self-sufficient in livestock during the sixteenth and seventeenth centuries, with an exportable surplus. Breeding bulls were sent to other countries of Central and South America, and animal products (skins, hides, and tallow) were exported. The latter went principally to the Cauca region of Colombia, Costa Rica, and Peru. Nevertheless, prosperous times alternated with periods of virtual disaster. Regardless of the depths reached during the periodic depressions, the livestock industry of central Panama proved its remarkable recuperative powers time and again. This suggests that the animal industry has a greater capacity for adaptation to the natural conditions of the savanna than any other agrarian activity. This is as true today as it was 400 years ago. Livestock appears to be the best answer to the question concerning what to do with great expanses of savanna grasslands unsuited to agriculture.
There was a serious livestock decline during the eighteenth and nineteenth centuries. Pirate incursions were followed by internal uprisings and general civil unrest. The small, white landowners of Azuero were struggling to break through the barrier of large estates erected by the landed aristocracy of Coclé and Veraguas. This was, in part, a cultural conflict. The people of the Azuero Peninsula, many of north Spanish origin, possessed a tradition of small land holdings or parvifundia. Opposed to this was the latifundia or large holdings of Coclé, which came to Panama from Andalucía and Extremadura. There was also a geographic conflict, since the aristocracy controlled all land and water routes to Panama City, the primary market. Furthermore, the political and economic fortunes of the colony were ruled by the latifundistas. During the eighteenth century, wars between families, especially between Guardias and Goytías, erupted in the savanna. The small landowners sided with the Goytías and the Guardias were defeated. Together with their allies, the Guardias were limited to Veraguas Province. Thus a route was opened through territory formerly occupied by the landed aristocracy and their latifundia. The Azuerians were aided in their struggle when the slaves were freed in the early 1800's. The small landowners had not been dependent on slave labor. On the other hand, their opponents found it impossible to maintain control over vast holdings without forced labor. As the old aristocracy declined during the eighteenth and nineteenth centuries small landowners began
moving into the savanna of Cocle.

The question of property rights was still simmering when the California gold rush began in the mid-nineteenth century. Increased traffic across the Isthmus created boom conditions for the local livestock men. This activity was followed by the railroad across Panama in 1855 and, later, the French attempt to build a canal. Thus the geography of Panama once again convinced men that the best overland route from Atlantic to Pacific lay over the narrow Isthmus. However, the distant stock producers in central Panama did not share a great deal of the new-found wealth. Profits went primarily to ranches convenient to the railroad and canal. Cattle prices were keyed to distance; the further away, the lower the price. The same pattern of price-distance relationship had existed in Panama since colonial days and is only today beginning to disappear. \(^9(1899-1902)\) As the competition in Panama increased, lower-priced Colombian animals were dumped on the market. The unrest created by such marketing practices was one of many things added to the pot of boiling political dissatisfaction in the Colombian province of Panama. The fight of the small landowners to break up large estates in the savanna continued, finally culminating in the Colombian "War of One Thousand Days" (1899-1902). The liberal campesino eventually wrested political control from the conservative aristocracy, but the price was high. Almost all livestock in central Panama was destroyed, as well as buildings, equipment, and human lives.
During the war cattle were sold at give-away prices, and even free use of pasture land was granted the purchaser. When the Republic was born (1903) the stock industry was at its lowest ebb in history. In a few years, between 1921 and 1931, Panama was again self-sufficient in cattle and actually exporting a surplus. At present the country does not produce enough cattle to supply a rapidly growing population with meat and milk. Nonetheless, large quantities are "exported" to the Canal Zone.

**Pastures**

The first important advance in savanna stock management since early colonial days came in the middle of the nineteenth century. During this period José de Obaldía introduced Pará grass (Panicum purpurascens and P. barbinode) to Panama from Brazil (also see chap. i). The Panicums are so numerous and widespread in Brazil and Africa that it remains a mystery as to the true home of the species, but Pará appears to have been well established in Brazil long before the arrival of Europeans. Guinea (India) grass (Panicum maximum) came to central Panama about the same time as Pará, being introduced from the United States. The latter country had earlier received Guinea grass from Brazil. The grass is recent in many parts of Brazil and seems to be an African introduction to that country. The third of the important savanna grazing grasses was introduced in 1914. Cesár A. Pardini brought faragua (Hyparrhenia rufa) from Brazil, where it is native.
Pará, Guinea, and faraguía comprise most of the artificial pasturage today in the savanna, although several other grasses are cultivated (see chap. 1). Natural pasturages are of little importance to the large landowners. Small farmers, though, with only two or three head, cannot afford artificial grasses and must be content to let their cattle roam, seeking whatever nourishment they can find. More than 60 per cent of the savanna farmers have no stock while 15 per cent have five head or less. Generally it is this 15 per cent that must utilize the natural grasses and browse plants of Panama. The quality of animals produced in such a manner leaves much to be desired. Some 17 per cent of all savanna farms are dedicated exclusively to livestock, and it is this group that has made the improvements during the past few decades.

Fencing.--Barbed wire fencing was introduced to the savanna in the mid 1800's, about the time Guinea and Pará grass entered. Used at first to separate lands and herds it has since become recognized as a means to improve grazings and grazing practice. Prior to the introduction of barbed wire little fencing was done, except to keep animals away from the dwellings and huertas. Most houses are still fenced and the traditional Spanish gate is frequently seen (Fig. 78). *Erythrina* sp. is occasionally planted as a poste vivo (Fig. 56). If planted close together and left untrimmed they will become intertwined and form excellent hedges. They
are never planted around pastures. Recently stockmen have acquired runway matting from abandoned United States airfields in the savanna and have used it for fencing. Wooden fences are rare in Panama, and electric fences are only now being considered by some of the larger dairymen. The small owner finds all types of fencing entirely outside his reach and he must be content to let his cattle roam at large.

In the central provinces the principal defects of animal husbandry include inadequate care of stock, insufficient hygiene, poor selection, imperfect breeding, and poor use of pasturage. Many of these faults are due to lack of
fencing. Panamanians generally regard fences as devices for keeping cattle away from the house, garden, and roza. They fail to realize that fencing is a primary necessity for the improvement of natural and artificial pastures.

The primary forage grasses.—The best pastures in the savanna are in Pará grass, which is generally cultivated in fertile, somewhat humid, lowlands. It can grow at higher altitudes (up to 3,000 feet) but always occupies its natural habitat along streams, marshy depressions, and localities subject to periodic inundation. In Panama the grass is seldom planted at higher elevations or in rough country because moisture conditions cannot be met. Planting of Pará is accomplished in two ways. It may be planted in cleared, unplowed land, or in deep furrows about three or four feet apart. The second method consists of throwing the grass itself into the trenches, to be covered later. The first technique is cheaper, but pastures planted in this manner need one or more weedings before the grass begins to thrive. Many months of cultivation are necessary before it is ready for stock. Planting in plowed lands is costly, but offers the advantages that once it is planted it does not need weeding. And, it is ready for stock three months after planting.

Guinea grass is well suited to higher elevations in central Panama, but also grows well in the lower and drier savanna. It may be easily propagated by seeds, which it
produces in abundance. This method is much less expensive than planting separate sprouts. However, if sprouts are planted the pasture will be ready much sooner than if seeded. Experienced stockmen never graze a Guinea pasture until the grass has produced and released its seed. This allows a new pasture to begin before the old one has been in use the first time. Such planning requires adequate fencing.

Faragua, or yaraguá del Brasil (Hyparrhenia rufa) was the last of the three primary forage grasses to be introduced to Panama. By far the most drought-resistant species among the introduced grasses, faragua will thrive in edaphically arid, hilly, "badland" savanna (Fig. 79). Pará and Guinea would usually fail under similar conditions. Faragua is more successful in competing with weeds and undesirable grasses than either of the two primary forage plants. It seems especially well adapted to marginal land that would otherwise be useless to stock. In the field it has also been observed that faragua is more resistant to overgrazing than Pará and Guinea, and survives annual burning much better. Although faragua pastures are not as nourishing as others, in its environment there is only one other forage grass that can successfully compete, namely Melinis minutiflora.

M. minutiflora (molasses grass) does well in the hilly, eroded areas of low soil fertility. Because it shares a common colloquial name with faragua in some
Spanish-speaking countries the two are often confused in the literature (see chap. 1). Though *M. minutiflora* is known as *calingeiro* in Panama, in some Spanish American countries it is called *varaguá*. Even so, it is entirely distinct from the true *varaguá*, or *faragua*. *M. minutiflora* has a lemon-like odor and secretes a sweet, viscous fluid that is sticky to the touch. To my knowledge, no other pasture grass in Panama has this characteristic. A small amount of molasses grass has entered Panama from Colombia and has become a volunteer. It invades abandoned fields, road cuts, and even established pastures. In
contrast to its great importance in Colombia, molasses grass has not been well accepted as yet in the central savanna. Some cattlemen claim that the peculiar odor is not agreeable to animals, and that they must be alternated with other forages. Nevertheless, the success of molasses grass in other tropical countries seems to contradict this belief. Exceptional soil-holding properties and tolerance of eroded, steep soils of low fertility suggest that it might fit well into central Panama's grazing program.

An important minor grass in the savanna is elephant grass (Pennisetum purpureum, elefante, Japanese cane, Napier grass). This African native is similar in appearance to Guinea grass. It grows taller than Guinea and will thrive as well in low, easily flooded land as in higher well-drained places. *Elefante* is resistant to the long dry season of central Panama and can stand heavier grazing than any of the three major grasses. New grass will reach heights of four or five feet within eight weeks after planting. If allowed to grow more the grass becomes hard and cattle will not eat it. Paspalum, or Bahía grass (*Paspalum notatum*) is another grass native to Brazil, but is called "Australian" grass in many countries. Although Bahía and Pará are closely related species, Bahía grows as well in the low, frequently inundated places as in the high, better-drained areas. It further differs from Pará in that it develops an erect vine.
Several of the larger operators have recently introduced Kudzu (*Pueraria phaseoloides*). They have found it to have excellent properties, especially as cut forage for greater milk production among dairy herds. Some stockmen predict that Kudzu will become increasingly important as cut forage in the central savanna. It thrives with very little cultivation in the same areas where Pará is now grown. Moreover, Kudzu will grow in the poor, rough regions where even Guinea has a difficult time. In areas of sandy soil, such as between Chamé and Río Hato, the plant does not develop fully. This Japanese vine seems to like a hot, humid climate like that of Panama, and resists temporary drought satisfactorily. It takes two years to establish a Kudzu pasture in the savanna, but once established it is said to last a lifetime. The plant not only prevents the growth of other grasses (an extremely valuable characteristic) but is almost impossible to destroy once it becomes well rooted.

A variety of secondary forage grasses are cultivated to a limited degree in the savanna, the more important of which are discussed briefly in Chapter I.

**Animals**

Most cattle in central Panama today are *criollo* (native varieties, descended from colonial stock), or crosses with *criollo* and Zebu (*Cebú*). The principal crosses have been with Zebu for meat, because of its size,
weight, and resistance to disease. Holstein crosses and Brown Swiss (Pardo Suizo) crosses are made for milk because of increased yield thus obtained. There has been a minor crossing with Jersey. As in colonial days, cattle are valued primarily for their meat and no persistent effort has been made to develop a dairy animal. The traditional leaning toward beef cattle remains a characteristic of savanna producers. Furthermore, the cattlemen, large and small, have felt that it is more desirable to develop a breed of animals that can withstand existing conditions than to improve those conditions.

Pigs, horses, mules, and goats are raised in the same regions producing cattle (see note 100). The numbers of these animals today is directly proportional to the intensity of Spanish settlement in the hearth. The most Hispanic sections of the savanna, notably the Azuero Peninsula, have more European animals than those of the Cocle' hearth ignored by the Spaniards. However, even strongly Hispanic people have gradually given up some animals, such as the mule. Mules are unimportant in Panama today, the decline beginning when the pack trains were discontinued during the Colombian era. They were never put to work on savanna farms. The goat, though not very important today, outnumbers the mules three to one. Pigs and horses are numerous, but suffer from the same poor management, disease, and lack of nourishment that characterizes the cattle industry. Horses, like mules are never used as farm work
animals, but, unlike the mules, serve as riding animals or for carrying light loads. Burros (donkeys) are not found in the savanna today, although some were probably used during colonial days. Most pigs and horses would be best classified as criollo, although there is some crossing in pigs and there are some pure breeds of horses.

Diseases.--Panama's climate poses certain problems with which mid-latitude lands are not confronted. Nevertheless, most animal diseases could be eradicated if the same methods employed in Florida or Louisiana stock raising were followed in the savanna. One of the most destructive parasites affecting Panamanian cattle is the tropical cattle tick (Boophilus microplus). It is found throughout the cattle-producing areas of the Republic and Central America, up to an elevation of 6,500 feet. In the United States over 99 per cent of the region formerly infested by a species of the same genera (B. annulatus) has been cleared. Simple dipping every fourteen days in an arsenical bath, spraying, or merely evacuating the pasture for six to ten months eliminates the tick. Nonetheless, the Panamanian prefers to search for a breed immune to the parasite, meanwhile losing 5 to 10 per cent of his herd every year. During periods of acute infestation as many as 90 per cent may die from disease. The fever tick serves as an agent in carrying the piroplasms that cause piroplasmosis (tick fever), an infectious blood disease. The tick is the
only agent known to transmit the disease, and elimination of the agent is elimination of the malady. Fever ticks feed only upon blood from cattle and often the animal must have more food simply to meet the demands of the parasites. Growth is retarded in calves, milk flow is greatly reduced, and animals become thin, weak, and stunted. Death may eventually result.

There are many other infestations of cattle and other animals. The more important diseases include nuche fly (Dermatobia hemenes), which is usually confined to higher elevations. There are many blood parasites and internal parasites, the latter including roundworms, hookworms, nodular worms, and lungworms. To this list might be added: brucellosis (Bang's disease, contagious abortion), tuberculosis, bovine mastitis, white scour (in calves), coccidiosis, encephalomyelitis (horses), anthrax, black-leg, hemorrhagic septicemia, and Johne's disease. Central Panama is also plagued with the vampire bat (Desmondus rotundus murinus or D. rufus), a major carrier of rabies. The bat will attack man as well as animals and is greatly feared by the campesinos.

One of the chief reasons given for burning the savanna is to destroy many of the above-mentioned parasites. There is no evidence that annual burning offers anything more than temporary relief for man and animals. In many cases the animal itself would have to be burned to destroy the parasite by fire alone.
Fowl

The aboriginal inhabitants of central Panama domesticated one bird before the arrival of the Spaniards, and had one other that was semi-domesticated. The Muscovy duck (*Cairina moschata*) is indigenous to Central America. It was thoroughly domesticated before the Conquest, a trait derived from South America. The Muscovy continues to be an important source of meat for some campesinos. Most people, though, dislike the flavor of the duck and, while refusing to eat it, keep the fowl as a scavenger and pet. The domesticated varieties range in color from almost pure white to the dark browns and blacks of the wild birds. White wing-coverts are present in all varieties. The Muscovy is a large duck, weighing from eight to ten pounds and averaging twenty-eight to thirty-two inches in length. It will breed with any other duck but is said to produce a sterile hybrid. Over half of Panama's 85,000 ducks are raised in the savanna, although it is unknown how many of these are Muscovies.

The curassow (*Crax globicera*), called *pavón* in Panama, was semi-domesticated and used for meat during Indian times. There is a possibility that the birds also served as pets and sentinels, as in some South American areas. The curassow is not domesticated in the savanna today, but
is still hunted occasionally for its meat. The turkey
(Meleagris gallopavo) is not native to Panama, but did
occur as far south as the Nicoya Peninsula in Costa Rica.
Early Spanish accounts of "turkeys" (pavos) in Panama
refer to the curassow, though turkeys were soon introduced
to all parts of the Republic. Nevertheless, they are not
as numerous as either the duck or chicken. Of the three
domesticated birds, the common Old World chicken (Gallus
gallus domesticus) is by far the most important. As in
other areas of tropical America, the chicken diffused
rapidly to all parts of Panama and is now found on every
campesino farm. Most well-known varieties are scattered
over the entire central savanna. A few large chicken farms
have appeared near La Chorrera, serving the Panama City-
Canal Zone market with birds and eggs. There is no evidence
that geese (sub-family Anserinae) or guinea fowl (Numida
meleagris) were successfully introduced to central Panama.
These birds are not encountered in the savanna today.

Hunting, Fishing, and Gathering

The campesino supplements his diet with animals from
the woods and fish from the sea and streams. He gathers
various woods for construction of all kinds, vines to sub-
stitute for rope, fruits, and medicinal plants and herbs. A
variety of other more-or-less abundant materials are also
collected. Many of the items utilized, as well as the tech-
niques for obtaining and preparing them, are pre-Columbian.
Hunting

Modern guns and rifles have replaced bows and arrows in the savanna. Game is stalked in the wooded places, especially in the gallery forests, hills, and along the coast. Dogs, nets, snares, and baited traps are used in hunting. Typical of Panama is the small black dog (Fig. 80). The animal is found throughout the Republic and is similar in size to dogs found in archaeological sites. It is likely that this animal is similar to the aboriginal savanna dog. Almost always the Panamanian dog is black.

Fig. 80.--The little, black Panamanian dog is eyeing a small iguana (I. iguana) he has just caught for the boy. Camarón, Panamá. January 2, 1956.
with a touch of white somewhere on his body. Fire is no longer used as a hunting technique, though campesinos keep a lookout for game when burning their rozas and pastures. The surround technique is seldom employed in hunting, but I have been told that an occasional large animal is hunted in this fashion. Most individuals hunt singly or in pairs.

The game hunted today is the same as that during Coclé Indian times, albeit animals are not so plentiful as formerly. Early Spanish descriptions of the abundant wildlife in central Panama are confirmed by archaeological finds. We can only surmise that the destruction of forests in many areas has led to a gradual impoverishment of native fauna. Wildlife still abounds in places that are wooded. The more important game animals are: Panama white-tailed deer (Odocoileus virginianus); brocket deer (Mazama americana); paca, or conejo pintado (Cuniculus paca virgatus); peccary (Pecari tajacu and Tayassu pecari); iguana (Iguana iguana); armadillo (Dasypus novemcinctus); raccoon (Procyon cancrivorus and P. lotor); squirrel (Sciurus variegatoides); and certain rabbits (Sylvilagus spp.). Occasionally today an ocelot (Felis pardalis) or a puma (F. concolor) is killed, but seldom are either deliberately hunted. Jaguars (F. onca) were once important to the Indians, who placed a great value on the beautiful skins. The large cats are rarely reported today on the Pacific watershed of Panama. Birds are still fairly numerous, even
in the open savanna, and include quail (Tinamidae family) and curassows (*Crax globicera*).

Deer, peccary, and iguanas are the most sought-after animals; quail, the principal bird. The *campesinos* today preserve meat they secure. Game is bled and quartered, while birds are plucked or skinned and fish gutted. A small frame (*barbacoa*) is then erected, measuring about a foot high and eight or ten inches long. On this they place the flesh and underneath maintain live coals for a period of four to seven days, until the meat is dry and hard. The resulting jerkey is similar to that described by Espinosa at Natá in 1516, and is probably an aboriginal technique for curing fresh game or fish. Hides and other animal products are also used, as discussed in following sections.

**Fishing**

Although fishing is gradually becoming an important industry in Panama it still remains primarily a subsistence economy (Fig. 81). Most *campesinos* fish for fresh-water species in the savanna rivers, while a few people near the coast devote all their energies to the salt-water varieties. Both fresh- and salt-water fish were items in the diet before the first Spanish entrada. Archaeological sites reveal that salt-water species were preferred. Even though there are over 127 species of fresh-water fish in central Panama, most of them are unpalatable and many are unsafe. None of the fresh-water fish in savanna
streams has any commercial value. They serve as a subsistence food only when salt-water kinds cannot be had.

Fresh-water fishing techniques include the simple pole, line, and baited hook, in the modern European fashion, whence it no doubt came. Today this is the usual way of fishing in the rivers and streams, either from a bridge, along the bank, or from a boat. Some small streams are dammed with stones or grass and branches, and the fish caught in nets fastened between a gap in the dam. The method, still practiced by the Guaymí, is aboriginal to the savanna. Conical, cane traps are sometimes baited and
placed in the downstream apex of a V-shaped dam. Though fish poisons were used by the Indians there is no evidence that poisoning is practiced today. However, the Indian method of spearing fish prevails in the mountains.

Most fishing is done in the dry season because streams are lower, less rapid, and there is no flooding. Furthermore, the dry season is the off-season for most savanna agriculture and the *campesino* has more time to devote to fishing for food or pleasure. Fishing in the salt waters of the Gulf of Parita is also usually at its peak during the dry months. Panama's dry winter months witness an increase in the numbers of salt-water varieties. During the period from January to April the Gulf of Parita is especially well provided with nutrient salts. This is due mainly to upwelling in the Gulf of Panama. The upwelling is seasonal and local, and the constant flow and mixing of waters greatly increases productivity of plankton. The fishery resources of the Gulf of Panama have never been subjected to extensive exploitation and domestic use has probably been so slight that there has been no depletion of the fish population. During colonial days only the pearl fisheries (now non-existent) of the Pearl Islands were exploited commercially.

All of the Gulf of Panama lies within the 100-fathom line that cuts due west from Punta Piñas to Cape Mala. Between Punta Chame’ and the Gulf of Parita there are extensive shoals. They lie seaward from the long sandy beach
(Playa Grande) that fronts the coast. East of Río Hato the savanna comes close to the sea, ending abruptly in a low, wooded cliff (Fig. 82). Between the Gulf of Parita and Río Hato there has been less uplift and the cliff is absent (Fig. 83). Corvina (Eriscion sp.), Panama's number one food fish, thrives in countless numbers in the shallow, relatively quiet, Gulf of Panama. In addition, there is a host of important edible marine fishes, including:

- anchovy (Engraulis sp.)
- black marlin (Makaira marlina)
- bonito (Sarda sarda)
- dolphin (Coryphaena sp.)
- grouper (Mycteroperca sp.)
- grunt (Haemulon sp.)
- herring (Clupea sp.)
- jack (Caranx hippos)
- mackerel, or "sierra" (Scomber sp.)
- mullet (Mugil sp.)
- queenfish (Seriphus politus)
- róbalo, or "snook" (Centropomus undecimalis)
- sailfish (Istiophorus sp.)
- sawfish (Pristis pectinatus)
- shark (Carcharodon sp.)
- snapper (Lutjanus sp.)
- tarpon (Tarpont sp.)
- tuna (Thunnus sp.)

In spite of the wealth of accessible seafood, there are only two or three settlements along the coast that might be classed as fishing hamlets (Fig. 83). None of the fishing settlements is located where uplift has been extreme. In such regions the land behind the coast is highly dissected and soils are almost too poor to support supplementary agriculture. There is also a difficulty of beaching boats in areas where the sea comes up to the base of the cliff (Fig. 82). Where there are fishing villages there are also
Fig. 82.—The Playa Grande, near Santa Clara, Coclé. Offshore shoals in the Gulf of Panama are Panama's primary fishing grounds. March 17, 1956.

Fig. 83.—The Playa Grande, near Río Hato, Coclé. A small fishing hamlet may be seen on the beach. March 17, 1956.
roza fields nearby. Boats, or cayucas, are fashioned from whole logs, but most fish are actually caught in traps. The mestizo fisherman, following the precedent of his Indian forebears, makes full use of the extreme semi-diurnal tides of the Pacific coast. The spring range is as much as twenty-two feet, while the neap range is as little as six feet; an average of twelve feet. The fisherman builds a trap of vertical canes, woven together with vines or rope, and constructed in the form of a spiral with a long, curving tail (Fig. 84). Some traps from the air look like a fancy number 9. The weir is placed well out from the shore during low tide. It is constructed so that once inside the maze a fish finds it difficult, if not

Fig. 84.—A fish weir, near Río Hato, Cocle. March 17, 1956.
impossible, to escape. Usually the traps are baited, and when the tide goes out the fisherman takes a basket to the trap and gathers his harvest. Some of the fish are sold in the nearest inland village, a few will be eaten, and the remainder will be dried over charcoal.

In addition to fin-fish the rural folk near the coast gather oysters, crabs, and the spiny, clawless lobster (*Panulirus* sp.). Oysters are frequently gathered from the prop roots of mangrove when the tide is low.

**Gathering**

The collecting of plants, shellfish, or any other material from nature, falls within the general category of gathering. Many of the items collected by the *campesinos* have already been discussed in the preceding sections. They are not specified here unless further elaboration is necessary.

**Fruits.**—Native fruits are abundant in central Panama and are collected for food and for the manufacture of *chicha*, as most fermented domestic drinks are called. Most of these indigenous fruit trees are cultivated (already discussed), though fruits are often gathered from wild forms. Some fruit trees are protected when found, but not taken into the *huertas*.

Among the trees not cultivated is *Brysonima crassifolia*, or *nance*. Its small edible fruit tastes like a tart apple,
and next to maize and sugar cane juice the fruit is the major source of chicha in central Panama. The wood makes good charcoal and is the chief fuel for people far removed from the most desired wood, mangrove. Frames for houses are frequently made from the tree (Fig. 65) and it is said to resist weather and termite attacks satisfactorily.

Closely related to the cashew (Anacardium occidentale) is espavé (A. excelsum). This large tree (up to one hundred feet tall and six feet in diameter) produces an edible fruit that is poisonous if eaten raw.

Wine is made from Acrocomia aculeata (palma de vino, coyol, winepalm) by fermenting the sap. In order to obtain the juice, the campesino cuts down the palm at the ground level, then cuts off the top about two feet from the bud. Near the top of the trunk he cuts a rectangular trench, measuring about eighteen inches long, five inches deep, and four inches wide. The juice collects in this hole and is dipped out until exhausted. It is then set aside to ferment. Seeds from the winepalm are often eaten by cattle, and it is said that some humans also eat them. The winepalm is tall, with a thick trunk, and is usually found in open places on the Pacific coast. Because the tree resists fire and is protected by the campesino, it is probable that it now occurs as the only species in certain areas that were formerly wooded.
Medicinal plants.—Balsam-of-Peru (Toluifera pereirae), known variously as bálsamo, árbol de bálsamo, and palo de bálsamo, thrives in the tropical forests from Mexico to South America. It contains a fragrant viscous substance (balsam) having a bitter flavor. Balsam is found in all parts of the plant and is sometimes extracted from the crushed fruit. It is usually obtained by making incisions in the trunk and placing rags in them to absorb the sap. By a papal bull issued by Pius IV (1562), and again by Pius V (1571), the clergy was authorized to use the balsam in the preparation of the chrism. And, it was declared a sacrilege to injure or destroy the trees. Balsam is still employed for this, but is especially important in the preparation of perfumes and ointments. It also serves some people as a treatment for catarrh, asthma, rheumatism, and venereal disease. The tall slender tree is an excellent construction wood and has been used in the Canal Zone for railroad ties and cabinet work. The wood is hard, durable, and takes a good polish.

One of the more valuable trees in Panama is Hymenaea courbaril (algarrobo), or true copal, which ranges from southern Mexico to central Brazil. The tree attains a height of ninety feet and a diameter of six feet. It yields the pale yellow or reddish gum called copal. The gum is still used as an incense in the savanna and many believe that it has medicinal value. Copal was important
to the aboriginal religion and its present use maintains
the association, in that magical powers are attributed to
the fumes. Copal gum may also be employed in the manufacture
of varnish, and its wood, which resembles walnut, is one of
the better local construction woods. The bark may be
removed in one piece, and in some places, such as central
Brazil, natives make large canoes from it. Copal bark has
never been employed in this fashion in the savanna.

Until rather recently, the resin of Guaiacum
officinale (guayacán) was a major remedy for syphilis, and
as early as 1508 the wood obtained great fame in Europe.
It brought extravagant prices and was used well into the
eighteenth century across the Atlantic, and even longer in
America, before its medicinal powers were questioned.
True guayacán should not be confused with Tabebuia guayacan
(cortéz, corteza), an unrelated tree sometimes called
guayacán in various parts of the Spanish American tropics.

Another common forest tree is Andira inermis (cocú,
cabbagebark). The bark of the cocú has a disagreeable odor
and is used as a vermifuge, purgative, and narcotic. How-
ever, in large doses it is a dangerous poison, for the
seeds contain a poisonous alkaloid.

Nance (Brysonima crassifolia), discussed above as a
source of chicha, is also a remedy for diarrhea and
dysentery, as well as a ferbifuge. The fruit is not used,
but rather an infusion of the tree's bark. The same
treatment is applied for snake and spider bites. Sometimes
the latter malady is treated by a solution made from the bark of *Rhizophoro mangle* (red mangrove).

An effective remedy for toothaches is obtained by chewing *Salmea scandens* (*duerme-boca*), a plant that is mildly poisonous and possibly habit-forming.

**Construction woods**—Generally, softer, more-easily worked woods are preferred for domestic woodworking. Durable, termite-resistant species are utilized for house and boat construction, handles, and other items subject to rough usage. Many of the species found in the wooded areas of the savanna also occur in Panama's wet forest zones. However, in Darién and on the Atlantic coast there are more species and varieties than in central Panama. There is no commercial timber exploitation in the central provinces at the present time. Most of the lumber yards in the larger interior towns obtain their wood from mills in Chiriquí Province. The lumber is hauled to the central savanna markets by truck.

**Forested areas of southern Veraguas Province** were once exploited by the colonial Spaniards. Timber was cut for local ship construction and for shipment to Peru. In the early seventeenth century there were more than 4,000 Negro sawyers in the Veraguas area, but in a few years the activity ceased. The heavily forested region is outside the limits of the savanna under investigation, and has never been studied botanically in any detail. Little is
known concerning species and variety, though each should approximate those of Darién.

The *campesino* obtains his construction woods by means of axes, *machetes*, and sometimes hand saws. Timbers that are too large to be dragged by horse or carried in an ox-cart are not generally used. A few professional carpenters and woodworkers, found in large towns, employ power tools in their work. They can obtain wood either from the lumber dealers, who have brought it in by truck, or they may secure it themselves in the *campesino* fashion. Most construction wood is derived from trees that thrive in the alluvial areas where subsoil drainage is good and water tables are normally high throughout the year. Only a few of the useful species can stand the long drought of the open savanna, unless local drainage is good and soils permit deep rooting.

The most important construction woods are given below.

<table>
<thead>
<tr>
<th>Family, genus, species</th>
<th>Common name</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABACEAE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dalbergia retusa</em></td>
<td><em>cocobola</em></td>
<td>furniture, knife and tool handles, musical instruments, canes</td>
</tr>
<tr>
<td><em>Platymiscium poly-stachyum</em></td>
<td>Panama red-wood, <em>quira</em></td>
<td>heavy timbers, cabinets, handles, billiard-cue butts in U. S.</td>
</tr>
<tr>
<td><em>Coumarouna sp.</em></td>
<td><em>almendro</em></td>
<td>anything requiring a very hard wood; used in C.Z. for railroad ties and piling</td>
</tr>
<tr>
<td>Family, genus, species</td>
<td>Common name</td>
<td>Uses</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
<td>------</td>
</tr>
<tr>
<td>Sweetia panamensis</td>
<td>malvecino</td>
<td>same as almendro</td>
</tr>
<tr>
<td>Diphysa robindioideae</td>
<td>macano or cacique</td>
<td>same as almendro</td>
</tr>
<tr>
<td><strong>ZYGOXYLLACEAE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaiacum officinale</td>
<td>Lignum vitae, guayacán</td>
<td>pre-eminent of local hardwoods, for objects requiring great strength and tenacity; ship posts, keels, rudders, mallets, and (in U.S.) bowling balls.</td>
</tr>
<tr>
<td><strong>CAESALPINIACEAE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peltogyne purpurea</td>
<td>nazareno or morado</td>
<td>similar to uses cited above</td>
</tr>
<tr>
<td>Prioria copaifera</td>
<td>amansa mujer or cativo</td>
<td>see above</td>
</tr>
<tr>
<td>Dimorphandra megistosperma</td>
<td>alcornoque</td>
<td>see above</td>
</tr>
<tr>
<td><strong>BOMBACACEAE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cavanillesia platani-folia</td>
<td>cuipo or quipo</td>
<td>canoes, drums, pilones</td>
</tr>
<tr>
<td>Ochroma limonensis and O. lagopus</td>
<td>balsa, balsa or lana</td>
<td>favorite for all types of wood-carving; especially drums, bateas, and figures; rafts</td>
</tr>
<tr>
<td><strong>EUPHORBIACEAE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astronium graveolens</td>
<td>zorro</td>
<td>same as D. retusa</td>
</tr>
<tr>
<td>Sapium aucuparium</td>
<td>olivo</td>
<td>resin used for waterproofing</td>
</tr>
<tr>
<td>and S. caudatum</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>MELIACEAE:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cedrela spp.</td>
<td>Spanish cedar, cigar-box cedar, cedro amargo</td>
<td>principal general-purpose wood because it is soft, easy to work, fragrant, durable and not subject to insect attack</td>
</tr>
<tr>
<td>Family, genus, species</td>
<td>Common name</td>
<td>Uses</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>MALPIGHIACEAE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brysonima crassifolia</td>
<td>nance</td>
<td>general construction</td>
</tr>
<tr>
<td>ANACARDIACEAE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anacardium excelsum</td>
<td>espave</td>
<td>general construction</td>
</tr>
<tr>
<td>LEGUMINOSAE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterlobium cyclocarpum</td>
<td>corotí,</td>
<td>general purpose</td>
</tr>
<tr>
<td></td>
<td>guanacaste,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ear-tree</td>
<td></td>
</tr>
<tr>
<td>Acacia spp.</td>
<td></td>
<td>general purpose</td>
</tr>
<tr>
<td>Cassia spp.</td>
<td></td>
<td>general purpose</td>
</tr>
<tr>
<td>Erythrina spp.</td>
<td></td>
<td>general purpose</td>
</tr>
<tr>
<td>Inga spp.</td>
<td></td>
<td>general purpose</td>
</tr>
<tr>
<td>Mimosa spp.</td>
<td></td>
<td>general purpose</td>
</tr>
</tbody>
</table>

Palms.--Perhaps more than any other class of trees, palms offer an excellent example of the interplay between culture and nature. Two of the palms, the coconut and pejibaye, have already been discussed among the pre-Hispanic domesticates, while the winepalm was considered above as a tree protected for its valuable sap. Several other palms serve the campesino, especially as sources for thatching and construction wood.

All of the palms deemed valuable by inhabitants of the hearth are culturally significant, even though they may never have been domesticated. Because man has protected the palms they have become conspicuous features on the landscape. This is especially true on hills (Fig. 85) and in bottomlands (Fig. 15), where the palm has survived despite clearing for agriculture. Nature has aided man in protecting the palms,
for generally the trees are fire-resistant. Even so, they have been spared the ax more than most other trees.

Among the more important protected palms is corozo (Attalea cohune), sometimes called corozo gallinazo or palma real. This is one of the largest Panamanian palms and on the Atlantic coast is probably the most common. Seeds of the corozo are rich in oil, although they are very hard to crack. Palm oil is rarely used today in the savanna, but in Mexico it is still important in the manufacture of soap, candles, and machine oil. Panamanians use the trunks for construction purposes. Corozo leaves are a primary thatching material, especially where the palms are abundant.

Fig. 85.--Black palm (Astrocaryum sp.), growing on a hill that has been cleared of its heavier vegetation. Near Parita, Herrera. January 29, 1956.
Corozos like a wet habitat; where they stand alone it is reasonably certain that other vegetation has been removed.

The black palm (Astrocaryum sp.) of Panama is not the same tree as the black palm of the upper Amazon (Guilielma insignis). Nevertheless, the same name, chonta, is used in both areas for the two different palms. In central Panama the names pina-pina and chunga are also employed for the native black palm. The hard black wood is now used for making various handles and canes, and was formerly used for fashioning bows and clubs. The sharp trunk spines make excellent needles.

Acanthorhiza sp. (palma de escoba, nolí) is the common broom palm. It is also used for thatching and for stuffing cushions. A tall palm with a stout trunk—palma de escoba prefers the bottomlands. It is a certain indicator of former forest land if ever found in the open. Another wetland (even swamp-land) palm is the oil palm (Elaeis melano-cocca). The tree resembles the corozo, with its thick, but shorter, trunk. Throughout Central America it is known as either corozo colorado or corocito colorado. Like the corozo, the oil palm is rich in oil.

One of the most significant sources of thatching is Manicaria saccifera (guágara, cabeza de negro, monkey cap). Thatched roofs made from guágara are said to last for forty or fifty years. Many people prefer it to rice straw as a roofing material; perhaps it was the principal thatch before
the Spaniards introduced rice to the Coclé hearth. Guágara has a short trunk and attains a height of about twenty feet. At the base of the leaves is a conic covering which may be made into long caps, called monkey caps. Such caps are still worn quite generally by the Guaymí to the west, and the trait is pre-Columbian. The palm's fruit, while not eaten by the campesinos, is a favorite of swine, and the palm appears to have spread in this manner from wet areas to dry places. Guágara seems to be native to regions of Am rather than Aw climate.

Two other palms are common on the Pacific watershed and have limited uses; Bactris sp. (uvito, caña brava, caña brava blanca, corocillo) and Pyrenoglyphis sp. (lata, palma brava, palma brava morada). The purplish fruit of the latter is occasionally eaten. While the hard seeds of the Bactris may be eaten they are not very tasty. Both palms are similar in appearance, except for a white flower in the Bactris and the purple fruit of the Pyrenoglyphis.

Poisons.—Although many poisonous plants are known to the rural folk the principal use today is for poisoning rodents and pests. By far the most important poison is mata-ratón (Gliricidia sepium, madre de cacao), the leaves and seeds of which are fed to undesirable animals. Cabbagebark (discussed under medicinal plants) is also a dangerous poison. Some people taking cabbagebark as an internal medicine have died from its effects. All along the Pacific
coast of Central America one may find Hippomane mancinella (manzanillo, manchineel), which yields a fruit resembling a small green apple. This fruit is a deadly poison; there are a number of accounts that describe the tragedies besetting Spanish exploring parties who ate the "apple." Manzanillo has left its name in a number of towns up and down the Central American coast.

Wild licorice, or crab's eye (Abrus precatorius) produces a brightly colored seed which, though poisonous, is used for necklaces and bracelets. It has been used in the past by criminal poisoners and is still used by Florida children in their home-made pop guns. Because of the extremely uniform seed size, jewel merchants once used the red and black seeds as a weight.

Other poisonous plants native to central Panama, and used mainly as fish poisons in former times, include: Melia azedarach (native chinaberry); Sapindus saponaria (soapberry or common southern chinaberry); Jatropha curcas (holy tree); Hura crepitans (sandbox); Anacardium occidentale (cashew); Serjania sp. (especially S. mexicana, or barbasco); and Salmea scandens (duerme-boca). Fish poisoning is probably still practiced in the highlands, but little, if any, is found today in the lowland savanna.

Miscellaneous plants.—Several genera of Bombacaceae provide silky fibers ("cotton") used for stuffing cushions, mattresses, and pillows. The principal ones are Bombacopsis
quinatum (*cedro espinoso*), *Ceiba pentandra* (*ceiba*, *kapok*), and *Bombax barrigon* (*ceiba barrigón*, *majagua*). These fiber-yielding plants were the principal sources of "cotton" during aboriginal times. True cotton (*Gossypium barbadense*, and probably *G. hirsutum*) is native to Panama and was cultivated as a perennial before the arrival of the Spaniards. It is not important today as either a subsistence or commercial crop.

Waterproofing for rain capes and bags is obtained from *Castilla panamensis* (*caucho*, *rubber*), the only true rubber tree in Panama, and from *Sapium* sp. (*olivo*), a substitute for rubber. Although frequently protected, there was no cultivation of rubber in the savanna before or after the Conquest. The soapberry, or chinaberry (*Sapindus saponaria*) is used in washing clothes, and clothing itself was once made from barkcloth (*Inophloeum armatum*). This mulberry, called *maragua* by the mestizos and *cocoa* by the Atlantic coastal Negroes, is still employed occasionally to make a blanket or a hammock. Formerly it was used by the Coclé peoples for making sails. Some barkcloth, called *tela de tapa*, is still made in the Azuero Peninsula. Barkcloth clothing continues to be fashioned by Atlantic coast Negroes. "Paper" was made from *copey* (*Clusia rosea*) by the first Spaniards to visit the Isthmus. The thick heavy leaves substituted for writing material and playing cards.
All kinds of vines are important for tying and binding things. The most useful are varieties of Philodendron sp. (Fig. 53) and Gynernium sagittatum (caña brava, uva, uva grass, wild cane). The latter grows in dense colonies on river banks and in low ground. Rope is made from agave, or pita (Agave panamana), a native to Middle America. Agave fiber is especially important today for manufacturing various bags, cordage, and hammocks. The plant is often found in the huerta and may be termed a semi-domesticated plant.

Fuels, primarily charcoal, are obtained from locally gathered woods; these are discussed in the following section.

Handicrafts and Home Industries

It has been said that the savanna campesino produces almost everything he consumes and consumes almost everything he produces. With certain exceptions this is true. He raises his food, makes his own dwelling and its furniture, some clothing, certain tools, primitive musical instruments, and most of his medicines. The typical roza farmer may buy a machete, an ax, and a coa every five years; one or two pieces of simple cotton clothing every year; and a blanket every few years. Soap, kerosene, liquor, salt, and a few patent medicines are required from time to time. Sometimes the campesina gets a few articles of feminine adornment, vessels of ordinary china, perhaps a kettle, bucket, and some steel knives. The husband will occasionally
buy a few nails, a rifle or shotgun and ammunition, a flashlight, and matches. Because he has little or no money, the campesino trades items from his roza or huerta, or of his own manufacture, for necessities he cannot produce.

The campesino produces little that has true commercial value. Panama remains one of the few American countries whose people have not even partially made capital of native skills by entering the export market. Nonetheless, some manufacturers of the savanna are important in the limited local market. These enable the farmer to acquire small amounts of cash, and include: (1) molasses and panelas (discussed under Subsistence Huerta Crops); (2) charcoal; (3) hats; (4) brooms; and (5) hammocks.

Semi-Commercial Domestic Manufactures

With the exception of molasses and panela, domestic manufactures are wrought from the natural environment. Although the manufactured goods are processed from native materials they are not all of pre-Conquest origin. The fabrication and utilization of the hammock is a trait belonging to the forest Indians of South America. It diffused north, through Panama to Mexico, before the Conquest. The hat is of European origin, though Indian skill in basketry and a native plant modified the trait somewhat. Both brooms and charcoal may or may not be pre-Iberian to
the savanna. There is little mention of either during the first decades of Spanish settlement. It is known that the Indians had some method of curing meat and fish, which suggests that charcoal might have been used. It might be theorized that consistent descriptions of neat villages and houses among the aborigines indicates that the broom was employed. The Spaniard already possessed charcoal and brooms when he came to central Panama and both could well be introduced items.

Charcoal (carbón).—A large percentage of the charcoal manufactured in Panama is marketed. The major producing area in central Panama is the District of Chámé. Here may be found extensive mangrove swamps; the mangrove tree being much esteemed for charcoal since it produces the best-quality fuel. The importance of Chámé's charcoal production rests on the fact that carbón is practically the only fuel known to the campesino. Areas of charcoal manufacture may be readily identified from the air. Burning of the wood results in a large black circle on the ground. Six to ten feet in diameter, the circle is known as a "charcoal ring." Fires are usually built on any solid ground available in the mangrove forest itself, or as close to the forest as possible. It is not uncommon to find an isolated dwelling on high ground in the swamp, always near the characteristic black circle. In savanna areas where mangrove cannot be readily obtained, nance (Brysonima crassifolia) is sub-stituted.
Hats (sombreros).—The most important campesino industry, in terms of value and volume, is the fabrication of straw hats. Although every village, and almost every rural family, in central Panama makes hats, production is centered in Cocle Province. Especially important is the highland District of La Pintada. This small mestizo district (pop. 10,391) manufactures almost half of all hats sold in Panama. The industry is entirely rural in its orientation, and the district capital and largest village, La Pintada, has a population of only 4,911. In spite of La Pintada's overwhelming importance in the hat industry, the provincial capital, Penonome, has given its name to the Panama hat. Throughout Panama the straw sombrero is called el penonomeño. There are a number of reasons for this. The District of Penonome is also a major producer of hats, and those shipped to market from La Pintada go first to the city of Penonome, eight miles to the south. From there they are collected and reshipped. Penonome, the major trade center and capital of the province, is better-known than tiny La Pintada.

The art of hat making is still best preserved and most fully exploited in the highlands of Cocle. Weaving skills (for straw baskets) were well developed in the area before the Conquest. Hat making seems to be characteristic of areas where basketry making has also survived. The Panama hat is made from Carludovica palmata; this is not a true
palm but a member of the family Cyclanthaceae. Called guachibán in the savanna, the plant is known by a variety of names elsewhere. The more popular are jipijapa, portorico, palmita, palmilla, atadero, and chidra. After the strands are split from the plant they are braided by the women, who tie several fibers to the big toe and work by hand. The braided plait is then hand sewn in a spiral, beginning at the center of the crown, and the hat is shaped as it is sewn. Brown or black patterns result from the braiding of dyed fibers with those of natural color, though other colors may be used. Reds and greens are especially employed for the bill-type cap which enjoys great popularity in Panama City and among the tourists.

The true Panama hat is not like the Ecuadorean hat, though the latter has become world-famous as the "Panama hat." This was because Ecuadorean hats were originally shipped to Panama for reshipment to all parts of Europe and eastern North America. The penonomeño is worn by everyone in the interior: men, women, and children; campesinos and town people. A good hat sells for fifty cents in the village market, but will bring more than three or four times that amount in Panama City.

Hammocks (hamacas, chinchorros).—Hammocks are still made in the savanna, but are most important in the highlands. Approximately 50 per cent of the locally manufactured hammocks are marketed in the producing area.
they are made from threads of native **ceiba** cotton, wrapped with fibers of **pita** (agave). Although coarse and scratchy, the Panamanian hammock is sturdy and, when dyed, a colorful furnishing. The hammock is aboriginal to the savanna but is seldom used today in the lowlands, except as a baby cradle. Most **campesinos** sleep either on canvas cots or upon a hide laid on the ground. A few people still use the Indian-style cane benches for sleeping.

**Brooms (escobas).**—Completing the list of semi-commercial manufactures is the broom, made of rice straw or palm. The District of Penonomé is the center for broom manufacture, and Coclé Province produces two-thirds of all brooms made in Panama. Of the five items discussed, the **escoba** is the simplest to manufacture. Straw or palm is simply secured to a stick by means of any of several fibers. During the eighteenth century brooms of this sort comprised one of Panama's principal exports to Peru.

**Weaving and Dress**

The weaving of cloth is of no importance in the hearth today. Before the Conquest the art was highly developed, and the two-bar loom was aboriginal to the area. Cotton (**Gossypium** sp. and **Ceiba** sp.) was spun on a drop spindle that had a disc-shaped whorl. By 1933 there was only one woman among the Guaymí (and none in the savanna) who knew how to weave with the loom. Most cloth used today is woven in the mills of North and South America, and Europe. Although
modern Western styles are generally worn by savanna inhabitants today, traditional Panamanian costumes persist.

The traditional Panamanian male costume (el montuno) originated in the hearth and later spread to adjacent areas. It consists of a long cotton blouse (zamarras) and short, wide trousers (fundas). The shirt is worn on the outside. The outfit is completed by a Panama hat, rawhide sandals (cutarras), and a woven, fiber shoulder bag (chácara). The montuno is a sixteenth- or seventeenth-century style, bearing a strong suggestion of the Spanish colonial naval uniform. Especially noticeable is the band worn around the hat, which crosses in the back and hangs over the brim, and the wide sailor collar of the shirt. The latter is not at all unlike the modern sailor uniform jumper. It is not a coincidence that the montuno is still worn as an everyday costume in parts of the Azuero Peninsula. This is the most Hispanic part of rural Panama, and some settlements were probably effected by Cantabrian maritime peoples. Urban panameños wear the montuno at fiestas, especially during the pre-Easter carnival, and some Guaymí have accepted a simpler version of the costume for everyday wear.

The feminine montuna, and its expensive fiesta counterpart, the pollera, are Andalucian in origin. They diffused through Panama City to the savanna, where they underwent some modification before rediffusing from the hearth. In the peasant version the sleeves of the blouse were shortened and
the neckline lowered; the long gathered skirt is now made of bright cotton print. A Panama hat and an over-the-shoulder bag are parts of the costume added after it came to the hearth. As with the montuno, the montuna has generally been replaced with conventional styles for everyday wear (Fig. 86). Campesinas continue to make montunos and montunas for festive dress, as well as the elaborate and costly pollera de fiesta. The latter is usually made of linen, with embroidered or appliqued designs, and trimmed

Fig. 86.—Contrasting clothing styles may be seen in this picture. The rural campesina (left) wears a Panama hat, cotton print dress, and carries a chácara over the left shoulder. Her hair is long and she is shoe-less. The mother and little girl (right) are dressed in typical Western fashion. Santiago, Veraguas. November 24, 1955.
with handmade lace. Ocú is the center for making montunos, and Las Tablas, for the montuna and pollera de fiesta. Many of the costumes are sent to Panama City and Colón for sale.

**Basketry**

Basket weaving has survived from pre-Conquest days and is widely practiced in the central provinces. The aboriginal twill baskets vary in size from two or three inches deep to two or three feet deep. Twining is also a well-spread technique, and there is a possibility that it, too, is pre-Hispanic. Twining, as a method of securing something, is used in native house construction. True wickerwork is a Spanish introduction to Panama. Although there are a variety of baskets and related items, four types may be singled out as significant. Zurrones are large (three feet deep), flat-bottomed, twilled baskets. They are attached in pairs to a horse and used for carrying large loads (see chap. v). Motetes are similar, but are carried on the back by means of a pole inserted through the basket near the top, and passed under each arm of the bearer. These are always employed when a large load is to be transported by foot. The tumpline, though aboriginal, is not used to carry baskets today.

Small seed baskets (sembraderas) are used for carrying seed to the fields, and often serve as containers at other times. A fourth kind of basketry is the chácara, previously mentioned. The highly decorated chácaras are usually made
of agave fiber and are a type of netting. They form an indispensable part of the rural costume. Simple nets are also made, utilizing a technique known as "coiled netting." Mats of different types, ranging from small place mats to floor mats, are woven in the same fashion as baskets. Rattles, sewing baskets, fans, and a host of other kinds complete the list.

Ceramics

Central Panama was once one of the New World's most advanced ceramic regions. Today the savanna inhabitants produce only a small amount of poor quality pottery (alfería), tiles (tejas) for roofing, and pipes (pipas, or cachimbas). There are usually several women in each village who make pottery. Ware includes flat griddles for tortillas, wide-mouthed jars of assorted sizes and varieties, and the indispensable tinaja (Fig. 45). The potter's wheel is not used by the rural pottery makers. Sand-tempered clay is kneaded with the hands, and after a small cup is shaped the jar is built up with long strips. It is not the coiled technique, however. The rolls are not continuous, but are placed on in short pieces and squeezed together and smoothed with the hands or with a piece of gourd. After drying for a few hours the exterior is smoothed with a wet tool. A day or two later the jar is fired by simply building a fire around it. This is apparently the prehistoric method, for it is still employed by the Guaymí. Pottery is no longer decorated
nor are there any embellishments such as spouts, coloring, handles, or varied shapes.

A few clay smoking pipes are made by the campesinos for their own use. The pipes are simple, undecorated pieces, usually having a cane stem. Tiles are made by hand on wooden molds. The industry has become more or less specialized and there is a tile "factory" in or near all the larger villages. Such an establishment is operated by five or six men, who work under a thatched shed. Usually, tile is the only part of the rural house that must be paid for in cash. Pottery has also taken on certain commercial aspects recently. Several of the larger towns now have pottery establishments, where the wheel is used. The product is comparable to our dime-store varieties. Most of the commercial ware goes to Panama City or provincial cities. Only townspeople rely on commercial outlets; rural folk rarely purchase factory-produced ceramics.

Woodworking

The campesino manufactures a number of wooden objects. Included are his furniture, implements for agriculture and food preparation, hunting and fishing devices, and musical instruments. Aboriginal to Panama (and from southeastern United States to the Amazon) is the pilón, or mortar, made from a waist-high log (Fig. 87). It is usually shaped like an hour glass, with the top scooped out to a depth of twelve or sixteen inches. Maize, rice, and occasionally coffee are
pounded in the bowl by means of a two-headed, wooden mano. Grains are not ground in the pilón, but pounded, to remove the hulls.

Pounded grain is winnowed on a batea; a shallow wooden tray that has a flat bottom and slightly sloping sides. It may be made from several of the softer woods and be of any reasonable shape or size.\(^{119}\) Frequently, it serves the campesina as a tray for washing and peeling vegetables, washing clothes, bathing the baby, or holding dried food in storage. Bateas described by Oviedo were as big around as a wash-basin, and were used in placer mining.\(^{120}\) The perfectly flat bateas are called bandejas.
Gourds (from either Lagenaria leucantha or Crescentia cujete) are made into vessels of different sorts, spoons, maracas, and water jugs (tulas). Calabazos may be decorated by carving or incising simple designs on the outer shell, but they are rarely painted or lacquered. Small pieces of gourd are made into buttons, and basic pottery-making tools are usually of gourd. Some wooden vessels are manufactured, but those of gourd are more important to the rural people.

Most of the musical instruments made in the savanna are of Negro or Spanish origin. The aboriginal conch-shell trumpets, pottery ocarinas, and flutes have disappeared. Apparently, no Indian drum has survived, either. Three drums of African origin are made for accompanying the national dance, el tamborito (the little drum). The dance, its steps, story, rhythm, and associated drums were derived from Negro slaves. The short, fat caja is beaten with two sticks and carries the rhythm of the refrain (tonda). La repicador (the "feminine" drum) is long and slender, carrying the rhythm of the dancers and indicating the steps. El pujador (the "masculine" drum), with its deep and sonorous tones, accompanies the repicador. The pujador, like its partner, is long and narrow, resembling a pilón. All of the drums are made from hollow trunks sealed with hide at one end and open at the other. The hide is secured with ropes, and wooden wedges (inserted to keep the ropes taut) are typically African in style and function. Occasionally one sees a
crude, five-string Spanish guitar. It is usually made from balsa and locally called *la mejoranera*. In addition to the rural instruments, there are violins, small accordions, and flutes of Western manufacture.

Other woodworking crafts include agricultural implements, boats, and furniture (all previously discussed). It is worth noting that woodworking in central Panama is confined to basic items having little commercial or esthetic value. In general, products are crude, seldom decorated with incising or carving, never colored, and usually not even symmetrical. The exquisite Negro woodworking traits, still retained in Haiti, are not found in the savanna. Moreover, the Indian was not the craftsman in wood that he was in ceramics and metals.

**Hides, Skins, and Leather**

Some hides and skins were used by the Indians for ceremonial dress, basket lining, pouches and bags, floor and bench coverings, and drum heads. The Spaniards and Negroes introduced new traits to replace those that gradually fell from use. Today the principal sources of hides and skins are cattle, deer, peccary, goats, and iguanas. Iguana skin has limited uses, for the reptile is smaller than the other animals used and the skin tears rather easily and will not stand hard wear. Tobacco pouches and small bags are made chiefly from iguana skin. Goat and cowhide are also used in the manufacture of larger pouches, and bottles for water or
other liquids are sometimes made from goatskin. Rawhide sandals (cutarras) are the typical footwear. They are attached to the foot by means of a thong. The thong runs between the big toe and the second toe, and over the instep to another thong attached to the heel and tied around the ankle. Drum heads are locally made, usually of cowhide. Cowhide, peccary hide, and deer hide serve as ground coverings. When so employed grains may be dried on them or the campesinos may sleep upon them, a single hide thus serving two purposes. Very little tanning is practiced, but the mangrove offers a local source of tannin. Bridles, saddles, harnesses, and leather-backed and -seated chairs are manufactured in some of the larger towns. The industry is confined primarily to the Azuero Peninsula, where Spanish influence is greatest. Tanning, curing, and tooling processes, as well as machines, are used for making Spanish saddles, though harnesses are usually of fiber.

Miscellaneous Manufactures

A number of items may be added to the inventory of domestic crafts. Medicines are prepared from resins and herbs, and soap is occasionally made. The ordinary stone mano and metate are still used for grinding grains, but there is no specialized stone work. Female adornments of a wide variety are manufactured at home by the campesinos. Included are necklaces and bracelets of shell, colored
seeds, pieces of perfumed wood, rare bird bills, and wild animal teeth.

Conclusion

The present-day rural economy of the central savanna is a reflection of the several cultures which have occupied the hearth. It is, in the main, a combination of Indian plant economy and Spanish livestock economy, with minor Negro contributions. Recently, a number of modern North American and European traits have penetrated this system.

Indian influence in the botanical realm is evidenced by the maintenance of most of the useful pre-Columbian plants. To the native inventory were added trees and garden plants, carried to Panama by the Spaniards. With Old World flora came improved farming and forestry implements, new uses for many of the native plants, and new techniques for their exploitation. Although the majority of the utilitarian plants have come down from pre-Hispanic times, the Iberians seriously altered the hearth's economy with their introductions. But economic alteration did not result in destruction; the Indian items remain as a lower stratum.

The greatest change wrought by the Spaniards on the landscape of the Coclé hearth was through the establishment of an animal complex amidst a farming people. With livestock came property rights, fences, cultivated pastures, leatherworking, and a host of associated traits. Whereas most Indians found it relatively easy to accept Spanish
plants, few could make the change to a pastoral life. Such a transition was not culturally feasible, by and large, and the native clings to farming, hunting, and fishing even today. Where the Spaniard occupied the hearth with determination, pastoral elements dominate on the cultural landscape.

As new European crafts appeared in central Panama, aboriginal ones declined. Indian weaving, ceramics, and metallurgy vanished, and certain crafts have managed to survive in only the most rudimentary forms. To all of this the Negro added little, save in the realm of music and folklore. The Spaniards gained supremacy in every quarter where there was a concentrated effort as dictated by their culture.
NOTES TO CHAPTER IV


The following table shows the present land use in central Panama.

* - includes only the districts of Chamé and San Carlos
# - includes only the districts of Atalaya, Calobre, Montijo, Río de Jesús, and Santiago

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>AREA IN HECTARES</th>
<th>TOTAL AGRICULTURAL LAND</th>
<th>CULTIVATED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hectares</td>
<td>%</td>
</tr>
<tr>
<td>REPUBLIC</td>
<td>7,447,000</td>
<td>1,159,082</td>
<td>15.56</td>
</tr>
<tr>
<td>(total)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CENTRAL</td>
<td>1,623,000</td>
<td>524,938</td>
<td>32.34</td>
</tr>
<tr>
<td>PANAMA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(total)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coclé</td>
<td>500,000</td>
<td>123,826</td>
<td>24.76</td>
</tr>
<tr>
<td>Herrera</td>
<td>235,000</td>
<td>122,502</td>
<td>52.12</td>
</tr>
<tr>
<td>Los Santos</td>
<td>387,000</td>
<td>168,195</td>
<td>43.46</td>
</tr>
<tr>
<td>Panamá</td>
<td>76,000</td>
<td>18,448</td>
<td>24.34</td>
</tr>
<tr>
<td>(total)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Veraguas</td>
<td>425,000</td>
<td>91,967</td>
<td>21.64</td>
</tr>
</tbody>
</table>

(continued)
Note 2—Continued

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>LAND AT REST</th>
<th>TOTAL PASTURES</th>
<th>FOREST, SWAMP, WASTELAND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hectares</td>
<td>Hectares</td>
<td>Hectares</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REPUBLIC (total)</th>
<th>213,564</th>
<th>552,087</th>
<th>156,820</th>
<th>2.87</th>
<th>7.41</th>
<th>2.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTRAL PANAMA (total)</td>
<td>99,700</td>
<td>257,665</td>
<td>71,181</td>
<td>6.14</td>
<td>15.87</td>
<td>4.38</td>
</tr>
</tbody>
</table>

Coclé 18,893 58,804 20,337 3.78 11.76 4.06
Herrera 25,408 65,166 13,237 10.81 27.73 5.63
Los Santos 32,692 85,631 22,515 8.45 22.13 5.81
Panama* 3,427 8,763 1,349 4.50 11.53 1.77
Veraguas# 19,280 39,301 13,743 4.53 9.24 3.23


<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>UNITS</th>
<th>1.0 to 1.9</th>
<th>2.0 to 4.9</th>
<th>5.0 to 9.9</th>
<th>10.0 to 19.9</th>
<th>20.0 to 49.9</th>
<th>50.0 to 99.9</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>REPUBLIC (total)</th>
<th>79,504</th>
<th>17,585</th>
<th>24,699</th>
<th>15,813</th>
<th>11,260</th>
<th>7,241</th>
<th>1,989</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENTRAL PANAMA (total)</td>
<td>39,084</td>
<td>7,259</td>
<td>12,414</td>
<td>7,180</td>
<td>5,137</td>
<td>3,493</td>
<td>1,047</td>
</tr>
<tr>
<td>Coclé</td>
<td>10,280</td>
<td>2,476</td>
<td>3,646</td>
<td>2,248</td>
<td>1,122</td>
<td>553</td>
<td>144</td>
</tr>
<tr>
<td>Herrera</td>
<td>8,087</td>
<td>1,788</td>
<td>2,369</td>
<td>1,379</td>
<td>1,164</td>
<td>998</td>
<td>304</td>
</tr>
<tr>
<td>Los Santos</td>
<td>11,228</td>
<td>2,462</td>
<td>3,260</td>
<td>1,907</td>
<td>1,665</td>
<td>1,330</td>
<td>439</td>
</tr>
<tr>
<td>Panama*</td>
<td>2,056</td>
<td>533</td>
<td>673</td>
<td>447</td>
<td>261</td>
<td>102</td>
<td>31</td>
</tr>
<tr>
<td>Veraguas#</td>
<td>7,433</td>
<td>2,148</td>
<td>2,466</td>
<td>1,199</td>
<td>925</td>
<td>510</td>
<td>129</td>
</tr>
</tbody>
</table>

(continued)
Note 2--Continued

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>NUMBER OF FARMS BY HECTARAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100.0 to 199.9</td>
</tr>
<tr>
<td>Republic (total)</td>
<td>597</td>
</tr>
<tr>
<td>Central Panama (total)</td>
<td>295</td>
</tr>
<tr>
<td>Coclé</td>
<td>58</td>
</tr>
<tr>
<td>Herrera</td>
<td>61</td>
</tr>
<tr>
<td>Los Santos</td>
<td>134</td>
</tr>
<tr>
<td>Panama*</td>
<td>5</td>
</tr>
<tr>
<td>Veraguas*</td>
<td>37</td>
</tr>
</tbody>
</table>


4. Angel Rubio, La Vivienda Rural Panameña (Colón, 1950), 60.

5. Caro Baroja, op. cit.


7. Ibid.

8. H. H. Bennett, Soil Reconnaissance of the Panama Canal Zone and Contiguous Territory. USDA Tech. Bull. No. 94 (Washington, 1929), 10. Recent work shows that even soils which are satisfactory in mechanical and chemical analysis may be agriculturally poor because of lack of structure. In a good agricultural soil the particles are integrated in small crumbs. This, among other things, permits adequate entry of air and water into the soil and also renders it much more resistant to erosion than a structureless soil. The effect of continued cultivation and cropping is gradually to
break down the structure. For this reason, while weeding during the early stages of crop growth remains essential, any more cultivations than are necessary should be avoided in the roza. Moreover, every time fresh soil is turned to the surface its organic matter content is quickly oxidized under exposure to the sun. See: G. B. Masefield, A Handbook of Tropical Agriculture (Oxford, 1949), 2-3.


10. República de Panamá, Censos Nacionales de 1950. Primer Censo Agropacuario, op. cit., pp. 13-29. The averages for landownership in the savanna are slightly higher than for the entire Republic. For the Republic: 13.2 per cent of the farms are owner-operated; 68.7 per cent operated by squatters; 8.9 per cent rented; and 9.2 per cent operated under mixed tenure arrangements.

<table>
<thead>
<tr>
<th>Province</th>
<th>Hectares under Cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coclé</td>
<td>25,792</td>
</tr>
<tr>
<td>Herrera</td>
<td>18,691</td>
</tr>
<tr>
<td>Los Santos</td>
<td>27,356</td>
</tr>
<tr>
<td>Panamá (two districts)</td>
<td>4,910</td>
</tr>
<tr>
<td>Veraguas (five districts)</td>
<td>19,643</td>
</tr>
</tbody>
</table>

**LAND TENURE IN CENTRAL PANAMA**

<table>
<thead>
<tr>
<th>Coclé</th>
<th>3,282 hectares cultivated by 964 owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>17,974</td>
<td>8,039 squatters</td>
</tr>
<tr>
<td>1,148</td>
<td>490 renters</td>
</tr>
<tr>
<td>3,387</td>
<td>787 mixed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Herrera</th>
<th>5,181 hectares cultivated by 2,088 owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,588</td>
<td>4,295 squatters</td>
</tr>
<tr>
<td>959</td>
<td>538 renters</td>
</tr>
<tr>
<td>2,963</td>
<td>1,666 mixed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Los Santos</th>
<th>3,448 hectares cultivated by 1,269 owners</th>
</tr>
</thead>
<tbody>
<tr>
<td>15,491</td>
<td>6,457 squatters</td>
</tr>
<tr>
<td>4,216</td>
<td>2,072 renters</td>
</tr>
<tr>
<td>4,201</td>
<td>1,430 mixed</td>
</tr>
</tbody>
</table>

(continued)
LAND TENURE IN CENTRAL PANAMA

Panamá (two districts):
- 652 hectares cultivated by 171 owners
- 2,662 " " 1,353 quarters
- 638 " " 280 "
- 958 " " 252 "

Veraguas (five districts):
- 4,213 hectares cultivated by 1,560 owners
- 9,312 " " 4,148 quarters
- 3,429 " " 697 "
- 2,689 " " 1,034 "

96,392 hectares 39,084 farmers

12. AGI, Panamá 100. Bishop of Panama to the King. 10 July 1637.
17. This figure is determined by using the dimensions of a montón given by Oviedo. See following note.
20. Ibid.
21. Ibid.
22. Ibid., p. 57. Under the law, the family is defined as, "the father and mother, children under 21, grandparents, and children over 21 if living under the same roof."
23. Ibid.

24. The average annual cash income of rural families is probably not over $20. From this the government must be paid rent for its land (about $1.00 a year), a tax must be paid for slaughtering animals ($4.00 for a cow, $1.00 for a pig), the church must be paid for religious ceremonies ($1.50 for a christening, $8.00 for a burial service, $20.00 for a marriage), a little goes for clothes and tools and sometimes a little to the doctor. When the family does not have enough to pay for service it does without. Often the marriage must be postponed until the children are old enough to help pay for it. Hooper, "Rural Panama," op. cit., p. 249.

25. About 68 per cent of all children born in Panama are illegitimate. The percentage is much higher than this in the savanna according to government estimates. Rubio, op. cit., p. 57.


27. Home consumption of rice ranges from 92.4 per cent of the crop in Los Santos Province, to 81.5 per cent in Coclé. A little over 1 per cent is kept for seed. República de Panamá. "Resultados de la Encuesta Agropecuaria de Junio y de la Agrícola de Septiembre: 1955" (Panamá, 1955), cuadro no. 5. (Mimeo).

28. República de Panamá. Censos Nacionales de 1950. Primer Censo Agropecuario, op. cit., pp. 64-6. The Experiment Station at Divisa has produced 84.6 quintals of rice per hectare (3,500 pounds per acre), using O. sativa var. Rexoro (non-irrigated) rice. The average yield of this variety is 52.3 quintals per hectare (2,000 pounds per acre). There is no doubt that the national rice production can be raised with no increase in hectarage by using better varieties with proper planting techniques. E. Espinosa and C. E. Caviness, "Densidades de Siembra en Arroz," Folleto No. 4, Inst. Nac. de Agr. (Divisa, 1954), 1-4. (Mimeo.)

29. Biesanz, op. cit., p. 130.
The earliest reference to rice in Panama (that I have been able to locate) is in a document dated September 20, 1605. "...maíz, arroz, frutos de los dichos cosechan...." AGI, Panamá 30. Ordinance of the Cabildo of Panama. 20 September 1605. Two years later we read: "Suele acudir el maíz a ciento y más por uno; el arroz y los frijoles aun a mas; de maíz y plátanos ay abundancia todo el año, pero no se coge de ningún fruto en cantidad que sobre para poderse llevar a otra parte, sino es del arroz." Juan Requejo Salcedo, "Relación Histórica y Geográfica de la Provincia de Panamá," Relaciones Históricas y Geográficas de América Central (Madrid, 1908), 141.


33. Marketing Panamanian Agricultural Products, op. cit., p. 15. There are about 130 privately owned rice mills in Panama. The government owns three, one of which is at Santiago. Santiago and Penonomé each have a drier and a warehouse.


<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>5.0 to 9.9</th>
<th>10.0 to 19.9</th>
<th>20.0 to 49.9</th>
<th>Over 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocle</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Antón (Dist.)</td>
<td>1</td>
<td>3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Herrera</td>
<td>257</td>
<td>22</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Los Santos</td>
<td>29</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Panamá*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Veraguas#</td>
<td>9</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

* - includes only two districts
# - includes only five districts
Note 35--Continued

Ibid., pp. 35-45. The average number of hectares per farm in rice is given below:

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>AVERAGE HECTAREAGE FOR ALL FARMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coclé</td>
<td>0.8</td>
</tr>
<tr>
<td>Herrera</td>
<td>0.8</td>
</tr>
<tr>
<td>Los Santos</td>
<td>0.9</td>
</tr>
<tr>
<td>Panamá (two districts)</td>
<td>0.5</td>
</tr>
<tr>
<td>Veraguas (five districts)</td>
<td>1.0</td>
</tr>
</tbody>
</table>


37. The same method is used by some people to obtain coffee and maize from campesinos who have no access to markets. I have heard one such dealer bemoan the fact that some day roads will reach the hill people and spoil a lucrative business.

38. Total maize production in the savanna amounts to 694,049 quintals, as against the Republic's total of 1,375,790 quintals. República de Panamá. Censos Nacionales de 1950. Primer Censo Agropecuario, op. cit., pp. 78-85. Six to 10 per cent of the maize is sold, and domestic consumption ranges from 25.5 per cent of the crop in Los Santos Province, to 65.4 per cent in Coclé. Grain fed to animals is inversely related to family use: 61.6 per cent fed to animals in Los Santos, and 25.5 per cent in Coclé. One to 2 per cent is kept for seed. República de Panamá. "Resultados de la Encuesta..." op. cit., cuadro no. 9.


40. Criollo varieties raised at Divisa produce an average of 57.1 quintals per hectare (2,280 pounds per acre), or more than triple the yield of the subsistence farmer. Tiquisate yields about 84.5 quintals per

41. Savanna varieties of criollo maize appear to be derived from South America. Row numbers range from 12 to 22; ear lengths from 13.2 cm. to 20 cm. Stalks are purple or yellow and average between 2.34 mts. and 2.78 mts. Most local varieties are called either maiz criollo (creole corn) or maiz amarillo (yellow corn). Most of the maize from central Panama with which I am familiar has a clear yellow grain. Two purple-grained varieties are known (called anchon and calilla). Two or three varieties have red cobs; all the others are white. Grains for all varieties are of moderate size. There is nothing to suggest that any corn varieties diffused to Panama from the north before 1500 A.D.

42. P. C. Standley, "Flora of the Panama Canal Zone," Contributions from the United States National Herbarium, XXVII (1928), 217. Standley says, "The lima bean is native to Panama and is found in the wild state."

43. Marketing Panamanian Agricultural Products, op. cit., p. 5.

44. Ibid., p. 4.


46. The abbreviation UAAMP stands for the University of Arkansas Agricultural Mission to Panama. The photographs were kindly furnished through the cooperation of Dr. Carl D. Koone, Dr. J. L. Charlton, and Mr. W. J. Windham, Department of Rural Economics and Sociology, University of Arkansas, Fayetteville, Arkansas.

47. Sancocho is the nearest thing to a national dish in Panama. Moore describes it as "...a portion of everything edible in the Republic." Evelyn Moore, Sancocho (Panama, 1947), 3. Meats, tubers, corn, beans, and greens are all boiled together and flavored with coriander. The meat and vegetables are placed in a large soup bowl and the rich broth is then poured over it.

48. Moore, in her description of sancocho, uses the word yuca to mean manioc. Ibid., p. 3. This usage is untenable in Panama, where yuca and yuca are clearly distinguished because they are two entirely
different native plants. Biesanz (op. cit., p. 243) refers to yucca as a "starchy tuber." Guzmán uses yuca on one page and yucca on another. L. E. Guzmán, Farming and Farmlands in Panama (Chicago, 1956), pp. 8 and 13. Carl Sauer (see Bibliography) alternates between both forms in his various writings.

The starchy tuber should always be called either yuca or manioc. Cassava ought to be reserved to mean the bread made from bitter manioc.

49. Yucca (Yucca elephantipes) is chiefly planted, but may be an escape in places within the savanna. Neighboring Costariqueños call it itabo, while the Nahuatl word, izote, is common further north.

50. Oviedo, op. cit., II, Lib. VII, Cap. V, 195. "Name (sic!) es una fructa extrangera e no natural de aquestas Indias... e vino con esta mala casta de los negros...."

51. Standley, op. cit., p. 34. Standley believes that all edible yams are of Old World origin.


54. Ibid., II, Lib. VII, Cap. V, 176. Maní is the name used in Haiti, according to Oviedo.

55. In 1955-56 the peanut crop was valued at less than $100,000. The current prices paid to farmers are $10 per quintal for shelled nuts, or $7.50 per quintal unshelled. R. K. Skinner, "Peanut Industry Offers Interior New Wealth," The Sunday American (Panamá, 15 April 1956), 1-5.

56. Columbus first attempted to introduce sugar cane into America in 1493, but this effort apparently failed. However, in 1506 Pedro de Atienza carried it to Hispaniola, and two or three years later the first American sugar was made there. Mexico acquired a few of the canes in 1520, and Peru, between 1533-35. Barrett, op. cit., p. 112. One Panamanian student of the subject believes that cane came into Panama about 1525. M. M. Alba, Geografía Descriptiva de la República de Panamá (4th ed., Panamá, 1954), 200. It might be noted that cane, a native of southeastern Asia, had reached Spain by 755 A.D., coming to that country with the invading Moors.
In the savanna the average sugar cane yield is 47.3 quintals per hectare (19 tons per acre). In Louisiana the average for 1954 was 22.75 tons per acre, but between 1909 and 1954 Louisiana's average per acre exceeded the present savanna average only four times (in 1944-45 and 1952-53). Landry, op. cit., 385.

The variety Barbados, cultivated with modern methods produces 112.2 tons of cane per hectare (44.88 tons per acre) at Divisa. The poorest yielding of the six varieties grown at Divisa produces 73.4 tons per hectare (29.36 tons per hectare). E. Espinosa and C. E. Caviness, "Prueba de Variedades de Caña," Folleto No. 6, Inst. Nac. de Agr. (Divisa, 1954), 5. (Mimeo.)

Average yield figures for the savanna include commercial and subsistence production. Subsistence yields are lower, while commercial yields are higher, than the averages indicate.

The Republic produced 7,745,550 pounds of molasses in 1950. The table below gives production by provinces and the per cent marketed in each.

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>MOLASSES PRODUCTION (Lbs.)</th>
<th>PER CENT MARKETED BY EACH PROVINCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocle</td>
<td>831,500</td>
<td>37.0</td>
</tr>
<tr>
<td>Herrera</td>
<td>1,365,000</td>
<td>42.0</td>
</tr>
<tr>
<td>Los Santos</td>
<td>2,440,250</td>
<td>40.0</td>
</tr>
<tr>
<td>Panama*</td>
<td>79,350</td>
<td>60.0</td>
</tr>
<tr>
<td>Veraguas#</td>
<td>1,314,050</td>
<td>54.0</td>
</tr>
</tbody>
</table>

* - includes only two districts
# - includes only five districts

Ibid., pp. 207-8. The 1950 production of panela in the Republic was 7,749,223 pounds. The table below gives the production by provinces and the per cent marketed in each.
Note 59—Continued

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>PANELA PRODUCTION (Lbs.)</th>
<th>PER CENT MARKETED BY EACH PROVINCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cocle</td>
<td>732,854</td>
<td>65.0</td>
</tr>
<tr>
<td>Herrera</td>
<td>11,466</td>
<td>10.0</td>
</tr>
<tr>
<td>Los Santos</td>
<td>67,282</td>
<td>10.0</td>
</tr>
<tr>
<td>Panama</td>
<td>125,186</td>
<td>88.0</td>
</tr>
<tr>
<td>Veraguas</td>
<td>328,583</td>
<td>87.0</td>
</tr>
</tbody>
</table>

* - includes only two districts
# - includes only five districts


61. República de Panamá. Estadística Panameña, XV (Julio de 1956), 77. During the first four months of 1956 Panama exported 8,437 kilos (18,561 pounds) of refined sugar. Most of this went to the United States for a price of $939.

62. The two mills have a grinding capacity of 4,000 tons of cane, and a refining capacity of 250 tons of sugar, per day. Each ton of cane will yield about 165 to 175 pounds of refined sugar. Marketing Panamanian Agricultural Products, op. cit., p. 16.

63. The yield of black strap is about six gallons per ton of cane, and it takes approximately 2.7 gallons of black strap to produce one gallon of alcohol. The market for black strap is limited, but a 2,000 liter (528 gallon) drum of alcohol sells for $55. Ibid., p. 16.

64. Ibid.

Note 65--Continued

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>5.0 to 9.9</th>
<th>10.0 to 19.9</th>
<th>20.0 to 49.9</th>
<th>50.0 to 99.9</th>
<th>Over 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coclé</td>
<td>60</td>
<td>10</td>
<td>8</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Herrera</td>
<td>44</td>
<td>16</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Los Santos</td>
<td>12</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Panama*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Veraguas#</td>
<td>40</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

* - includes only two districts
# - includes only five districts

66. In the savanna any gourd or gourd-like plant is called a *calabazo* (calabash). The "true" gourds belong to the family Cucurbitaceae. The family Bignoniaceae (Bignonia) includes *Crescentia cujete*, which is called *calabazo*, *totumo*, *totumbo*, or *palo de calabaza*. The family also includes the sausage tree, candle tree, and trumpet bush.

67. The Cuna Indians employ peppers in a number of ways to ward off evil spirits, or to appease those that have been offended. Peppers may be burned, dropped in deep pools of water, or tied to the bows of boats. There seems to be a relationship between the beliefs of the Cuna and campesinos with regard to peppers and mysticism. Possibly, this reflects a common Chibchan origin, though it might represent a much later diffusion from either north or south.


69. The members of the Arkansas Agricultural Mission to Panama (living in Divisa, Herrera) raise okra for their own use. I was told that this is the only plant that is never stolen from their gardens. Most campesinos do not consider okra fit to steal, much less eat.

70. With the possible exception of one African species, all members of the genus *Cocos* are found in America. Barrett, op. cit., p. 248.

Oviedo, op. cit., II, Lib. IX, Cap. IV, 277-81. Oviedo returned to Panama, after a trip to Spain, in 1525. He found that the colony at Santa María de la Antigua del Darién had been abandoned (1524) and that the Indians had sacked and burned the village. With no place to settle (he was unwelcome at Pedrarias' new capital of Panama City) Oviedo moved to Nicaragua. Again, Oviedo left the New World for Spain in 1530. Therefore, his description of the "vast groves" of coconuts is based on observation between 1525 and 1530. Five years hardly allows sufficient time for the diffusion and acceptance of the nut, and the establishment of groves, unless coconuts are aboriginal to America.

The first Spaniard to visit Nicaragua was Gil González Dávila, who departed for that land from Taboga Island (Panama Bay) on January 21, 1522. Oviedo followed Dávila three years later. This only allows three years for the coconut palm to become established in Nicaragua, assuming Dávila introduced it. A coconut palm will not mature in so short a period, therefore, it was in Nicaragua before the first Spaniard entered the country.

Outside of Panama the uses of the coconut are almost too numerous to mention. The roots may be used as a remedy for fevers, the trunk for house construction, boat-building, and furniture; it is highly esteemed by many people because of its beautiful grain. The leaves are used for thatch, baskets, hats, and mats. Combs may be made from foot stalks. The fibrous network at the base of the leaves serves for sieves, and in some areas the natives weave it into clothing. The flowers are used as a medicinal astringent: from the cut flower-stalks palm wine is obtained in quantity; and in Ceylon a spirit called "anack" is distilled from the liquid. From the unfermented juice, sugar ("jaggery") is procured; vinegar may also be obtained from the liquid. The fruit is well-known throughout the world. The husk produces coir (kire), from which ropes, cordage, mats, brooms, brushes, bedding, and other useful articles may be manufactured. The hard shell may be made into lamps, masks, drinking vessels, and spoons. The white kernel (called "copra" when dried) is used elsewhere, as in Panama, for oil. The milk is used by almost everyone using the coconut; this is the primary subsistence function of the palm

75. Otto Lutz, Los Habitantes Primitivos de la República de Panamá (Leipzig, 1924), 16. Lutz believes that yuca and pejibaye comprise a plant association, characteristic of Chibchan culture, of which Guaymi is a derivative. He is saying, in effect, that the use of the plants does not necessarily mean that a group is of Chibchan origin, but that they could not be so derived without the association.

76. Sauer, "Cultivated Plants," op. cit., p. 525. The plant is native between Ecuador and Nicaragua, the extreme limits of Chibchan influence. Sauer suggests that the palm does not occur anywhere in America in the wild state.

77. Oviedo, op. cit., II, Lib. IX, Cap. XXIII, 306-7. The name avocado is derived from aguacate, which in turn comes from the Nahuatl ahuacatl. In some parts of tropical America it was once known as cura.


79. Papaya is the common name for C. papaya in all Spanish-speaking countries except Cuba, where the word should never be used because it is obscene. The Cuban name is fruta bomba.

80. Sauer, "Cultivated Plants," op. cit., p. 538. Sauer does not think that cacao was a pre-Conquest tree in Panama. On the other hand, Standley, who is probably more familiar with the flora of Panama than any other person, states unequivocally that cacao is native and pre-Hispanic. Standley, op. cit., p. 34.


82. Barrett, op. cit., pp. 88-9. Besides the nutritious fat, starch, and protein, cacao gives the drinker a 2 per cent theobromine stimulus. Most coffee has only about half as much of the similar alkaloid, caffeine.
Barrett says, "The Caribs carried the fruit on their raids: a few slips or a top left on the beach after a feast of Arawak flesh and the plant was "introduced." Barrett, op. cit., pp. 159-60.

República de Panamá. Censos Nacionales de 1950. Primer Censo Agropecuario, op. cit., pp. 171-81. In 1950 central Panama produced 2,133,800 bunches of bananas; the Republic, 10,497,400 bunches. In 1951 only 458 bunches of bananas were shipped by truck to the Panama City market, the bulk of the sales being made in local markets. Marketing Panamanian Agricultural Products, op. cit., p. 8.

In 1950 the savanna produced 26,449,600 plantains; the Republic, 94,735,100 plantains. The subsistence value of the crop may be compared with bananas on a rather even basis in some areas. However, as an item in the diet, bananas could be eliminated, whereas plantains would be sorely missed. Very few plantains are marketed outside the savanna. In 1951 only 9,300 plantains were shipped out of the region, though over 26,000,000 were raised. Marketing Panamanian Agricultural Products, op. cit., p. 8.

Next to the coconut, no other food fruits are more widely known or used than bananas and plantains. The genus Musa, with at least fifty species, is the only important one of the six Musaceae genera. The greatest number of species are found from south China to the Philippines, where about twenty are endemic, to the East Indies and Northern Australia, then across the Pacific to the east and to the Deccan Plateau on the west. In 327 B.C., Alexander found bananas in the Indus Valley, along with cotton and mangos. Assyrian bas-reliefs show plants that seem to be bananas, indicating that they may have been imported as early as 1100 B.C. The name Musa is in honor of Antonio Musa, physician to Emperor Augustus.

In 1516 Friar Tomás de Berlanga found the Canary Islanders depending to quite an extent on bananas, and in that year he carried a few roots to Hispaniola. It was probably from these plants that the banana spread widely throughout the West Indies before 1550. Barrett, op. cit., pp. 173-6.

Authorities in general are agreed that the banana came over with the Spaniards, but Sauer, among others, thinks the plantain is pre-Columbian in America. Sauer, "Cultivated Plants," op. cit., pp. 526-7. Humboldt
maintained that the plantains, in two of its species, were native to America and well-known to the aborigines. A. von Humboldt, Essai politique sur le royaume de la Nouvelle-Espagne, V (2d ed., Paris, 1824), 385-7, and note on p. 397. In Oviedo's classic account of plantains on Hispaniola, he states, "Here they call them plátanos" ("...que aca llaman plátanos."). It is therefore suspected that the Spanish word plátano is of Arawak origin, and that Oviedo confused the fruits. He apparently incorrectly used the word plátano to mean banana. His writing gives every indication that it was not the musa (banana) with which he was familiar. Oviedo, op. cit., II, Lib. VIII, Cap. I, 204-9. In many parts of Spanish America both bananas and plantains are called plátanos. This is frequently the case in Panama.


89. The "sweet lime" is larger than the common lime, and has a sweet, rather insipid flavor.


91. Madre-de-cacao has a number of different names in Middle America. In Panama it is variously known as bala, balo, madera negra, and mata-ratón. In El Salvador it is called palo de hierro; sangre de drago in Costa Rica; madriado in Nicaragua; cacahuancha in Mexico, and bien vestido or piñon florido in Cuba. Standley, op. cit., p. 209.


93. AGI, Panamá 30. Memorial from the capítulos of Panama City for the capítulos of the cattle region, 1592.

94. Standley, op. cit., p. 75.
Heads of Livestock in 1790

<table>
<thead>
<tr>
<th>Location</th>
<th>Price Each</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>JURISDICTION OF PANAMÁ</strong></td>
<td></td>
</tr>
<tr>
<td>21,000 Valley of Pacora</td>
<td>8 pesos</td>
</tr>
<tr>
<td>5,000 Chepo</td>
<td>8 &quot;</td>
</tr>
<tr>
<td>4,000 Panamá</td>
<td>10 &quot;</td>
</tr>
<tr>
<td>2,000 Portobelo-Cruces</td>
<td>12 &quot;</td>
</tr>
<tr>
<td>4,000 Arraiján</td>
<td>8 &quot;</td>
</tr>
<tr>
<td>3,500 La Chorrera</td>
<td>8 &quot;</td>
</tr>
<tr>
<td>1,500 Capira</td>
<td>8 &quot;</td>
</tr>
<tr>
<td><strong>CENTRAL SAVANNA</strong></td>
<td></td>
</tr>
<tr>
<td>4,000 Chame</td>
<td>6 pesos</td>
</tr>
<tr>
<td>1,500 San Carlos</td>
<td>5 &quot;</td>
</tr>
<tr>
<td>20,000 Antón</td>
<td></td>
</tr>
<tr>
<td>6,000 Peñonomé</td>
<td></td>
</tr>
<tr>
<td>1,500 Ola</td>
<td></td>
</tr>
<tr>
<td>1,500 Calobre</td>
<td></td>
</tr>
<tr>
<td>20,000 Nata-Cocle</td>
<td></td>
</tr>
<tr>
<td>12,000 Santa María</td>
<td></td>
</tr>
<tr>
<td>8,000 Parita-Ocú</td>
<td></td>
</tr>
<tr>
<td>16,000 Los Santos, Paseí</td>
<td>5 &quot;</td>
</tr>
<tr>
<td>16,000 Las Tablas, Pocrí</td>
<td></td>
</tr>
<tr>
<td>16,000 Santiago-environs</td>
<td></td>
</tr>
<tr>
<td><strong>VERAGUAS-CHIRIQUI</strong></td>
<td></td>
</tr>
<tr>
<td>5,000 San Francisco</td>
<td>5 pesos</td>
</tr>
<tr>
<td>3,500 Cañazas</td>
<td>5 &quot;</td>
</tr>
<tr>
<td>7,000 Pueblo Nuevo</td>
<td>3 &quot;</td>
</tr>
<tr>
<td>30,000 all of Chiriquí</td>
<td>3 &quot;</td>
</tr>
<tr>
<td><strong>TOTAL NUMBER OF LIVESTOCK IN PANAMA (1790)</strong></td>
<td><strong>158,000</strong></td>
</tr>
<tr>
<td><strong>TOTAL NUMBER OF HORSES IN PANAMA</strong></td>
<td><strong>106,500</strong></td>
</tr>
</tbody>
</table>

Also see Note 100 below.
artificial pasturage, whereas 55,444.4 hectares are in natural pasturage.

98. Arturo Motta, "La Industria Ganadera, Su Desarrollo y Perspectivas," Panamá, 50 Años de República (Panamá, 1953), 382. Over 20 per cent of the farms with stock have only two or three head of cattle: 1.6 per cent of the farms have 100-199 head; 6 " " " " " " 200-499 " " " " 6 " " " " " " over 500 " " " " 2 " " " " " "

99. See Notes to Chapter I, Note 2.

100. Motta, op. cit., p. 383. Less than 1 per cent of the savanna animals are pure bred; 46.5 per cent of the cattle are crosses (chiefly with Zebu); 52.6 per cent are criollo.


<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>CATTLE</th>
<th>PIGS</th>
<th>HORSES</th>
<th>MULES</th>
<th>GOATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPUBLIC</td>
<td>570,023</td>
<td>181,975</td>
<td>157,771</td>
<td>5,109</td>
<td>3,410</td>
</tr>
<tr>
<td>CENTRAL SAVANNA</td>
<td>314,512</td>
<td>102,485</td>
<td>85,311</td>
<td>810</td>
<td>2,489</td>
</tr>
<tr>
<td>Cocle</td>
<td>57,395</td>
<td>16,345</td>
<td>18,504</td>
<td>181</td>
<td>244</td>
</tr>
<tr>
<td>Herrera</td>
<td>80,707</td>
<td>22,836</td>
<td>18,567</td>
<td>113</td>
<td>147</td>
</tr>
<tr>
<td>Los Santos</td>
<td>117,622</td>
<td>43,646</td>
<td>28,744</td>
<td>266</td>
<td>1,881</td>
</tr>
<tr>
<td>Panama</td>
<td>8,473</td>
<td>1,327</td>
<td>2,969</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>Veraguas</td>
<td>50,315</td>
<td>16,331</td>
<td>16,527</td>
<td>214</td>
<td>217</td>
</tr>
</tbody>
</table>

* - includes only two districts
# - includes only five districts

Below is given the number of livestock in Panama for each of the years that censuses were taken. Ibid., p. ix.

<table>
<thead>
<tr>
<th>AREA</th>
<th>YEAR</th>
<th>CATTLE</th>
<th>PIGS</th>
<th>HORSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republic</td>
<td>1790</td>
<td>158,000</td>
<td>------</td>
<td>35,000</td>
</tr>
<tr>
<td></td>
<td>1898</td>
<td>164,795</td>
<td>83,044</td>
<td>34,000</td>
</tr>
<tr>
<td></td>
<td>1904</td>
<td>144,595</td>
<td>82,236</td>
<td>17,240</td>
</tr>
<tr>
<td></td>
<td>1910</td>
<td>128,256</td>
<td>49,835</td>
<td>26,909</td>
</tr>
<tr>
<td></td>
<td>1938</td>
<td>94,363</td>
<td>20,087</td>
<td>4,056</td>
</tr>
<tr>
<td></td>
<td>1942</td>
<td>333,960</td>
<td>137,958</td>
<td>------</td>
</tr>
</tbody>
</table>

a - See Note 96 above
b - No count made


<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>CHICKENS</th>
<th>DUCKS</th>
<th>TURKEYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>REPUBLIC</td>
<td>1,633,587</td>
<td>85,540</td>
<td>23,361</td>
</tr>
<tr>
<td>CENTRAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAVANNA</td>
<td>823,409</td>
<td>42,519</td>
<td>12,673</td>
</tr>
<tr>
<td>Coclé</td>
<td>164,829</td>
<td>8,667</td>
<td>7,341</td>
</tr>
<tr>
<td>Herrera</td>
<td>178,867</td>
<td>9,050</td>
<td>752</td>
</tr>
<tr>
<td>Los Santos</td>
<td>292,573</td>
<td>13,080</td>
<td>1,691</td>
</tr>
<tr>
<td>Panama*</td>
<td>34,952</td>
<td>1,245</td>
<td>1,757</td>
</tr>
<tr>
<td>Veraguas#</td>
<td>152,188</td>
<td>10,477</td>
<td>1,132</td>
</tr>
</tbody>
</table>

* - includes only two districts  
# - includes only five districts

103. In 1954 only 830 individuals claimed fishing as their principal occupation in the vicinity of the Gulf of Panama. This group operated 264 boats of all descriptions: 80 diesel or steam, 39 gasoline (mostly outboard motor), 72 sloops, and 133 assorted vessels (ranging from canoes to rowboats). Alba, op. cit., p. 191.

Sportsmen generally recognize Panama Bay as one of the finest tropical fishing grounds in America. While there is a desire to bring wealthy sportfishers into the country, there are, at the same time, discriminatory laws preventing foreign commercial operations. Until the laws are changed there can be no foreign capital, equipment, or know-how for Panama's fisheries.


106. Standley, op. cit., p. 222.
In 1955, twelve bales of cotton were produced in Chiriquí Province. In 1956 the production for the entire Republic dropped to only six bales. I have never seen cotton growing as a crop (subsistence or commercial) in central Panama, yet, the plant is supposed to be native to the region.

The only major attempt to grow cotton in Panama was made in 1863, when the United States donated one hundred bushels of seed to the Colombian government. Some 700 acres were planted that year, and plans called for an expansion of 3,000 acres in 1864. However, the project failed. Apparently, there was apathy on the part of the campesino to plant a crop with which he was not familiar. He was not equipped to handle the crop and did not have the desire to raise it. C. T. Bidwell, The Isthmus of Panama (London, 1865), 264-71.

Rubio, La Vivienda Rural Panameña, op. cit., p. 62.

Usually, the campesino trades eggs for salt, kerosene, and soap.

República de Panamá. Censos Nacionales de 1950. Primer Censo Agropecuario, op. cit., pp. 207-8. In 1950 about one-third of the 256,079 sacks of charcoal produced in the Republic came from central Panama. In all of the producing areas over 99 percent was marketed, according to the census. However, the figures obscure the fact that much of the domestic production was not reported. The census reports the amount of charcoal produced by people who make their living, to a large degree, in such a manner. Most campesinos manufacture some charcoal on their own.

<table>
<thead>
<tr>
<th>Province</th>
<th>Charcoal Production (Sacks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coclé</td>
<td>11,183</td>
</tr>
<tr>
<td>Herrera</td>
<td>1,503</td>
</tr>
<tr>
<td>Los Santos</td>
<td>2,340</td>
</tr>
<tr>
<td>Panamá (two districts)</td>
<td>83,637</td>
</tr>
<tr>
<td>Veraguas (five districts)</td>
<td>0</td>
</tr>
</tbody>
</table>

Ibid., pp. 205-6. In 1950 Panama produced 147,606 hats, of which 91,711 were sold. Coclé was the leading producer with 55,802 (45,210 sold). The
District of La Pintada produced 43,310 hats (37,081 sold). Herrera marketed 50 per cent of its 13,585 hats; Los Santos, 35 per cent of 37,560; Veraguas (five districts), 65 per cent of 6,317. The District of Santiago accounted for half of the total Veraguas production. The two savanna districts of Panamá Province only made 254 hats, almost all for domestic use.

113. *El penonomeño* means "the Penonomenian."

114. República de Panamá. Censos Nacionales de 1950. Primer Censo Agropecuario, op. cit., pp. 205-6. Of the 4,195 hammocks made in the savanna in 1950, about half (2,331) were sold. Production was as follows: Coclé, 399 (65 per cent sold); Herrera, 265 (35 per cent sold); Los Santos, 192 (35 per cent sold); Panamá (two districts), 30 (perhaps a few sold); Veraguas (five districts), 128 (a few sold).

115. Ibid., pp. 205-6. Central Panamá marketed 25,745 of the 37,745 brooms produced in 1950. Coclé alone manufactured 21,072 brooms, selling 18,820. Herrera reported only 47 brooms; Panamá (two districts), 60 brooms; Veraguas (five districts), 499 brooms. Only a few of the brooms made in the last three provinces left the manufacturing family. Los Santos sold about 22 per cent of the 6,648 brooms made there.

116. ACM, op. cit. This document mentions that Penonomé (in 1790) was then a center of agave and cotton (tree cotton?) production. Perhaps the presence of two binding fibers were partially responsible for Penonomé's early importance in broom manufacture.


118. Ibid., pp. 241-2.

119. The *bateas* used for winnowing are usually round or rectangular, with approximately six square feet of surface. They are not decorated. In recent years, batea painting and lacquering has achieved wide popularity among Americans in the Canal Zone. Copying Coclé Indian pottery designs (from Lothrop's work) the women of the Zone make beautiful trays. Many Zone women have collections of several hundred bateas, of all shapes, sizes, colors and patterns. The demand for unfinished *bateas* with which to work has resulted in the manufacture of a limited number
for sale. The North American influence may be seen in the new styles that have recently made their appearance on the streets of Panama City: hearts, clubs, diamonds, spades, and leaves.

120. Oviedo, Sumario de la Natural Historia de las Indias (México, 1950), 248-51. The washers used large bateas by holding them against the stream current to wash out wastes.

121. Biesanz, op. cit., pp. 355-9. John and Mavis Biesanz say, "The tamborito is the highest expression of Panamanian folk art, combining dance, music, lyrics, and native costume." The dance began with the Negro slaves and supposedly portrays tribal wars and the courtship of the ostrich. Lyrics lampoon the upper classes and the subject for ridicule may be anyone or anything. For a complete discussion, see Biesanz' book.
CHAPTER V

TRADE, TRANSPORT, AND COMMUNICATIONS

The trade, transport, and communications complex occupies a significant position on the modern savanna landscape, and is intricately interwoven with the many physical and cultural elements already discussed. As in most other aspects of present-day savanna life, Iberian cultural forms predominate. The well-organized system of trade, transport, and communications that was spread across the Cocle hearth before 1515 all but collapsed within half a century after the Conquest began. Only in certain means of transport are there vestiges of the aboriginal complex.

Panama became a land of passage when Balboa crossed Darién in 1513, and its history a narrative of the arrival, dominance, and decline of one foreign group after the other. Despite the resulting emphasis on inter-oceanic passage and the accompanying population concentration at each end of the route, two-thirds of all modern Panamanians live west of the Canal Zone. The central savanna is, in effect, the geographical center of that portion of the Republic effectively controlled by the national government. Communications to the east and west of the savanna are
maintained over land, in the main, not over water or by air. Although most of the inhabitants live within thirty-five miles of the coast, they are separated from the trans-Isthmian area by a mountain barrier and the sparsely populated thorn savanna (compare Maps II and XIII). This setting of relative isolation has produced a descriptive term for the savanna and its occupant—interior and interiano, respectively. In Panamanian Spanish el interior literally means the central savanna. Other sections of the Republic, even other savanna portions, are almost never included within the meaning of the expression. The interiano is well aware that he is geographically removed from the main currents of foreign culture that flow through the passage route. Such has been the case for over 400 years. Since the coming of the Spaniard, some commercial-minded interianos have been mainly concerned with overcoming their relative isolation. There has been some improvement in overland transport and communication, coming as fingers stretched from Panama City. However, many pre-Columbian routes have disappeared during the 400 years that all attention was focused on the Panama City area. Only recently has there been a concerted effort to bind the interior tightly to the trans-Isthmian zone, primarily through the media of highways, airlines, and telecommunications.
Central Panama's main artery of transport is the Carretera Nacional (National Highway), a portion of the Inter-American Highway (Map XIX). The National Highway is the "main street" of western Panama, although it is not a new route, contrary to popular opinion. The present road generally follows the course set by Gonzalo de Badajoz, when he made the first entrada into the savanna in 1515 (see chap. ii and Map IX). There is good reason to believe that Badajoz was following an Indian trail from Chame to Penonomé, thence to Natá and the Azuero Peninsula. He was receiving directions along the way from Indians who were thoroughly familiar with the most direct route to the next village. The aboriginal routes were undoubtedly well-established trade lanes, for Coclé peoples were carrying on a lively commerce before the arrival of the Europeans.¹ Before 1515 the savanna was the most densely settled portion of the Isthmus and trails were located where movement was relatively easy. Most often local relief and vegetation density controlled the route location. Because all savanna rivers are short and flow toward the Pacific, they are practical for communications lines perpendicular to the major belt of settlement only. To traverse the populated regions in a lengthwise fashion inter-fluve trails were more or less a necessity.

The modern highway faithfully follows the major trails, as did Badajoz, Espinosa, and successive waves of invading
ROADS
- Hard surface, all-weather
- Gravel or broken pavement, all-weather
- Dirt, passable only in dry weather
- --- Proposed all-weather highway

RAILROADS
- - - Broad gauge—5'6"
- - - Narrow gauge—3'0"

The Central Savanna
Spaniards. And yet, the Panamanian government is frequently criticized because the Carretera Nacional passes through the non-agricultural savanna. Critics say that the road serves only the interests of cattlemen and that roza agriculturists are totally neglected. Any such criticism shows an ignorance of Panamanian prehistory.

Once the Spaniards were firmly established at Natá, certain improvements in the road were made; especially significant was the construction of bridges (Fig. 88). In places the route was altered slightly to include newly settled Spanish towns in the savanna. Modern engineers have made few route alterations, except to straighten and

Fig. 88.—Puente del Rey, or King's Bridge, located a half mile north of Old Panama City. Built in 1519, this is probably the oldest European-built bridge in the Western Hemisphere. November 20, 1955.
bank curves and build new steel or concrete bridges (Fig. 89). Paving has been sporadic since the 1920's, but today the first-class highway reaches west only to Penonomé (Fig. 89 and Map XIX). From that city to the west and into the Azuero Peninsula broken macadam alternates with dirt and gravel (Figs. 90, 91). Despite the poor condition of the road west of Penonomé it may be classed as all-weather, and will remain the vital transport link for the savanna. Present plans call for completion of the National Highway to the Costa Rican frontier and work is proceeding at this writing.

![Concrete bridge at highway](image)

**Fig. 89.**—Concrete bridge at highway at San Carlos, Panamá. This section of the National Highway is in excellent condition. November 23, 1955.
Fig. 90.--A portion of the macadam highway between Chitre, Herrera, and Los Santos, Los Santos. The same type of highway extends from Penonomé, Cocle, to Santiago, Veraguas. December 28, 1955.

Fig. 91.--Gravel section of the National Highway, near Santiago, Veraguas. From Santiago to David, Chiriquí, the road is no better than this--generally worse. November 24, 1955.
Most feeder roads branching from the main highway are dirt or gravel surfaced. Some secondary roads are passable in a car during the dry season, while some are little more than trails and permit only ox carts (Fig. 92). In all probability, many of the trails have changed little since the Conquest (Fig. 93). They link the same centers of population and are traversed by many people that still carry goods on their backs. It appears that roads as a whole have gradually improved in the savanna, but have declined in number since the bulk of the aboriginal population was driven out in the early 1500's.

Means of Transport

As in Indian times, the human back is still a primary means of transport in the central savanna, though the aboriginal carrying pole has disappeared. The latter probably diffused to Panama from northwestern Mexico, the only other area in America where this technique was employed. West of the savanna the Guaymí use the tump-line, but there is no evidence that it is pre-Iberian in Panama. The line is not used in the savanna. Table VII indicates the methods utilized in the savanna for transporting goods to market. The horse has become increasingly important since the Conquest and is today the most important means of savanna transport. Nonetheless, it has yet to replace foot travel in Coclé.

Horses, mules, burros, and oxen.—During the colonial period the Spaniards introduced the principal beasts of
Fig. 92.—A "farm-to-market" road, west of Parita, Herrera. For miles, this is the only road serving a densely settled agricultural area. Oxen cannot use the road during some weeks of the rainy season. December 28, 1955.

Fig. 93.—Las Cruces Trail, one mile northwest of Madden Road, C. Z. The cobbled trail extended from Panama City to Cruces (eighteen miles) and was used from the late sixteenth to the mid-nineteenth century. November 27, 1955.
TABLE VII
FARM-TO-MARKET TRANSPORT

<table>
<thead>
<tr>
<th>Means of Transport</th>
<th>Number of People Reporting, by Province</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Republic</td>
</tr>
<tr>
<td>Foot</td>
<td>19,291</td>
</tr>
<tr>
<td>Horse</td>
<td>30,729</td>
</tr>
<tr>
<td>Cart</td>
<td>3,111</td>
</tr>
<tr>
<td>Boat</td>
<td>4,834</td>
</tr>
<tr>
<td>Truck &amp; Chiva</td>
<td>5,546</td>
</tr>
<tr>
<td>Foot &amp; Boat</td>
<td>653</td>
</tr>
<tr>
<td>Horse &amp; Truck</td>
<td>3,463</td>
</tr>
<tr>
<td>Foot &amp; Truck</td>
<td>752</td>
</tr>
<tr>
<td>Other</td>
<td>802</td>
</tr>
</tbody>
</table>

burden known to them. A large number of associated traits accompanied the introduction. There is a possibility that horses first came to Panama with Nicuesa and Encisco (1510).4 It is not known if any of the animals of either expedition survived the hardships of those first colonies. Later, in 1514, Pedrarias brought horses to Santa María de la Antigua del Darién (see chap. iv).

Once trans-Isthmian traffic was established after 1519, the mule replaced the horse as the prime mover of heavy loads. Recuas, or mule trains, hauled goods across the Isthmus until the railroad was completed in 1855. Each recua normally consisted of one hundred mules, and could transport up to fifteen tons of cargo.5 It is difficult to estimate the number of mules involved in
inter-oceanic shipping, for traffic fluctuated from month to month, and year to year. The dry season was always the time of heaviest travel for both cargo and passengers. Even the arrival of the Spanish fleets was geared to coincide with the onset of the dry months. When the Panama Railroad was completed, some 3,000 mules were engaged in carrying cargo from Panama City to Cruces. From Cruces goods moved either over the Camino Real to Porto Belo or down the Chagres River by boat (Fig. 94). Assuming that the California Gold Rush created traffic conditions similar to other peak periods, I estimate about the same number of mules for the active years of the sixteenth century—or, about 3,000. Lesser numbers were employed during the intervening period.

Fig. 94.--The Chagres River meets the Atlantic Ocean, six miles southwest of Colón. Sailing up the river the Spaniards came within eighteen miles of the Pacific. March 9, 1956.
The savanna supplied many of the mules for the trans-Isthmian recuas, although never enough during the years of greatest activity. Mules were brought to Panama from Nicaragua and Honduras, and in the late 1500's Honduras was shipping 600 mules to Panama City every year.\(^7\) Some of the savanna mules went to the Veraguas mines, but this market vanished in the early seventeenth century. Today few mules are used in Panama and they are never used to pull the plow. I was told that there is one recua still operating in the central provinces, though I was never fortunate enough to see this relic. The mule train, consisting of some twenty to thirty mules, departs from El Roble, Coclé, (?) and is driven to the mountains by two men. Assorted goods are traded for coffee, which grows well in the highlands and is worth more, pound for pound, than any other crop grown in the area. The trip is said to last from six to ten weeks.

There is little information extant concerning recuas in the savanna during the colonial period. Occasional references suggest that they were used along the main east-west trade route to Panama City, now the Carretera Nacional. Burros never attained any importance in Panamanian transport and they are not found anywhere in the Republic today. Oxen and two-wheel carts were introduced to the Azuero Peninsula, probably during the seventeenth century. Today over 50 per cent of all oxcarts in Panama...
may be found in the Province of Los Santos (Table VII). Only oxen pull carts in the savanna; the horse and mule are never so employed. Oxcarts in the savanna uniformly have two spoked wheels (Fig. 56, chap. iii), similar to ones found in southern Spain. The solid-wheel, northern-Spanish cart (carro chirrion) is unknown in central Panama. Oxen are rigged with a yoke fastened to the back of the horns, in typical Spanish fashion (Fig. 95). Use of oxen and oxcarts declines as one moves away from the centers of Spanish settlement. The same relationship between Spanish culture and the use of oxen may be noted in the case of the horse. The latter is vitally important to people predominantly Iberian in origin. As late as 1920 the horse and the oxcart were the wealthy landowners' preferred means of transport on

Fig. 95.—A team of oxen, rigged to a two-wheel, spoked cart. Cañazas, Veraguas. April 15, 1956.
the savanna. Only the most fortunate peasant had access to one of these means of carriage.

Goods transported by horse are carried in bags or baskets (zurrones) attached to either side (Figs. 96, 106). A special, but related, device is used for hauling milk cans (Fig. 97). The basket carried on the back, called motete, is much like the zurrón (Fig. 106). A rod is inserted through the motete near the top and is passed under each arm of the bearer. This method of carrying a basket on the back appears to have replaced the carrying pole in the savanna. All of the large baskets used today are of Spanish origin; almost identical types may be found in Spain.

Fig. 96.--The campesino sits between two rawhide bags used for carrying fruit to market. Zurrones, or baskets, are attached in the same fashion and are about the same size. (Photo by UAAMP, 1955).
Fig. 97.--Two campesinos transporting milk along the National Highway. The man on the left is riding on a Spanish saddle. Note the rawhide sandals on each man. (Photo by UAAMP, 1955).

Modern means of land transport.--Privately owned motor vehicles are more or less restricted to the larger savanna towns. In 1954 there were only 1,563 motor vehicles of all types in central Panama. In the same year there were 2,168 oxcarts. Where roads are adequate automotive transport is becoming increasingly important. The camioneta, or station wagon, is the principal means of commercial transportation (Fig. 98). There are several large companies that operate fleets of camionetas, and hundreds of individuals in Panama City possess commercial licenses for personal cars. Camionetas
Fig. 98.—A camioneta (with doors open) at the rest stop of San Carlos, Panama. The restaurant shown is fifty-eight miles west of Panama City and is a favorite stop for vehicles. November 23, 1955.

do not run by any fixed schedule; they usually postpone departure until they are loaded. It is not uncommon to see twelve to fifteen people, plus baggage, parcels, and small animals, crammed into a station wagon. Accidents are rare but they are serious when they do occur. Fares are regulated by the national government and they are reasonable, considering the condition of the highway west of Penonomé. Camioneta routes are excellent indicators of passable roads within the Republic. Commercial vehicles are operated wherever there is an even chance of getting through. Regardless of what critics may say of Panama's internal transport, it is better developed than
casual observation would suggest.

There are no railroads and no modern busses operating in the savanna. However, a type of bus, called a chiva, is seen throughout the area (Fig. 99). The chiva will transport anything at hand; passengers, pigs, chickens, grain, vegetables, and packages. Like the camioneta, it is an unscheduled vehicle that must be flagged from the roadside. If the roza farmer has a little surplus to market he normally hauls it by chiva, if he is one to depend on automotive transport. Chiva

Fig. 99.—A typical chiva of central Panama. (Photo by UAAMP, 1955).
fares are lower than those of the station wagons, and bulky products normally refused by the camioneta operator may be carried on the chiva.

**Water Routes**

Pre-Columbian, overland trade was extended by means of canoes and rafts along rivers and over open sea. Cocle Indians carried on overseas trade with what is now eastern Panama, Colombia, Ecuador, and Peru (see chap. 11). There may have been some maritime connections with Chiriquí and the peninsulas of Osa and Nicoya to the west and north. Today there is little boat travel to or from central Panama other than along rivers. Larger vessels cannot use the so-called ports that front the Gulf of Parita (Map XX). There is no scheduled boat service to any savanna port and indications are that marine traffic will completely cease once the National Highway is finished. Coastwise traffic was undoubtedly greater during pre-Conquest days. Indian balsa rafts and dugout canoes could navigate shallow channels through the tidal flats during periods of high tide. Furthermore, overland transport depended on the human back, a method less preferred than the other. The Spanish-introduced pack animals caused a gradual decline in coastal shipping. Eventually it disappeared entirely.

After Panama became a Republic, surveys were made in the central provinces (1906-15) to determine the
feasibility of constructing ports and roads. It was hoped that the ports of Aguadulce, Chitré, Obaldía, Posada, Mutis, and Mensabé could be improved and connected by paved roads to inland centers. All of the various surveys reported in the negative, citing high relative cost and difficulty of navigation to the port as reasons for abandoning the venture. There has yet to be a serious attempt to improve savanna port facilities. The section most in need of port development coincides with that part of the savanna bordered by extensive mud flats and mangrove swamps. Not only would initial cost be high but maintenance would be a continuous and expensive task. There are no important ports in central Panama; the closest are Pedregal, Chiriquí, and Balboa, Canal Zone. Puerto Mensabé is perhaps the best savanna port, for it lies well south of the mangrove swamps and could be opened to larger craft with a nominal amount of dredging. However, it is so far south in the Azuero Peninsula that a major development would serve only a small area of Los Santos Province.

Boats

The long, slender, aboriginal dugouts, pointed at both ends like North American birch-bark canoes, are still used in the savanna rivers.¹⁴ They are propelled more often by poling than by paddling, though the South American leaf-shaped paddle is known and used. The cotton-sailed, balsa raft disappeared soon after the Conquest.
AIRPORTS:
- First class, full facilities
- Second class, limited or no facilities

SEAPORTS:
- First class, full facilities
- Second class, limited or no facilities

SCHEDULED LOCAL SERVICES:
- Coastal boat
- Airplane
- River navigation limited to craft under 10 tons

MAP XX
At one time the sail was also employed with large dugouts, and the Spaniards frequently used Indian canoes of this kind for long sea voyages along the coast. River, like marine, travel is of minor importance today (see Table VII). A few boats are still used to carry goods to market, but there is no commercial use of boats anywhere in central Panama.

**Air Routes**

Air service to and from the savanna is irregular, with only one small line operating what might be called a scheduled flight (Map XX). The scheduled line flies from Chitré to Panama City, sometimes via Santiago and Aguadulce. It carries passengers, cargo, and mail. Another company flies, according to demand, between Santiago and Santa Fe. Both airlines use light craft, including Stinsons and Beachcrafts. Rates are reasonable, considering passenger risk involved. Maintenance is substandard and broken instruments, windows, and torn outer fabric are common to most planes. Radio facilities are completely lacking and it is a miracle that there have been no serious accidents in recent years. Charter service is available to anyone desiring it.

During World War II the United States constructed a number of excellent, paved airfields in central Panama. Under pressure from a nationalistic Panamanian government all of the former United States fields have been abandoned.
Most of the military fields were intentionally located away from main population centers, thereby rendering them unfit for commercial use. The Aguadulce airfield, however, is centrally located and still in fairly good condition. It would make an excellent stopping point for planes flying between Panama City and David. There are also abandoned paved strips in serviceable condition at Río Hato, Pocri (Los Santos), and Chame-Bejuco.

Postal, Telephone, and Telegraph Service

All postal, telephone, and telegraph facilities in the savanna are owned by the Republic and administered by the Postal and Telecommunications Branch of the Ministry of Government and Justice. The national telegraph system was begun in 1892, and a line between Panama City and Santiago was one of the first to be completed. The line was completely rebuilt in 1909 and steel posts were erected in 1915. Today ten principal lines lead west from Panama City to the savanna. Four of these split off at Divisa for the Azuero Peninsula, while six continue to Chiriquí. The telephone network is more extensive than the telegraph and adequate service is provided for almost every town in central Panama (Map XXI).

Panama utilizes every available means of transport to move the mails, but in the savanna most mail travels by car, truck, or horse. Postal service was inaugurated during Spanish colonial times, but theft and poor service continued
Sources:
R.P., Min. de Gobierno y Justicia, Bases de Correo y Telecommunications, Panamá, 1955.
until the Republic was created in 1903. Santiago, because of its central location, is the terminus of a route from Panama City and one from David. Trucks make two round trips a week between the latter cities and Santiago. Feeder routes are handled by car, where possible, and on horseback, if necessary. A small boat carries mail from Puerto Mensabé to Tonosí (Map XXI).

Radio, Television, Newspapers, and Motion Pictures

Independent commercial radio stations operate in all the larger savanna towns, and provide excellent news coverage and reasonably good entertainment (Map XXI). One of the Chitre stations belongs to a Panamanian network and offers slightly better fare than rival outlets. There is no television in the Republic at this time. However, the United States Armed Forces operates a low-power, English-language station at each end of the Canal Zone. Newspapers must come every day by car from Panama City as there are no publishing facilities in central Panama. Papers usually arrive by camioneta four to six hours after they are on the streets in Panama City.

Panamanians are avid movie fans and most towns over 1,500 population have one or two theaters. Most of the films shown are North American with Spanish sub-titles, and they seem to be more popular than Mexican or Argentine productions. Although the government has never used movie theaters as outlets for propaganda, they would seem
to offer an excellent medium for communication with thousands of interianos.

It is obvious that telecommunications, mail, and newspaper routes parallel the established road network. All of the communications media are recent innovations. Electric lines might well be included as a part of the telecommunications complex, though rural electrification has barely begun. Electric power is available to most towns along the National Highway and to a few on secondary roads. Service is poor and wholly inadequate even in the large savanna towns. This has caused some responsible citizens to suggest nationalization of the privately owned Compañía Panameña de Fuerza y Luz, S. A.; the company owns and maintains all power facilities in the Republic. The same company also owns the telephone company serving Panama City and Colón.

Trade

Before the coming of the Spaniards trading was active whenever the savanna Indians were not at war. The chief articles of commerce included salt, maize, cloth, hammocks, thread, raw cotton (chiefly tree cotton), salted fish, slaves, ceramics, and gold. Archaeology indicates that trading reached as far north as Yucatan and south to Ecuador. Not only did Coclé merchants visit distant lands, but Peruvians, Ecuadorians, and Mexicans came to Panama for commercial reasons. Traffic declined with the advent of Iberian colonization and trans-Isthmian shipping soon
dominated the Panamanian commercial scene. Nevertheless, trade in the savanna did not completely disappear. Certain savanna commodities were hauled by mule train and boat to Panama City for transshipment to the colonies, especially to Peru. The chief articles of export during the colonial period were agave, batées, and brooms. Areas outside of the savanna produced pearls, palm oil, and timber. Until ca. 1600 gold was exploited in the Veraguas mountains north and west of the central savanna. The savanna has supplied varying amounts of maize and animals to Panamanian urban centers since the mid-sixteenth century. Still, production during the colonial period was never enough to satisfy the needs of the trans-Isthmian region. Panama had to import meat and grain from Peru, Colombia (via Cartagena), and northern Central America.

During the late seventeenth century English pirates introduced contraband traffic to the savanna. The contrabandistas shipped goods from the Caribbean coast, via the Río Cocle del Norte, to the Pacific coast. At first contraband was handled on a trial basis but soon became a full-scale business operation, controlled by the English. Goods were transported by Negro slaves and contracted Indian laborers. They included tobacco, liquor, cloth, and an assortment of other items, most of which came from Jamaica. English pirates were able to establish and control trade routes in the interior of a Spanish colony because Panama by this time had become a neglected, depopulated country.
Unquestionably the local government was in league with the smugglers, for the latter could not have operated otherwise. Contraband trade actually became so prosperous and productive that the pirates opened a commercial agency in Natá. At that time (1746) Natá was the seat of Spanish power in central Panama. All goods coming over the cordillera were collected at Natá for reshipment to other points along the Pacific coast. The brazen buccaneers went so far as to send ships from Panama, such as the "Mare of the South Sea." This, and other ships, flew the English flag and ran unopposed to ports of Central and South America. Eventually, Spain realized that her sovereignty in the savanna was being threatened. A force of men was sent to Penonomé, Natá, Los Santos, Las Tablas, Parita, and Santiago to suppress the contrabandistas. After the Englishmen were expelled from the savanna, trade and regional prosperity generally declined and many routes, especially those over the mountains, fell into disuse.

Brief revivals of commercial activity occurred during the California Gold Rush (1849) and the attempt to build a French canal (1880). Nevertheless, there were no improvements in transport facilities or communications from the middle of the eighteenth century until the beginning of the Republican era (1903). Rather, a general decline set in after the Spanish success against the pirates, culminating with the destructive "War of One Thousand Days" (1899-1902). It was the expressed desire of both
participants in this Colombian civil struggle to lay waste to the land. What few mule trains there were vanished. The newly begun telegraph network was interrupted and much of it destroyed. The meager port facilities and small coastal boats were devastated. During all of the troubled years cattle had to be driven overland to Panama City if they were to be marketed. It often took the vaqueros several months to drive the animals 200 miles, and many steers were lost on the way.  

Responsibility for the neglect and decadence of Panama during the nineteenth century lay with the Colombian government in Bogotá. Panama was not even considered an integral part of Colombia by many Bogotá officials. In 1846 Colombia signed a treaty which provided for the United States to keep the Isthmus open to traffic. During these years Panama City was described as being more difficult to reach than Tibet. The old Camino Real was a shambles and there was little traffic across the Isthmus. There was almost no domestic trade, no regular mails, no newspapers, no libraries, and many people were wandering the streets in search of work. The livestock industry was at its lowest ebb; a cow brought no more than $4.00, a horse half that much. With economic conditions at such a low level in the trans-Isthmian region one can only imagine what it was like in the savanna during the same period. The subsistence roza farmer was no doubt unaffected, but the commercial farmers and livestock men suffered greatly.
New commercial life appeared with the expanded transport and communication facilities of the twentieth century. Even so, farm-to-market routes are still mere trails and are woefully inadequate for modern Panama. Because the farmer must haul his produce to market on a pack horse, ox-cart, or his own back the amount he can market is severely limited. Fruits and vegetables are subject to spoilage during the slow, difficult journey to the village.

Markets

Panamanian markets are of Spanish origin, not Indian. In no way do they resemble the lavish Indian markets of Mexico and Guatemala. In the latter countries rural folk normally do most of their trading at an outdoor market that is located on the town plaza. Such markets contain wide selections of articles, arranged in sections, by products. Durable goods of local and foreign manufacture occupy an important place in the market area. In Panama, on the other hand, the public market is primarily an outlet for perishables. The only functional separation of goods is that of meat, and fruits and vegetables. Any non-perishable items in the market are generally sold from the vegetable sections.

Savanna public markets are owned by the community and managed by someone appointed by the mayor. They are never located on the plaza, but are usually close by (see Fig. 28). Occasionally the market is outdoors,
occupying one side of a street or sidewalk (Fig. 100). Most often the savanna market is located in a permanent building (Fig. 101). Meat and vegetable stalls in the market building are rented on a first-come, first-served basis (Fig. 102).

The typical market in a medium-sized town will have eight to ten meat stalls, each renting for forty to fifty cents a day. Usually, two-thirds of the stalls are reserved for beef, one-third for pork. Since the movement of animals to market corresponds to the seasons only

Fig. 100.--Typical Panamanian street market, set up on a public sidewalk. (Photo by UAAMP, 1955).
Fig. 101.---A public market building (Photo by UAAMP, 1955).

Fig. 102.---Interior view of a public market building, showing the vegetable and fruit stalls. (Photo by UAAMP, 1955).
about half of the stalls are occupied during February-April. Most small cattle producers try to market their animals near the end of the wet season before feed becomes scarce.

Abattoirs are separate from the market place. They vary in size, shape, and design, but most of them are no more than empty sheds with a killing floor, hoist, and carcass rack. The abattoir may be enclosed with a steel lattice, but it is never screened against flies and other insects. Refrigeration is lacking in all savanna abattoirs, though some have built a room for units that have yet to arrive (Fig. 103). There are no rendering facilities and pork fat is usually sold at a low price or left on the carcass. No use is made of by-products at any of the slaughterhouses. In the average town daily slaughter of cattle runs between one and seven head, with two to four pigs being normal. Meat is hauled from the abattoir to the market by truck or oxcart, where it is sold to the highest bidder (Fig. 104).

Vegetable stalls (Fig. 102) will rent from thirty to seventy-five cents a day. Most market buildings contain four or five such stalls which handle fruit and vegetables in season. Excess produce is sent to the Panama City market. This is usually done by selling the foodstuffs to a passing chiva driver, who in turn will re-sell it in the city. Sometimes the farmer will go to
Fig. 103.--The abattoir at Chitré, Herrera. The shirtless man is leaning against the door leading to a room built for refrigeration, but the equipment has never been installed. The killing floor is to the left of the concrete tables. (Photo by UAAMP, 1955).

Panama City himself, carrying two or three sacks of his produce with him. The vegetable market has declined in recent years; most of the produce goes direct to small retail stores, street vendors (push carts), passing trucks, or roadside stands (Fig. 105). Generally, all transactions for meat or agricultural produce are on a cash basis. Manufactured items, including salt, charcoal, and kerosene, may be bartered.

The isolated producers and buyers have no way of knowing the supply and demand conditions, for there are
Fig. 104.--Campesinas buying freshly slaughtered meat at an interior market. Such markets have no refrigeration facilities. (Photo by UAAMP, 1955).

Fig. 105.--Roadside stands near Chitré, Herrera. (Photo by UAAMP, 1955).
no established grades, standards, or market news. Each sale becomes an individual, often heated, bargaining ordeal, with the seller in the least favorable position. The producer is never aware what is the going price of a commodity, and his greatest fear is that of not being able to sell his products before they spoil. He will usually sell at the highest price offered rather than risk a lower price from the next customer. Within the same market the same quality product frequently sells at several different prices, unknown to the seller.

While in larger towns markets are open seven days a week the number of business days decreases with the size of the town. In small isolated villages Sunday is the principal market day, as in most of Latin America and Spain. Large markets are always held on important religious holidays, such as Holy Week, Christmas, and the local saint's day. In the large towns the Holy Week market takes on the aspect of a fair. There are dances, drinking bouts, parades, bull-teases, and exhibitions of horsemanship. The campesino will journey many miles to participate in the Holy Week festivities, whereas during the rest of the year he trades closer to home. Although Holy Week is a major holiday in all Hispanic countries, it is especially important in those countries where rainfall determines seasons. The occasion always comes during Panama's dry season, which is the ideal time for travel in the savanna. The festival also occurs after most roza
crops are harvested, and the farmer with a small surplus is more likely to have money during this period than at any other time in the year. Further, it is essential that he make a few small purchases before the coming planting season.

Traveling salesmen are always on hand during the important market days, bringing useless as well as practical items from the city. Such tradesmen still make the rounds of rural Panama and this activity will probably increase as better roads come to the more remote regions. Salesmen frequently save the campesino a long journey to market, and rural stores are now replacing other functions of the market. Slowly the need for the public market is disappearing as the campesino sells direct to the merchant. The small stores sell a little of everything (Fig. 106) and are a Panamanian equivalent of the general store.

Many of the merchants in town not only buy from the campesino but go to his home to pick up the purchase. Every year more and more goods are sold on the home farm, but most farmers still sell their produce some distance away (Table VIII). 28

The Indian's system of trade, transport, and communication was sufficient to meet the demands of his culture; modern Panama's is not. The problem is not one of production, but rather one of how to move goods to market. Even the back-country roza farmer can usually produce a surplus, and could add many crops to his inventory
Fig. 106.—Typical general store in the central savanna. The large baskets hanging on the posts are zurrones. Two motates may be seen on the floor, behind the post on the left. Two pilones stand to the left of the same post; a batea is on the right pilón. Over the pilones hang two A-frames for attaching baskets to a horse. A jaguar skin hangs on the left side of the door, in front of the girl. Assorted pottery lines the shelves; the large tinajas stand upside-down on several shelves. A drum may be seen on the ground, between the girl and the boy. A corotú tree shades the scene. (Foto Flatau-Panamá).
### TABLE VIII
MARKETING FARM COMMODITIES

<table>
<thead>
<tr>
<th>Location Where More than 50% of Goods Sold</th>
<th>Republic</th>
<th>Coclé</th>
<th>Herrera</th>
<th>Los Santos</th>
</tr>
</thead>
<tbody>
<tr>
<td>On home farm</td>
<td>3,064</td>
<td>310</td>
<td>124</td>
<td>1,040</td>
</tr>
<tr>
<td>In home village</td>
<td>13,780</td>
<td>1,061</td>
<td>988</td>
<td>4,566</td>
</tr>
<tr>
<td>In other villages of the District</td>
<td>13,835</td>
<td>1,664</td>
<td>638</td>
<td>2,341</td>
</tr>
<tr>
<td>In the capital of the District</td>
<td>27,105</td>
<td>3,582</td>
<td>4,351</td>
<td>2,076</td>
</tr>
<tr>
<td>In the capital of other Districts</td>
<td>4,923</td>
<td>239</td>
<td>939</td>
<td>307</td>
</tr>
<tr>
<td>In villages of other Districts</td>
<td>3,894</td>
<td>969</td>
<td>599</td>
<td>626</td>
</tr>
<tr>
<td>In Panama City</td>
<td>3,641</td>
<td>132</td>
<td>100</td>
<td>171</td>
</tr>
<tr>
<td>In Colón</td>
<td>933</td>
<td>32</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>In the Canal Zone</td>
<td>44</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Undeclared</td>
<td>2,472</td>
<td>578</td>
<td>183</td>
<td>355</td>
</tr>
<tr>
<td>TOTAL FARMS</td>
<td>73,691</td>
<td>8,569</td>
<td>7,922</td>
<td>11,494</td>
</tr>
</tbody>
</table>

If he had a way of disposing of them. Culture and environment determined the pattern of communications and these are geographically sound. However, it is entirely incompatible for Panama to maintain a twentieth-century National Highway and a sixteenth-century system of feeder roads and marketing.
NOTES TO CHAPTER V


2. Ibid.


4. Ángel Cabrera, Caballos de América (Buenos Aires, 1945), 130. Martín Fernández de Enciso, the lieutenant of Alonso de Ojeda, carried "doce leguas e algunos caballos" (twelve mares and some horses) to Santa María de la Antigua del Darién. Diego de Nicuesa, the first governor of Castilla del Oro, had horses with him at Nombre de Dios.


6. R. D. Carles, Crossing the Isthmus of Panama. Translated by Phyllis Spencer (Panamá, 1952), 28.

7. AGI, Patronato 183, no. 1, ramo 16. Description of Puerto de Caballos, Honduras...made by Juan Bautista Antonsell, October 7, 1590. "...y también se sacan se la dicha Chuluteca [in the southeastern portion of Honduras] 600 mulas de carga cada año, y la mejor parte dellas las llevan a Panamá y de 2 años a esta parte han empezado a sembrar trigo y se fa muy bien."

Antonio Vázquez de Espinosa, "Compendio y Descripción de Las Indias Occidentales" (1628), Smithsonian Miscellaneous Collections, CVIII (Washington, 1948), 244.
"Por esta provincia de Costarica para la de Veragua, y Panamá, pasan todos los años muchos españoles, que llevan mulas de Honduras, y Nicaragua, para vender en Panamá, para el tragin de Puerto Velo...."

8. Angel Rubio, La Vivienda Rural Panameña (Colón, 1950), 63.
9. Ibid.

10. República de Panamá, Estadística Panameña, XV (April, 1956), 116. The figures exclude the two savanna districts of Panama and five of Veraguas.

11. Ibid.

12. Distance between Panama City and selected points in the savanna, together with 1956 commercial fares, are given below. Information obtained from Encomiendas, S. A., Calle H, Panamá, R. P.

<table>
<thead>
<tr>
<th>Town</th>
<th>Fare</th>
<th>Distance from Panama City</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Miles</td>
</tr>
<tr>
<td>Capira</td>
<td>$0.70</td>
<td>31.1</td>
</tr>
<tr>
<td>Bejuco</td>
<td>1.00</td>
<td>46.4</td>
</tr>
<tr>
<td>San Carlos</td>
<td>1.25</td>
<td>58.2</td>
</tr>
<tr>
<td>El Valle</td>
<td>2.00</td>
<td>62.0</td>
</tr>
<tr>
<td>Río Hato</td>
<td>1.50</td>
<td>75.0</td>
</tr>
<tr>
<td>Antón</td>
<td>1.75</td>
<td>81.6</td>
</tr>
<tr>
<td>Penonomé</td>
<td>2.00</td>
<td>93.4</td>
</tr>
<tr>
<td>Natá</td>
<td>2.50</td>
<td>114.1</td>
</tr>
<tr>
<td>Aguadulce</td>
<td>2.65</td>
<td>120.3</td>
</tr>
<tr>
<td>Parita</td>
<td>3.40</td>
<td>150.3</td>
</tr>
<tr>
<td>Santiago</td>
<td>3.60</td>
<td>157.0</td>
</tr>
<tr>
<td>Chitré</td>
<td>3.60</td>
<td>157.6</td>
</tr>
<tr>
<td>Los Santos</td>
<td>3.70</td>
<td>160.0</td>
</tr>
<tr>
<td>Guararé</td>
<td>4.00</td>
<td>174.1</td>
</tr>
<tr>
<td>Las Tablas</td>
<td>4.10</td>
<td>176.7</td>
</tr>
<tr>
<td>Mensábe</td>
<td>4.80</td>
<td>184.9</td>
</tr>
<tr>
<td>Soná</td>
<td>5.00</td>
<td>186.1</td>
</tr>
<tr>
<td>Remedios</td>
<td>8.00</td>
<td>243.4</td>
</tr>
<tr>
<td>David</td>
<td>10.00</td>
<td>302.5</td>
</tr>
</tbody>
</table>


14. Ibid.

15. Ibid.

16. The airline fare from Panama City to Chitré is $6.00, one way; $10.00, round trip.

17. In Panama City and Colón telephone and electrical service is supplied by a private corporation, Compañía Panameña de Fuerza y Luz, S. A.

18. Lothrop, op. cit.
20. R. C. West, "Colonial Placer Mining in Colombia," *Louisiana State University Studies*, no. 2 (1952), 2-3. West assigns the major production years of the Veraguas mines to the years 1513-1600. This conforms with the numerous historical sources cited in the Notes to Chapter II.


27. *Ibid*.

CHAPTER VI

SUMMARY AND CONCLUSION

Whether because of the natural endowment, or in spite of it, aboriginal culture in the savanna evolved to a higher level than any other on the Isthmus. Through such cultural practices as burning, farming, erecting houses and villages, and engaging in trade, the Indians had wrought great changes on the natural landscape before the Conquest. The native was skilled in weaving, ceramics, metallurgy, and a variety of other crafts. Although he practiced simple digging-stick, migratory farming, food production was more than enough to meet local demands. A relative abundance of food permitted a dense population. Apparently the Indians' non-material culture was no less elaborate than the material one.

Above all, the Indian's greatest contributions to the present cultural landscape have been in five areas: (1) he altered the natural environment through the use of fire; (2) he was responsible for one of the two basic house types now in use; (3) he had become thoroughly familiar with virtually all useful native plants before the Conquest and domesticated many of them; (4) he established population centers that continue to persist; and (5) he developed
trade and communications routes that later served the Spaniards.

Indian utilization of the hearth was dramatically interrupted in 1515 by the Iberian invaders. In the beginning the conquerors sought gold; later, gold and religious converts. In a few years neither remained and the Spaniards came face-to-face with the serious business of survival. Unwilling to abandon European culture the Spaniard added his own livestock complex and associated traits to the existing Indian plant economy. Further, the Spaniards brought several significant plants from the Old World and supplemented the local food with these. Rice eventually replaced maize as the basic subsistence crop in the savanna hearth; introduced bananas, sugar cane, and African yams soon competed with native plantains, coconuts, and yuca in the huertas. Spanish steel tools permitted more rapid land clearing and allowed for more cultivation in the fields. The use of fire became even more essential as lands were cleared for pastures. Spanish replaced the native languages; Roman Catholicism became the state religion. Gradually the aboriginal cultural landscape crumbled as the new order took root, but it did not succumb.

Once in possession of the hearth the Spaniards made no deliberate attempt to destroy everything Indian. The Iberian notion of "reduction" and pacification precluded total erasure of the aboriginal cultural landscape. A mutual cultural exchange occurred between conquered and
conqueror; as cultures blended, so did race. The mestizo emerged to bear the new culture that was neither all Indian nor all Spanish. Nevertheless, Spanish cultural traits predominate throughout the modern hearth and today the central savanna culture is basically Iberian in origin.

It is culture that determines what use is to be made of a given environment. We cannot say why the Indian chose to settle the savanna, but the Spaniard undoubtedly selected it as the area most suited to his cultural tradition. It goes without saying that the Spaniards were technologically superior to the Cocléans, in terms of the savanna environment, and the cultural landscape erected and extended by the Iberians became the primary one. Beyond the realm of flora and fauna, and non-material elements, the Indians possessed few items with which the Spaniards were not familiar. Oviedo suggests this by devoting so much space to Panamanian natural history and to non-material culture. These were things more or less peculiar to the New World and not shared in some form by the invading Europeans. Cultural features familiar to Oviedo (and all Spaniards) were often taken for granted and left unsaid. Without question, many of the surviving native traits merely complemented similar ones from Spain.

To the evolving mestizo culture and race of central Panama was added a sprinkling of Negro elements. Since the nineteenth century, Anglo-American traits have entered
the Panamanian cultural stream and have taken their places on the cultural landscape. The modern savanna continues to be the Panamanian culture hearth, serving the mestizo as it did the Cocle and Spanish peoples previously.

From the focal area of central Panama, mestizo traits have spread to most sections of the Republic. The mestizo and his culture have come to be regarded as "typically" Panamanian; his hearth as the "true" Panama.
BIBLIOGRAPHY

I Unpublished Documents

Archivo General de Indias, Sevilla (AGI)

Audiencia de Panamá, legajo 13: Letters and dispatches from the president and oidores. 1541-1584.


Audiencia de Panamá, legajo 14: Letters and dispatches from the president and oidores. 1585-1599.


Audiencia de Panamá, legajo 15: Letters and dispatches from the president and oidores. 1600-1608.


Audiencia de Panamá, legajo 30: Letters and dispatches from the secular Cabildo of Panamá. 1544-1624.

Ordenanzas de la ciudad de Panamá, sobre esclavos negros. 1572.
Cabildo de Panamá al Rey. 26 abril 1583.
Memorial de los capítulos de la ciudad de Panamá por el capítulo de los ganados. 1592.
Ordenanza del Cabildo de Panamá. 20 septiembre 1605.
Regidores del Cabildo... de Natá al Rey. 10 mayo 1609.
Cabildo de Panamá al Rey. 25 junio 1610.
Cabildo de Panamá al Rey. 12 junio 1611.
Don Gaspar de Aybar al Rey. 1637.

Audiencia de Panamá, legajo 32: Letters and dispatches from the secular Cabildo of Nombre de Dios, Portobelo, and Veragua. 1541-1688.

Cabildo de Nombre de Dios al Rey. Sin fecha (ca. 1550).
Cabildo de Nombre de Dios. 6 mayo 1569.
Información sobre el descubrimiento del Valle de Guaymí. 11 enero 1575.
Regidores del Cabildo de Concepción de Veragua al Rey. 13 abril 1575.
Cabildo de Concepción de Veragua al Rey. 1 abril 1584.
Cabildo de Veragua al Rey. 6 noviembre 1601.
Cabildo de Portobelo. 1 julio 1620.

Audiencia de Panamá, legajo 33: Letters and dispatches from royal officials of Panamá and Portobelo. 1542-1607.

Oficiales reales al Rey. 6 julio 1560.
Oficiales reales al Rey. 20 octubre 1560.
Oficiales reales al Rey. 25 abril 1561.
Oficiales reales al Rey. 23 noviembre 1562.
Oficiales reales al Rey. 10 febrero 1565.
Información hecha año de 1577 de la carasbía de la tierra y del excesimos precios en Panamá. 18 febrero 1577.
Baltasar Pérez al Rey. 25 mayo 1596.
Francisco Valverda al Rey. 25 junio 1607.

Audiencia de Panamá, legajo 100: Letters and dispatches from the Bishop of Panamá. 1543-1648.

Obispo de Panamá al Rey. 27 junio 1589.
Obispo de Panamá al Rey. 29 junio 1591.
Relación de los pueblos que tiene la Provincia de Veragua y que vecinos son encomenderos como que no lo son...la cual ha hecho a Obispo deste Reyno en la visita que hizo el año 1604.
Obispo de Panamá al Rey. 29 julio 1606.
Obispo de Panamá al Rey. 30 junio 1607.
Obispo de Panamá al Rey. 14 junio 1611.
Obispo de Panamá al Rey. 10 julio 1637.

Audiencia de Panamá, legajo 101: Letters and dispatches from the Bishop of Panamá. 1649-1709.

Obispo de Panamá al Rey. 20 marzo 1661.
Relación expresa del Obispado de Panamá.
Remitida por el Dr. Don Diego Ladrón de Guerra, Obispo. 1691.

Audiencia de Panamá, legajo 222: Letters and dispatches from the Bishop of Panamá. 1652-1739.

Relación del Obispado de Panamá, hecha por Pedro, Obispo de Panamá. 15 mayo 1736.

Audiencia de Panamá, legajo 223: Letters and dispatches from the Bishop of Panamá. 1740-1759.

Francisco Xavier, Obispo de Panamá al Rey. 29 septiembre 1756.

Patronato 150, no. 14, ramo 4.

Información sobre los méritos y servicios del capitán Francisco Vázquez en el descubrimiento, pacificación y población de la provincia de Veragua y de las ciudades de Santa Fe y Concepción. Panamá, 23 febrero 1562.

Patronato 183, no. 1, ramo 16.

Descripción del Puerto de Caballos en Honduras ...hecha por Juan Bautista Antonelli. 7 octubre 1590.

Patronato 238, no. 2, ramo 4.

Información fecha contra el capitán Juan de Montesdoca y otras personas señores de quadrilhos, sobre la depoblación de las minas de Veragua y Coclé. 1610.

Patronato 238, no. 2, ramo 5.

Testigo de Capitanes Francisco de Agama y Francisco Fernández Quintero. Julio de 1610.
Testigo de Gaspar de los Reyes. San Pedro de Montijo, 10 mayo 1611.
Estado que especifica todo el ganado vacuno y caballar que se calcula puede existir al presente en toda la extensión de la provincia de Panamá desde Portobelo hasta los confines de Chiriquí, expresándolo por partidos o distritos y señalando los precios a que respectivamente están situados en cada uno de ellas a saven.

3 diciembre 1790.
Noticia relativa a la Provincia y Ciudad de Panamá. 3 diciembre 1790.
Noticia de minas en el Istmo de Panamá. 1803.

Real Academia de Historia, Madrid (RAH)

Colección Mata Linares, vol. 70.

Información del Obispo de Panamá en una visita a su obispado en la Provincia de Chiriquí.
Panamá, 30 julio 1803.


Fundación de la villa de los Santos, año 1568, y se concluyó fuése villa en 1574.

Colección Muñoz, vol. 79.

Licenciado Gama al Real. 28 julio 1533.

Colección Muñoz, vol. 86.

Fray Pablo, Obispo de Tierra Firme al Rey. 1552.
Relación de los indios de Tierra Firme, hecha en 1553 por Gobernador Alvaro de Sosa.
Nombre de Dios, 15 mayo 1552.

Colección Muñoz, vol. 87.

Juan Fernández de Rebolledo al Obispo Fray Bartolome de las Casas. Nombre de Dios, 28 junio 1554.
Theses and Dissertations:

Facultad de Administración Pública y Comercio, Universidad de Panamá.


Facultad de Filosofía, Letras y Educación, Universidad de Panamá.

Abello, Consuelo. "La colonización de Panamá por los españoles." 1949.

Cañizales, Berta G. de. "Los estudios geográficos en Panamá durante el Siglo XIX." 1949.

Cardoze C., Nydia M. "Estructura geográfico-política de Panamá; historia de las divisiones territoriales de la República de Panamá." 1947.


León, Modesto de. "Principales descubrimientos, exploraciones, estudios geográficos y mapas elaborados en el Istmo de Panamá durante el Siglo XVI." 1949.


Pinate, Elena Ch. de. "División territorial del Istmo de Panamá durante la primera década de la época colombiana." 1950.

Plataniótis Versas, Aliky. "División territorial del Istmo de Panamá en los siglos XVI, XVII, XVIII y XIX (1543-1821)." 1951.
Rosa C., Elsa E. de la. "Panamá vista a través de los viajeros en el Siglo XIX." 1951.


Santanach, Lucila P. de. "Distribución geográfica de la población panameña, 1930 (comparación con la de 1940)." 1952.


Véliz, Luis D. "Historia de Panamá visto a través de Oviedo." 1953.

Department of Geography, Clark University.


Freile, Alfonso. "Agricultural Geography of Panama." (in process)


_________. "Censos Nacionales de 1950. Densidad de Población por Kilómetro Cuadrado en la República." Panamá, Agosto de 1954. (mimeographed)


Aguadulce, R. P. Prepared by Headquarters, Army Air Forces (AAF), and Weather Division, AAF. Irregular from 1942-1945.


David, R. P. Prepared by Headquarters, AAF, and Weather Division, AAF. Irregular from 1942-1944.

______. Prepared under the supervision of 1st Lt. William Postelnek, AC. November 28, 1943.

______. Prepared by Headquarters, AAF (?). No date (ca. 1944).


Jaqué, R. P. Prepared by Headquarters, AAF, and Weather Division, AAF. Irregular from 1942-1944.


Pocri (Los Santos), R. P. Prepared by Headquarters, AAF, and Weather Division, AAF. Irregular from 1942-1945.
U. S. Air Force.


Río Hato, R. P. Prepared by Headquarters, AAF, and Weather Division, AAF. Irregular from 1942-1944.

Prepared by Headquarters, AAF (?). No date (ca. 1945).

"Notes on Forecasting Tropical Weather." Prepared by Capt. Walter A. Sokolosky, AC. No date (ca. 1945).


"Experimentos Sobre Control de Malezas y Hierbas en el Arroz." Folleto No. 13, Instituto Nacional de Agricultura. Divisa, Diciembre de 1954. (mimeographed)


García, Jerónimo. "Plano aproximado de la Provincia de Veraguas...." Santiago (Veraguas?), 1 Diciembre de 1837. Negative of original map on file in the Canal Zone Library, Balboa Heights, C. Z.


López, Juan. "Carta Maritima del Reyno de Tierra Firme u Castilla del Oro." Sevilla, 1785. Negative of original map on file in the Canal Zone Library, Balboa Heights, C. Z.

Moreno, Manuel B. "Utilización de los Segmentos Censales en la Apliación del Muestro Estadística en Panamá." Contraloría General de la República, Oficina del Jefe de la Sección Estadísticas Agrícolas. Panamá, 1956. (typescript)

Stephenson, Kermit. "Almacenaje de Semillas en Panamá." Folleto No. 8, Instituto Nacional de Agricultura. Divisa, Julio de 1954. (mimeographed)

Striker, Marion M. "Soil and Land Investigations in Panama." Ditto copy on file at Servicio Interamericano de Cooperación Agrícola, Panamá, R. P. November, 1952.


II Printed Materials

Acosta, J. D., and Melo, M. E. Elementos de Agricultura Tropical. Panamá, 1924.
Acosta, José de. *Historia Natural y Moral de las Indias*. Madrid, 1894.


__________. *Leyendas y tradiciones panameñas*. Panamá, 1952.


Alba, Alberto F. "El Árbol Panamá," Revista de Agricultura, Comercio e Industrias, XII, No. 16 (1954), 33.

__________. Plantas y árboles. Panamá, no date.

Alba C., Manuel M. *Costumbres y paisajes de la sierra*. Panamá, 1925.

__________. "Cronología de los Gobernantes de Panamá." Boletín de la Academia Panameña de la Historia, III, No. 8 (1935), 7-182.

__________. *Etnología y población histórica de Panamá*. Panamá, 1928.


_______ Old Panama and Castilla del Oro. New York, 1944.


_______ "New Palms in Panama, and Others," Gentes Herbarum: Occasional Papers on the Kinds of Plants, VI (1943), Fasc. 4, Art. 5. Ithaca, N. Y.


Benoist, R. "La végétation de la Guyane française," *Bulletin de la Société Botanique de France*, LXXI (1924), 1169; and LXXII (1925), 1065.


Boletín de la Academia Panameña de la Historia. Juan Antonio Susto has been Permanent Secretary of the Academia since its establishment (1921), and Editor of the Boletín since it first appeared (1933). The Boletín appeared irregularly between 1933 and 1939, as follows: 1933 (nos. 1-5), 1934 (Nos. 6-7), 1935 (Nos. 8-9), 1936 (Nos. 10-11), 1937 (Nos. 12-15), 1938 (Nos. 16-19), and 1939 (No. 20, the last issue).


________. Crossing the Isthmus of Panama. Translated by Phyllis Spencer. Panamá, 1952.

________. La Tierra de los Cholos. Panamá, 1947.

________. San Blas: Tierra de los Cunas. Panamá, 1954.


Casas Torres, José M. La Vivienda y Los Nucleos de Población Rurales de la Huerta de Valencia. Madrid, 1944.


Church, George E. "Interoceanic Communication on the Western Continent," The Geographical Journal, XIX (1902), 313-54.


Cochrane, Charles S. Journal of a Residence and Travels in Colombia, During the Years 1823 and 1824. 2 vols. London, 1825.


Comercio, Industria y Turismo. Edited by Lic. Pablo Abad. Monthly publication of the Chamber of Commerce and the National Tourist Commission, Panamá, R. P. Printed in Spanish, but usually one article is in English. The magazine contains information concerning recent economic legislation, transportation and lodging facilities, and frequently an article on geography, history, or folklore. Distributed gratis.
Conte Bermúdez, Hector. Estudios históricos sobre Natá de los Caballeros. Panamá, no date.


Crespo, José D. Geografía de Panamá. New York, 1928.


Cristoffel, H. M. "Exploración de la Gran Sabana," Revista de Fomento (Venezuela), XIX (1939), 501-726.


Crowe, P. R. "The Seasonal Variation in the Strength of the Trades," Transactions and Papers of the Institute of British Geographers, No. 16 (1950), 25-47.

Crowe, P. R. "Wind and Weather in the Equatorial Zone," Transactions and Papers of the Institute of British Geographers, No. 17 (1951), 23-76.


de Smidt, Leon S. Among the San Blas Indians of Panama. Troy, N. Y., 1948.


Espinosa, Gaspar de. "Relación e proceso que Licenciado Gaspar Despinosa, Alcalde Mayor, hizo en el viaje ...dentre esta Cibdad de Panamá a las provincias de París e Natá, e a las otras provincias comarcanas," Colección de Documentos Inéditos de Indias. Vol. XX. Edited by J. F. Pacheco, et al. Madrid, 1873. (This is a report of the second Espinosa expedition.)

Espinosa, Gaspar de. "Relación hecha por Gaspar de Espinosa, Alcalde Mayor de Castilla de Oro, dada a Pedrarias de Ávila, Lugar-Teniente General de aquellas Provincias, de todo lo que sucedió en la entrada que hizo en ellas de orden de Pedrarias," Colección de Documentos Inéditos sobre la Geografía e Historia de Colombia. Vol. II. Edited by A. B. Cuervo. Bogotá, 1892. (This is a report of the first Espinosa expedition.)


Hardy, F. "The Soils of South America," Plants and Plant Science in Latin America, II (1945), 322-6.


Hildebrand, Samuel F. "A New Catalog of the Fresh-Water Fishes of Panama," Zoological Series, Field Museum of Natural History, XXII (1938), No. 4.


Humphries, Frank T. *The Indians of Panama: Their History and Culture*. Panamá, 1944.


Instituto Panamericano de Geografía e Historia. *El territorio del Istmo de Panamá, en que se encuentra la República de Panamá, pertenece geográficamente a América Central o a América del Sur?* Publicación No. 201. México, 1955.

Inter-American Women's Club, Colón Unit. *Panama Folklore*. Colón, 1948.


Johansen, Holger. *A Handbook of the Principal Trees and Shrubs of the Ancon and Balboa District, Panama Canal Zone*. Mt. Hope, C. Z., 1925.


López de Velasco, Juan. Geografía y Descripción Universal de las Indias Desde el Año de 1571 al de 1574. Edited by Justo Zaragoza. Madrid, 1894.

Lothrop, Samuel K. "Aboriginal Navigation off the West Coast of South America," Journal of the Royal Anthropological Institute, LXII (1932), 229-56.

Lothrop, Samuel K. "Archaeology of Southern Veraguas, Panama," Memoirs of the Peabody Museum of Archaeology and Ethnology, IX (1950), No. 3.


Lutz, Otto. Los Habitantes Primitivos de la República de Panamá. Leipzig, 1924.


Morison, Samuel E. Christopher Columbus, Mariner. New York, 1956.


"Nuestro Vivienda Rural Actual," Revista de Agricultura, Comercio e Industrias, XII, No. 15 (1954), 24-5.


Ocaña, Bernardo. Por Una Ciencia Agrícola. 2d ed. Panamá, 1952.


Fiscal years 1931-32 (pub. 1938), 1933-34 (pub. 1938), 1935-36 (pub. 1939), 1940 (pub. 1941).


———. Departamento de Estadística. *Boletín de Estadística*. Irregular to 1913 (No. 24) and since 1932 (No. 78). Panamá.


Panamá, República de. Contraloría General de la República, Dirección General de Estadística. Censo de Población: 1940. I (Darién), II (Panamá), III (Colón), IV (Chiriquí), V (Coclé), VI (Veraguas), X (Compendio General). Panamá, 1943 (I-III), 1944 (IV-VI), 1945 (X).


. Estadística Panameña. Panamá, 1941 to date.


Pulle, A. A. *Enumeration of the vascular plants known from Surinam*. Leyden, 1906.


Recopilación de Leyes de los Reynos de las Indias. 3 vols. Madrid, 1943.


Robinson, Tracy. *Fifty Years at Panama*, 1861-1907. New York, 1911.


__________. "Dry Climates of the United States." University of California Publications in Geography, V (1931), 1-41.


Sapper, Karl. "Beiträge zur Ethnographie des südlichen Mittelamerika," Petermanns Mitteilungen, XLVII (1901), 4-40.


__________. Über die geologische Bedeutung der tropischen Vegetationsformationen in Mittelamerika und Sudmexiko. Leipzig, 1900.


________. "Cultivated Plants of South and Central America," Handbook of South American Indians, VI (1950), 485-543.


Saville, Caleb M. "Hydrology of the Panama Canal," American Society of Civil Engineers, XXXIX (1913), No. 1.


Sosa, Juan B., and Arce, E. J. Compendio de historia de Panamá. Panamá, 1942.


Thacher, John B. Christopher Columbus. 3 vols. Cleveland, 1903.

The Month in Panama. Edited by Dorothy M. Meléndez, Panamá, R. F. A popular English-language magazine, published monthly by the Colón Free Zone. Though not a scholarly journal, it often contains interesting articles about Panamanian folklore, Indians, and archaeology. $2.00 a year.


Thompson, J. E. S. The Rise and Fall of Maya Civilization. Norman, 1954.


Tropical Agriculture. Quarterly Journal of the Imperial College of Tropical Agriculture, Port-of-Spain, Trinidad. 1924 to date.


———. "Influencias mayas en el alto Ecuador," Boletín de la Academia Nacional de Historia (Quito), IV (1922), 205-40.


———. 7465th Engineer Reproduction Division, Corozal, C. Z. Military Survey of Panama, 1:20,000. Series E861. Sheets: 76 (Otoque); 94-98 (Chamé); 144-145, 147-149 (Picacho); 171 (San Carlos); 181-187 (Majagual); 298-299 (Penonomé); 301-309 (Antón); 311, 316-317 (Parita); 393-394, 399 (Natá); 401, 493-409 (Aguadulce); 491-499 (Santiago); 639 (La Pena); 643-644 (Montijo).

U. S. Corps of Engineers, Army Map Service. 7465th AU
Engineers, Corozal, C. Z. Republic of Panama—
1:500,000. Special Map No. 2. Sheets A, B, and C.
(1953).

U. S. Department of Agriculture. Tropical Forest
Research Center. The Caribbean Forester.
Published Semi-Monthly from 1939 to date. Río
Piedras, P. R.

Yearbooks of Agriculture. Washington: 1938
(Soils and Men), 1941 (Climate and Man), 1948
(Grass), 1949 (Trees), 1953 (Plant Diseases), 1955
(Water), and 1956 (Animal Diseases).

U. S. Geological Survey. Geologic Map of the Canal Zone
and Adjoining Parts of Panama. Scale 1:75,000.

U. S. Waterways Experiment Station. Maximum Possible
Precipitation Over the Panama Canal. Hydro-
meteorological Report No. 4. Prepared under the joint
auspices of the U. S. Department of Commerce, Weather
Bureau (Hydrometeorological Section), and the War
Department, Corps of Engineers (Engineer Department).
Vicksburg, Mississippi, 1943.

Vageler, Paul. An Introduction to Tropical Soils.
Translated by H. Greene. London, 1933.

Vaillant, George C. Artists and Craftsmen in Central


Van Der Merwe, C. R. Soil Groups and Sub-Groups of South
Africa. Pretoria, 1941.

Vásquez Hernández, Publio A. "La Personalidad Interna-
tional de Panamá," Boletín de la Academia Panameña
de la Historia, I (1933), 453-556, and 563-626.

Vavilov, N. I. "The Origin, Variation, Immunity, and
Breeding of Cultivated Plants," Chronica Botanica,
Vol. XIII (1949-50). Translated from the Russian by
K. Starr Chester.

Vázquez de Espinosa, Antonio. "Compendio y Descripción
de Las Indias Occidentales (1626)," Smithsonian
Miscellaneous Collections, Vol. CVIII (1948).


PENONOMÉ
Annual Rainfall (\(\text{"}"\)): 72.78
Aw'gi

BALBOA
Annual Rainfall (\(\text{"}"\)): 68.70
Aw'gi

CAPE MALA
Annual Rainfall (\(\text{"}"\)): 68.62
Aw'gi

SANTA ROSA
Annual Rainfall (\(\text{"}"\)): 67.52
Aw'gi
AGUADULCE
Annual Rainfall (""'): 49.74
Aw'gi

SANTA CLARA
Annual Rainfall (""'): 44.94
Aw'gi

RÍO HATO
Annual Rainfall (""'): 42.89
Aw'gi

POCRÍ
Annual Rainfall (""'): 39.99
Aw'gi
VITA

Robert Henderson Fuson was born in Bloomington, Indiana, July 7, 1927. He moved with his parents to New Bern, North Carolina, in the summer of 1932, where he later attended grammar and high school. Upon graduation from high school in June, 1944, he enlisted in the Army Air Corps. Later he was discharged from the Army and re-enlisted in the Navy, serving in the Pacific campaign of 1945.

In September, 1946, he entered Indiana University and was awarded the Bachelor of Arts degree in Government in 1949. In September, 1949, he began graduate work in Geography at the University of Kansas; later, he transferred to Florida State University, where the degree of Master of Arts in Geography was granted in June, 1951.

From June, 1951, until June, 1953, he was employed as a geographer with the Aeronautical Chart and Information Center, Washington, D. C. In February, 1952, he married Amelia Fernandez of Tampa, Florida. A daughter, Karen Amelia, was born in December, 1953.

He entered the Graduate School of Louisiana State University in June, 1954, and was granted a graduate assistantship that September. He became Visiting
Instructor of Geography and Anthropology in June, 1955, and Instructor the following September. Between September, 1955, and June, 1956, he was Instructor of Geography and Anthropology with the Louisiana State University Caribbean Program, Panama Canal Zone.

Returning to the Baton Rouge campus in September, 1956, he continued as an Instructor while completing course work for the doctorate. He is now Instructor of Geography, University of Miami, Florida; a position accepted in September, 1957.

EXAMINATION AND THESIS REPORT

Candidate: Robert Henderson Fuson

Major Field: Geography

Title of Thesis: The Savanna of Central Panama:
A Study in Cultural Geography

Approved:

[Signature]
Major Professor and Chairman

[Signature]
Dean of the Graduate School

EXAMINING COMMITTEE:

[Signature]

[Signature]

[Signature]

[Signature]

Date of Examination:

May 9, 1958