

INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.
2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.
3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.
4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.
5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

**University
Microfilms
International**

300 N. Zeeb Road
Ann Arbor, MI 48106

8312344

Flowers, Nancy May

FORAGER-FARMERS: THE XAVANTE INDIANS OF CENTRAL BRAZIL

City University of New York

Ph.D. 1983

**University
Microfilms
International** 300 N. Zeeb Road, Ann Arbor, MI 48106

Copyright 1983

by

Flowers, Nancy May

All Rights Reserved

PLEASE NOTE:

**In all cases this material has been filmed in the best possible way from the available copy.
Problems encountered with this document have been identified here with a check mark ✓.**

1. Glossy photographs or pages _____
2. Colored illustrations, paper or print _____
3. Photographs with dark background _____
4. Illustrations are poor copy _____
5. Pages with black marks, not original copy _____
6. Print shows through as there is text on both sides of page _____
7. Indistinct, broken or small print on several pages ✓ _____
8. Print exceeds margin requirements _____
9. Tightly bound copy with print lost in spine _____
10. Computer printout pages with indistinct print _____
11. Page(s) _____ lacking when material received, and not available from school or author.
12. Page(s) _____ seem to be missing in numbering only as text follows.
13. Two pages numbered _____. Text follows.
14. Curling and wrinkled pages _____
15. Other _____

**University
Microfilms
International**

FORAGER-FARMERS: THE XAVANTE INDIANS OF CENTRAL BRAZIL

by

Nancy May Flowers

A dissertation submitted to the Graduate Faculty in Anthropology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, the City University of New York.

1983

**COPYRIGHT BY
NANCY MAY FLOWERS**

1983



This manuscript has been read and accepted for the Graduate Faculty in Anthropology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

Jun 30, 1983
date


Chairperson of Examining Committee

Jan. 28, 1983
date


Executive Officer

Daniel R. Gross

Daniel G. Bates

Warren De Boer

Sara Stinson

Michael Harner
Supervisory Committee

The City University of New York

ABSTRACT

FORAGER-FARMERS: THE XAVANTE INDIANS OF CENTRAL BRAZIL

by

Nancy May Flowers

Adviser: Daniel R. Gross

This thesis is a study of the adaptation of the Xavante Indians to their physical and human environments. The Xavante, like other native groups of Central Brazil, until they were circumscribed by Brazilian settlement, combined cultivation of crops with extensive foraging. The Xavante resisted domination by the national society for over 200 years. I discuss aspects of their subsistence system and social structure that contributed to the effectiveness of this resistance. The Xavante were finally pacified in the 1940's, and are now settled on a reservation where they grow rice as a staple crop and are beginning to participate in the local market economy. I examine some of the effects of contact and subsistence change on nutrition, on fertility and mortality patterns, and on social organization. Finally, I discuss some of the implications of the Xavante experience for studies of cultural evolution. I suggest that, although the Xavante and other modern groups should

not be regarded as representing "stages" in human evolution, we may fruitfully examine the interaction of competing human groups with different technologies for clues to general processes. These processes may help to explain events more distant in time, such as the agricultural transition.

PREFACE

My interest in Brazil, and especially in the Amazon region, goes back a long time, to even before I began graduate study in anthropology. In the 1960's, when I was working as a photo-journalist, I traveled through much of Brazil, photographing and collecting material for magazine articles. I remember that during those years I several times consulted Dr. Charles Wagley, who was then at Columbia, about topics for articles on Brazil. Dr. Wagley was not only very helpful and interested in my work, he also impressed me by his wide knowledge of Brazil. Perhaps it was he who unknowingly put in my head the idea of becoming an anthropologist.

In any case, in 1972 I enrolled as an anthropology major at the Brooklyn Center of Long Island University. There I was fortunate enough to have as a teacher Michael Hittman, whose enthusiasm for anthropology and ability to communicate it to his students contributed to my decision to go on to graduate study. In the following year I transferred to Hunter College, and after finishing my undergraduate work entered the Ph. D. program at the CUNY Graduate School.

In 1975, Daniel Gross, with whom I shared an interest in Brazil, and whose courses had stimulated my desire to study South American Indians, was formulating plans for a comparative ecological study of Indian groups in Central Brazil. He offered me, with two other graduate students, Madeline Ritter and Dennis Werner, the opportunity of being fieldworkers on the project. Each of us would be based for a year in a different Indian village, and beside collecting data for the Human Ecology in Central Brazil project would do the fieldwork for our own dissertations.

The early months of 1976 were filled with preparations for the field. Maddy, Dennis, and I ran around New York collecting supplies, and wondering endlessly together about what we should take to the field. Were Swiss army knives as essential pieces of equipment as some said? Should we take freeze-dried foods with us? Would we need sleeping bags? Occasionally we had long-distance phone consultations with Dan, who was already in Brazil since he had an appointment as a visiting professor at the University of Brasilia.

Maddy, Dennis, and I arrived in Brasilia in February, 1976, and stayed with Dan and his family there while we waited for our permits from the Indian agency to work in Indian villages, collected more equipment and trade goods, and planned our research. It was in Brasilia that we really became a team, as we collaborated in writing questionnaires

and codebooks, trying to standardize procedures so that our data would be comparable when we later did the analyses. Dennis was the first to leave for the field to do his study with the Mekranoti-Kayapó in Pará state. In May I left for the Xavante reservation at Pimentel Barbosa in Mato Grosso, and a few weeks later Maddy went to the Kanela village in Maranhão. The fourth fieldworker was a Brazilian graduate student, Maria Francisca Leoi, who worked in a Bororo village.

At dawn on a May morning Dan, who was to accompany me to the field site, and I were packing my gear onto the back of a truck lent us by the University of Brasília. Dan was grumbling that the stuff would never fit, and if it did was so heavy that the truck would break down before we reached the Xavante. But eventually everything was tied on, more or less securely, and we were off. At Aragarças, on the Araguaia river, we stopped at the Campus Avançado, an outreach campus of the University of Brasília, where we were welcomed by the director, José Quintas, and his wife Ana. The next day we continued our journey over a rutted, dusty frontier road. Progress was slow, for the log bridges by which rivers were crossed were mostly broken down, so we joined the line of trucks carrying cattle and sacks of rice that were backed up along the road waiting for a tractor to pull them across the river shallows.

When we arrived at the Pimentel Barbosa Indian Post, the Indian agent, Ismael Leitão, met us. Ismael was an old-timer who had been with the Xavante, off and on, since they were pacified in the 1940's. He escorted us to the Xavante village, some 300m from the post, where we presented introductory gifts to Apowẽ the headman, now white-haired and somewhat stooped, but alert and dignified. Apowẽ was the first Xavante leader to make peace with the whites, and he greeted us ceremoniously, tying around Dan's and José Quintas' necks the cotton cord with a feather at the back worn by all Xavante men. I was immediately impressed by the physical presence of the Xavante -- the tall, muscular men, the sturdy women, and the bright-eyed lively children.

The following morning Dan and José Quintas left with the truck and the next few days were lonely, but I was soon planning to move to the village, where it would be easier for me to do my work. Fortunately the older people at Pimentel Barbosa accepted my wish to live among them, for they remembered the visit of another anthropologist, David Maybury-Lewis, almost 20 years before. They understood that I was doing the same kind of work and David, too, had insisted on living in the village. I also soon realized that he had set a model of appropriate behaviour for anthropologists. One morning early in my stay I walked from the post to the village hoping to begin to get acquainted with some of the women, though as yet I knew only a few

words of Xavante. I sat down beside a woman who did not appear to be too busy to talk, and began to point to nearby objects and ask her the Xavante words for them. She told me the Xavante words and insisted that I repeat them several times. But after a few minutes she frowned and asked me through gestures where my notebook was and why I wasn't writing the words down "like David always did." When Apowẽ saw my tape recorder he reached for the microphone with a practised hand and without hesitation began recording songs and formal speeches.

As I write this, it is five years since I left the Xavante, and I have spent much of that time converting the data I collected during my fieldwork into abstract terms of frequencies and percentages to be assembled into tables and displayed as graphs. But now, as I look back, the abstractions drop away, and I remember that the mortality tables are made up from information gained during long conversations with mothers whose grief showed as they spoke of the sickness and death of their children. The crop statistics represent hours spent under the hot sun threshing and weighing rice harvested from a measured patch of garden, and I can feel the damp heat and hear the buzz of insects. Sometimes the collection of data was boring, as when I sat all day in my neighbor's house with notebook and scales, waiting for food to be brought into the house so I could record it before it was cooked and eaten. One time the

young women of the household decided to tease me a bit by popping food into their mouths or into the pot before I had a chance to weigh it. After putting up with this for a while I stormed out and went back to my house to sulk. But the elderly head of the household came after me, called me "sister" and brought me back to his house to finish my work.

There were many other times of frustration and, worse, of loneliness, boredom, and even the haunting fear, when I was not feeling well, of becoming seriously ill far from adequate medical care. But the pictures that remain most vivid in my mind are those of the high moments: walking down to the stream in the heat of the day, watching clouds of butterflies rise as my feet sank into the mud at the water's edge, and plunging into cool, clear water; waking in my hammock in the middle of the night to hear the deep chorus of voices as the men "sang around the village" to keep it safe from all alien human and supernatural beings; coming out of my doorway at sunrise to watch the closing event of the Wai'a ceremony when the young men ran to catch falling arrows before they reached the ground, and raced with them back to the dying council fire. During these months among the Xavante I did not measure my life by the calendar, but by ripening crops, the succession of crescent and full moon, by dry and by rainy season. It was a good time.

I think my greatest frustration came from the sense of my inability to help the Xavante as much as they helped me by showing and instructing me about their way of life. Women brought me their sick children, and often I had neither the medicine nor the knowledge to cure them. Fathers brought me their sons and asked me to teach them Portuguese and arithmetic so they could deal better with their changing world; I tried, but I could not devote much time to the task if I was to do my own work. When I went to Brasilia the elders, who believed me to have influence there that I knew I did not, demanded that I prod the government agency into supporting their efforts to secure their lands from the encroachments of the ranchers who were clearing large tracts of the surrounding country for cattle-raising and mechanized rice farming. When I left to return home, Apowẽ's oldest son made a final speech for my tape recorder, urging me to write about the Xavante "so that your people will know." That, at least, I have tried to do.

1. ACKNOWLEDGEMENTS

First of all, I should like to thank Daniel Gross, my adviser and chairman of my dissertation committee, for guiding my research. He has provided unfailing encouragement and support both in the field and after my return, and his criticism has been both incisive and constructive. I should also like to thank Silêde Gross for

her warm hospitality when I stayed with the Gross family in Brasilia. My colleagues on the research team, Maddy Ritter and Dennis Werner, contributed a great deal. Each of us had a different field experience, yet had much in common, and discussions with them helped to clarify many problems.

I should also like to thank the members of my dissertation committee, Daniel Bates, Warren De Boer, and Sara Stinson, for reading and offering valuable suggestions and criticisms through several drafts of my thesis. Dr. Michael Harner, my outside reader, commented helpfully on the final draft.

I owe much to the faculty and fellow students at the Graduate Center. I should particularly like to thank Delmos Jones who helped me greatly in my struggles with the mysteries of the computer. Joan Turner, Joan Montbach and D'Ahlborn Slater generously shared their limited office space with me and my piles of books and papers. I thank my friends, Tom and Elizabeth Butson, for "holding the fort" while I was out of the country doing fieldwork, and for patience and moral support while I was writing the dissertation.

Since my return from the field I have had the pleasure of meeting David and Pia Maybury-Lewis, and discussing our common concern for the Xavante and their future. I should particularly like to thank them for taking letters and

photographs to my Xavante friends on a recent visit they made to Pimentel Barbosa.

For help in the field I am especially grateful to Basílio da Sousa Barros and Ismael Leitão of the FUNAI post at Pimentel Barbosa. José Quintas and his wife Ana provided warm hospitality and assistance whenever I left the village for a few days of rest and to renew supplies. I should like to thank all the Xavante at Pimentel Barbosa for their patience and cooperation. Especially helpful were my friends and neighbors: Apowẽ (who died shortly after I left the field), Tsurupredu, Warodi, Tsibupá, Wadzaé, Tsidadzé, Tsiriburã, Rẽ'wai'õ, Wautó, and Otomoabá.

Support for the field research and analysis of data used in this thesis was provided by grants from the National Science Foundation, grants BNS 76-03378 and BNS 78-25295, and by the PSC-BHE Faculty Research Award Program of the City University of New York Grants 11479E and 12182. All of these grants were awarded to Daniel Gross as principal investigator.

CONTENTS

ABSTRACT	v
PREFACE	vii
Acknowledgements	xiii

<u>Chapter</u>	<u>page</u>

I. INTRODUCTION	1
Summary of Chapters	6
Approaches to the Evolution of Food Production	8
Relative Costs and Benefits of Collecting and	
Cultivating	16
From Foraging to Agriculture	21
Scheduling and Subsistence Strategies	24
Innovation and Work Effort	29
Cultural Evolution in Amazonia	33
The Interfluvial Upland Region	35
The Floodplains	38
The Cerrado	40
The Cerrado Habitat	43
Hunting	45
Gathering	47
Scheduling	51
Agriculture	52
Aggregation and Dispersal	55
Warfare and Social Organization	61
Summary	64
II. THE CENTRAL GÊ IN HISTORY	67
Introduction	67
Prehistoric Evidence	69
Divisions of the GÊ and Their Relationships	72
Genetic and Linguistic Evidence	73
Relationships Among the Central GÊ	76
Contact and Conflict	78
1500-1650	78
1650-1730	83
1730-1790	92
Campaign Against the Xavante	104
The secular Aldeias of Goiás	108

1790-1850	118
1850-1950	133
The River Porpoises and the Turtle	133
Xavante Expansion in Mato Grosso	137
1940 to present	141
Resistance and Pacification	141
 III. XAVANTE POPULATION AND COMMUNITY	 146
Introduction	146
The Present Village at Pimentel Barbosa	147
Social Organization	155
Clan and Lineage	155
Household Composition and Matrilocal Residence	157
Age Sets and Age Grades	161
Group Fission and Recombination	164
Social Antagonism and Village Splits	164
Conflict and Exogamy	168
Dilemma of the Young Wamari	175
Village Splits and Tribal Unity	179
Effect of Contact on Fertility and Mortality	180
Population Fluctuation in Small Groups	180
Fertility and Mortality Changes in the Xavante	186
Previous Studies	187
Age Distribution of Fertility and Mortality	190
Changes in Disease Patterns	198
Changes in Mortality Patterns	200
Changes in Fertility	207
Summary and Discussion	213
 IV. SUBSISTENCE, WORK, AND CHILDREN'S GROWTH	 217
Introduction	217
Recent Changes in the Xavante Subsistence System	218
Changes Before 1958	218
The Seasonal Round in 1958	219
Subsistence Changes 1958-1976	225
The Seasonal Round in 1976-77	227
The Present Subsistence System	231
Hunting	231
Individual Hunting	231
Collective Hunting	232
Fishing	237
Gathering	238
Agriculture	240
Rice	244
Maize	244
Other Crops	251
Food Exchange	252
Animal Foods	252

Vegetable Foods	253
Market Labor and Exchange	256
Adult Subsistence Labor and the Growth of Young Children	260
Comparison with Earlier Studies	261
Children's Nutrition and Growth	264
Comparison with Other Studies of Seasonal Variation in Weight	273
Hunter-Gatherers	273
Subsistence Agriculturalists	279
Summary and Discussion	284
V. SUMMARY AND CONCLUSIONS	287
Summary	287
The Central Brazilians Compared	290
Cultural Level of the Central Brazilians: A Problem of Definition	290
Community Size, Mobility, and Agriculture	293
Warfare, Mobility, and Social Organization	300
The Future of the Xavante	306
Some Historical Implications	315
General Characteristics of Central Brazilian Adaptation	315
The Agricultural Transition	318
Physical Effects of Agricultural Dependence	322
Conclusions	325
 Appendix	
A. FIELD DATA COLLECTED AND METHODS OF ANALYSIS	334
Time Allocation Observations	334
Agricultural Productivity	335
Estimates of Hunting and Fishing Yields	336
Soil Samples and Botanical Observations	336
Dietary Studies	338
Growth and Weight of Children Under Two Years	339
Censuses and Genealogies	340
Pregnancy Histories	341
Comparative Life Tables	345
Fertility Rates	348
Historical Information	351
General Participant Observation	352
Photographic Records	352
 REFERENCES CITED	 353

LIST OF TABLES

<u>Table</u>	<u>page</u>
1. Censuses of Total Xavante Population	149
2. Polygyny in 1958 and in 1976	160
3. Table of Age Set Positions in 1958 and in 1976 . .	162
4. Fate of Adults Present at São Domingos in 1958 by Clan and Lineage	174
5. Marital Status of Men and Women at Pimentel Barbosa by Age and Lineage	178
6. Age and Sex Distribution in Xavante Villages in 1952-64 and in 1976	192
7. Livebirths per Woman, by Age of Woman, in 1962-64 and in 1976	193
8. Surviving Children by Age of Woman in 1962-64 and in 1976	195
9. Deaths of Children Born to Women at Pimentel Barbosa by Age of Child at Death	196
10. Deaths of Children 0-24 months, 1974 to 1977 . . .	199
11. Life Table in Pre-Contact Period	203
12. Life Table in Contact Period	204
13. Life Table in Post-Contact Period	206
14. Deaths of Children at Different Periods by Age at Death and by Sex	208
15. Age Specific Fertility Rates of Women at Pimentel Barbosa at Different Periods	210
16. Xavante Adult Activities by Sex and by Season . .	228
17. Xavante Hunts	233

18.	Xavante Crop Production	245
19.	Daily Per Capita Consumption of Representative Foods by Season	246
20.	Mean Stature and Weight of Xavante Adults	263
21.	Children's Weight for Age at Different Seasons	265

LIST OF FIGURES

<u>Figure</u>	<u>page</u>
1. Map of Central Gê Locations 1650-1730	88
2. Map Showing Locations of the Central Gê 1730-1790 .	96
3. Map of Goiás in 1755, Showing Mining Settlements and Locations of Indian Tribes	98
4. Pictorial Map of Missions and Central Gê Villages Circa 1750	112
5. Locations of Central Gê Groups 1790-1850	121
6. Locations of the Central Gê in 1860	131
7. Locations of Xavante Villages Shortly Before Second Contact	139
8. Map Showing Location of Current Xavante Indian Posts and Missions (1990)	148
9. Sketch Map of Village on Pimentel Barbosa Reservation	152
10. Age Pyramid at Pimentel Barbosa in 1976, Comparing Wamãri with Non-Wamãri	176
11. Age Specific Fertility Rates of Xavante Women at Different Periods	211
12. Xavante Treks in 1958 (from Maybury-Lewis 1967:54)	221
13. Scales Used to Indicate Nutrient Levels in Soil Samples	242
14. Levels of Nutrients in Gardens at Pimentel Barbosa	243
15. Brieger's Map Showing Distribution of Interlocked Soft Corn Varieties	249
16. Distribution of Meat from Two Peccaries Shot by a Hunter	254

17.	Weight Growth of Xavante Babies at Different Seasons	267
18.	Seasonal Variation in Children's Weight, Food Consumption, and Subsistence Labor	272
19.	Codebook for Xavante Pregnancy Histories and Sample of File	344

Chapter I

INTRODUCTION

One of the earliest problems to interest anthropologists was the question of how and why people came to depend on cultivated crops and domestic animals for subsistence, and it continues to be a topic of intense debate to the present day. Until recently most attention was directed toward nuclear areas where pristine states eventually arose. People were seen as having progressed from hunting and gathering to becoming incipient cultivators and then settled farmers. Populations increased, and farmers intensified agriculture, growing a surplus that supported non food-producing specialists. Anthropologists saw the "Neolithic Revolution" as the baseline for the transformation in technology and social organization that we call civilization.

In recent decades evidence has been accumulating in both the Old World and in the New World which indicates that the transition from food gathering to food production was a process that took different courses in different geographical areas (D. Harris 1977a). In some regions the transition was never totally effected, and people who grew crops continued to use them as a resource supplementary to

wild foods. This suggests that knowledge of domestication techniques does not in itself determine whether or not people will become dependent on agriculture.

It is not easy to identify archaeologically the origins of cultivation, since in many cases domesticates are not clearly differentiated from wild varieties (Higgs and Jarman 1972). But at many sites where domesticated plant remains have been found, for example in Mexico from around 7000 B.C., and from around 15,000 B.C. in the Nile Valley (Wendorf et al. 1982) people continued to live as nomadic foragers for thousands of years longer, incorporating crop growing in their seasonal subsistence round.

The crucial point at which domestication seems to have a transforming effect on human society is not when people start to cultivate but at the stage when agriculture becomes such an important part of their subsistence that they must subordinate other seasonal food-getting activities to the labor demands of clearing, planting, weeding and harvesting. A broad based economy is then replaced by an economy focused on a limited range of domestic plants and animals.

The investigation of the agricultural transition and the pressures that may have produced it is largely the purview of archaeology because the long-term evidence is archaeological. However, when the transition is recent, or never took place, ethnological comparisons are relevant.

Studies of present-day hunters and gatherers based on fieldwork (e.g. Lee 1968; Woodburn 1968; R. Gould 1977) demonstrated that foraging for food does not necessarily mean a life of struggle and uncertainty. These findings made it necessary to rethink the assumption that the advantages of agriculture were self-evident because it provided people with a more abundant and reliable food supply than did hunting and gathering. But in the present as well as in the past it may well be that the distinction often made between foragers and "incipient cultivators" is not a very useful one. With the probable exception of Arctic hunters it seems that most modern foraging groups know how to manage plant and animal resources to increase the harvesting potential. Steward (1938), for example, showed that some Great Basin groups irrigated wild plants, and some practised a little horticulture, but these activities modified their foraging rounds very little because, like many forager-farmers, they planted their crops, left to collect wild foods, and returned to their plantations only to harvest. The Australians also irrigated wild plants and on occasion planted wild seeds and wild yams (Campbell 1965, Irvine 1970, D. Harris 1977b). Schrire (1980) showed that the Kalahari Bushmen were not only in contact with farmers and herders over the past several centuries, but have themselves planted and kept flocks, though at other times they lived entirely by foraging. It

seems that all these peoples have "mixed" economies but vary the mix opportunistically within a broad-based system. In that sense they are non-Neolithic.

The cerrado region of Central Brazil is one of the regions where the techniques of agriculture have been known for a long time, yet native groups continued to depend primarily on wild foods, with limited use of crops until they were circumscribed by the surrounding Brazilian society and their mobility restricted. My study focuses on the Xavante Indians who were settled on a reservation 30 years ago, after more than 200 years of intermittent contact and hostilities with white settlers. Since that time their life has undergone radical changes. Although they still hunt for animal protein, and collect wild plants to some extent, they have become highly dependent on growing upland rice, and have even entered the regional economy by selling some of their rice production on the the local market.

The Xavante experience raises at least three questions which may be relevant to the problem of why some people increased their commitment to agriculture and settled life, and others did not.

1. Why did the Xavante and other related Central Brazilian groups use cultivated crops for a long period without becoming dependent on agriculture?

2. What are the effects on the Xavante of their recent pacification, settlement, and investment in agriculture? How do these changes affect their social organization, nutrition and physical growth, and fertility and mortality patterns?
3. To what extent can the Xavante experience inform us about the effects of increased dependence on agriculture in the past?

In ethnological studies of change, the problem of time depth is serious, since typically the fieldworker spends only a year or two observing the society he or she is studying. In the present study I have approached the problem in several different ways:

1. By controlled comparison among four Central Brazilian native groups that have been in contact and circumscribed for varying lengths of time.
2. By the use of documents from the colonial period that refer to relations between the settlers and the Xavante and other native groups.
3. By comparison with a series of ethnographic and biological studies of the Xavante that were made 15-18 years ago when the Xavante were pacified but still nomadic.
4. By collecting data over 14 months of fieldwork, using time allocation, measures of food production and collection, food intake, and measurement of children's growth to show seasonal variation.

1.1 SUMMARY OF CHAPTERS

In this introductory chapter I outline the history of theoretical approaches to the origins and development of agriculture and discuss some current theories. I discuss recent research on cultural evolution in Amazonia and point out that its main focus has been on contrasts in agricultural potential between the floodplains and the interfluvial uplands, while there has been little attention paid to the cerrado, a third natural division of Amazonia. I describe the cerrado habitat and how it was exploited by the Xavante and other native groups. I suggest some implications of adaptation to the cerrado for cultural evolution and survival.

In Chapter 2, which recounts the history of Central Ge relations with colonists, I have used documentary records. Since the Xavante and other Central Ge groups were among the most active and hostile with which the Portuguese colonial government had to contend in the penetration and settlement of Central Brazil, they are frequently referred to in the colonial governors' letters to Lisbon and in other documents. I suggest that in the context of the occupation of their territory by cattle raisers and gold seekers the resistance of the Central Gê and other semi-nomadic groups may have been more effective than that of fully agricultural peoples.

In Chapter 3 my comparisons are based on previous studies carried out 15-18 years ago among the Xavante when they were recently contacted. At this time the Xavante were much more nomadic than they are at present. D. Maybury-Lewis (1965b, 1967) described the Xavante subsistence system as well as their social and political organization as it was in 1957-58. In 1962-64 a team of physical anthropologists, physicians, and geneticists studied Xavante demography, morphological characteristics, gene frequencies, and general health status (Neel et al. 1964; Salzano et al. 1967; Niswander et al. 1967; Weinstein et al. 1967; Niswander 1967; Neel and Salzano 1967; Neel et al. 1968). These studies provide a base to help me identify the effect on the Xavante of contact and pacification, including increased feuding, epidemics of introduced diseases, and changes in fertility and mortality.

In Chapter 4, I examine the present subsistence system in detail, using data from a time allocation study and from measures of production. I also present data from household food consumption observations, and from growth studies of small children over the agricultural seasons, to show how seasonal variation in intensity of labor devoted to agriculture may affect the nutritional status of the community and the growth of its children.

Finally, in Chapter 5 "Summary and Conclusions", I present the conclusions to be drawn from this study, including historical implications. I also suggest that the Xavante experience has implications for the survival of modern non-industrial groups when incorporated into modern state societies.

1.2 APPROACHES TO THE EVOLUTION OF FOOD PRODUCTION

Nineteenth century evolutionists approached the discussion of agricultural origins by presenting generalized models of cultural progress. Morgan, for example, proffered a scheme of evolutionary stages, each associated with a type of technology and subsistence. Every discovery and invention that provided greater subsistence security was considered an advance toward civilization.

The acquisition of farinaceous food in America and of domestic animals in Asia and Europe were the means of delivering the advanced tribes, so provided, from the scourge of cannibalism... This forcibly illustrates the great importance which is exercised by a permanent increase of food in ameliorating the condition of mankind" [Morgan 1973:44].

White and Childe were also interested in the agricultural transition primarily because of its role in the general evolutionary process. For White (1949) the most significant aspect of domestication was that it increased the energy brought under human control.

After some 985,000 years of cultural development, certain plants were brought under the control of domestication and cultivation, and various animal species were brought under control through domestication. The energy resources for culture building were greatly increased as a consequence of this increase in control over the forces of nature... After hundreds of thousands of years of relatively slow and meager development during the Old Stone Ages, culture suddenly shot forward under the impetus of augmented energy resources achieved by agriculture and animal husbandry [White 1949 272-273].

Childe (1967) called this great leap forward the Neolithic Revolution. He explained its beginnings in the Near East by a drying trend in climate that brought humans, plants and animals into a closer mutual relationship in the better-watered areas. Braidwood argued that climatic change was unnecessary to explain domestication: the important factors were the availability of plants and animals that would respond to efforts toward domestication and the cultural readiness of people to undertake those efforts (Braidwood 1963:110; see also Reed 1977). Once established in a "nuclear zone" the complex of domesticated plants and animals would spread by cultural diffusion.

Two seminal ideas developed by Julian Steward are basic to much modern thinking about cultural evolution: multilinear evolution through adaptation to specific environments (Steward 1976:11-29; Sahlins 1960:12-44) and the method of cultural ecology (Steward 1976:30,42; Sahlins 1964; Netting 1971). The effect of these ideas was to

redirect the focus of investigation from universal processes to the development of local systems.

Many investigators applied systems theory (Cancian 1967 Maruyama 1963; Plog 1977) to the anthropological study of change, often combining it with an ecological approach. Flannery (1971) explicitly used systems theory in his analysis of agricultural development in Mesoamerica. While others were less explicit in their use of systems theory, what Kirch (1980) calls "the systemic-adaptive paradigm" has guided many recent studies of cultural evolution. Binford outlined the appropriate research strategy:

If our aim is the explanation of cultural differences and similarities in different places and at different times, we must first isolate the phenomena we designate "cultural." Culture is all those means whose forms are not under direct genetic control (that is, extrasomatic [White 1959:81]) which serve to adjust individuals and groups within their ecological communities. If we seek understanding of the origins of agriculture or of "the spread of the village-farming community," we must analyze these cultural means as adaptive adjustments to the variety of ecosystems within which human groups were participants.

Adaptation is always a local problem, and selective pressures favoring new cultural forms result from non-equilibrium conditions in the local ecosystem. Our task, then, becomes the isolation of the variables initiating directional change in the internal structuring of ecological systems. Of particular importance is understanding the conditions which favor the rearrangement of energy-matter components and their linked dependencies in a manner which alters the effective environment of the unit under study [Binford 1971:34].

A number of workers adopting this paradigm see change as resulting from destabilization in the relationships among components of the system; therefore no single "cause" need be evoked to explain evolutionary changes (Bray 1976:78). Others (Poserup 1965; Cohen 1977; Harner 1970; Pfeiffer 1977) argue that there is a long-term tendency for human populations to increase. Population growth acts as a "prime mover" in the sense that it continually destabilizes the balance between people and their food resources. I shall discuss this view in more detail in the next section.

As investigators extended the study of the development of agriculture to many world regions (e.g. Caldwell 1962; Clark 1976; Coe and Flannery 1971; Gorman 1972; Harlan et al. 1976; D. Harris 1972b, 1976, 1977a, 1977b; Patterson 1971; Watson 1965) it became clear that there were many "alternative pathways toward agriculture" (D. Harris 1977a). Moreover, in many places the beginnings of cultivation observable in the archaeological record seemed to have occurred thousands of years before people became dependent on crops as their primary means of subsistence (Higgs and Jarman 1972; MacNeish 1972; Rindos 1980; Wendorf et al. 1982). Harlan et al. (1976) pointed out that if the process was to be understood investigators must study intermediate stages and why these often lasted so long.

Recently some anthropologists are seeking to return to more general models of cultural evolution. They maintain that since most explanatory models used in anthropology are tied to specific environments and specific groups they have limited usefulness for deriving general principles (Hardesty 1980). Some look for these general principles in models taken from evolutionary biology which they then use to explain and predict human behavior. "If we make our problems operational in terms appropriate to analysis of a more general theory such as synthetic evolutionary biology, we can employ those principles and free ourselves from induction and tautology" (Ford 1977:183; but cf. J. Sauer 1977). The application of these theories implies emphasis on the common properties that humans share with other animal species. Diamond (1977) argues that this need not be an impediment to their use.

In fact, however, every animal species is basically different from other animal species. Faced with this diversity, biogeography has developed a common framework for understanding such unlike distributions as those of giraffes, rose-breasted grosbeaks, cockroaches, and oak trees, by seeking relations among key variables or processes. These variables or processes are ones that are relevant to understanding any species. Like other species, man reproduces, dies, disperses, exploits environments of varying stability and productivity, adapts phenotypically and genetically, is subject to intraspecific competition, and (still like other species) differs from other species in particular characteristics of each of these processes. These are the processes that provide the ingredients for biogeographic analysis [Diamond 1977:249].

Hardesty, however, notes that many of these models, which stress adaptation of populations to their environment, fail to take sufficient account of the capacity of human behavior to adapt by changing its effective environment in a habitat.

Human behavior is unique in its capacity to change the amplitude and predictability of environmental fluctuations, and it is here that many of the species diversity models are likely to be too narrow or specialized. Those that use responses to environmental variability, such as the stability-time hypothesis and the May-MacArthur model, assume that the environment is controlled by external processes; there is no provision for a species that responds by changing its environment, for a process of environmental change that is internal to the model. What must be added to make the models more general is an interactive process that connects the community of cultural or biological species and its environment [Hardesty 1980:180].

Some anthropologists have applied optimal foraging theory (MacArthur and Pianka 1966; Schoener 1971) to analyze and explain food niche change in human groups. A number of these studies are collected in Winterhalder and Smith (1981). Hames and Vickers (1982) also used optimal foraging theory to predict changes in hunting strategy of South American Indians when game is depleted. But Christenson (1980a) found, when he compared human and nonhuman food-niche change that the human strategy of increasing environmental predictability by intensifying control over plants and animals could not be predicted from optimal foraging models.

Not unexpectedly, humans do not fit current models of food-niche change well because of somewhat hypertrophied adaptive abilities. The ever-widening human food niche in the Mesolithic and Neolithic (i.e., the broad-spectrum revolution) is predicted by most ecological models of niche change under conditions of declining resource availability (e.g., Emlen 1966; MacArthur and Pianka 1966); however, the subsequent intensification of agriculture and the drastic narrowing of the food niche is beyond their current scope. Thus, cultural ecological models have the potential of extending and even modifying the models developed by evolutionary ecologists. The quality and quantity of data on the human diet through time and across space may allow valuable insight into the processes of food-niche change not possible in the study of other animals [Christenson 1980a:61].

Until people began to subordinate the collection of wild food to food production, growing a few crops may have favored a broad food niche by making some resources more easily available and thus freeing more time to collect others, especially animal protein (Werner et al. 1979). In accordance with "Romer's Rule" (Hockett and Ascher 1964) evolution proceeds through minimal responses to environmental changes which maintain the system as long as possible, but as these small adjustments build up they may have cumulative effects that eventually lead to replacement of the system by a different one. At this point change becomes revolutionary in its results. When food production increases to the point when it interferes with food collection schedules, any further increase in food production will be at the expense of hunting and gathering. The result is narrowing of the food niche, and crop failure may have a

disastrous effect on food supplies (Bray 1976:91; Kirch 1980:127; Rindos 1980:761-763). Efforts to ward against famine, by storage, accumulation of surpluses, and by trade may be the more direct causes of the social consequences of agricultural commitment than the production of crops per se (Bender 1978; Hardesty 1980:181). Some groups that did not have effective agriculture used these social mechanisms to increase resource predictability. On the Northwest Coast, in California, and in Florida rank societies emerged without an agricultural base (Goggin and Sturtevant 1964; King 1978; Suttles 1968). Suttles corrected the notion that cultural complexity developed among Northwest Coast peoples because they lived in an exceptionally rich environment. "Abundance there consisted only of certain things, at certain places and at certain times, and always with some possibility of failure" (Suttles 1968:58). On the other hand we find people such as the Central Brazilians who cultivated high-yielding crops over a long period without committing themselves to agriculture or developing stratified social relationships. What we should probably look for, then, are the ecological and social factors that favor adaptation to environmental unpredictability through flexibility and exploiting a heterogeneous resource base, versus those that stress specializing on obtaining high yields from stable resources. In systemic terms, this is the difference between "resilience" and "stability" and, as Holling (1973)

stresses, this difference is not simply one of relative equilibrium, but is often that between survival and extinction.

1.2.1 Relative Costs and Benefits of Collecting and Cultivating

Hunters and gatherers have to contend with fluctuation of resources over whose reproductive rates they have no control. A number of investigators therefore suggested that with the advent of agriculture food supplies became more abundant and reliable. Butzer (1971) provided a typical statement of this viewpoint.

The invention and adoption of new tools and a new economic subsistence would inevitably promote a great increase of population made possible by the increased and more reliable food supply. Food production per unit area was much greater, and even during a bad crop year a certain amount of food would be available. There would not be complete dependence on the seemingly erratic movements and biological cycles of wild game. Life and death were no longer so precariously balanced; birth rates increased and human mortality declined (Butzer 1971:314).

However, as Patterson (1971) pointed out, this essentially contrasted a "hunter-gatherer" stereotype with a "farmer" stereotype. It neither accounted for regional variation nor for the long period of experimentation with cultivated plants during which there was still partial dependence on wild food. Nor did it account for occurrences of hunger among agriculturalists (see, for example, Scudder

1975:215-47). Fieldwork among contemporary hunter-gatherers during the 1960's and 1970's demonstrated that foraging for food did not necessarily mean that people must work continuously to ward off starvation. (Gould 1977; Lee 1968; Sahlins 1972; Woodburn 1968:52). Similar suggestions have been made about prehistoric populations. Caldwell (1962) argued that in the forested areas of eastern North America, where people had a balanced economy based on hunting and gathering, there was a long time lapse between first knowledge of cultivation and reliance on agriculture. However, such findings may have led to premature generalizations about the dependability of hunting and gathering subsistence.

For hunters and gatherers all subsistence labor is essentially "harvest" labor, as there is little delay between expending labor to procure a food resource and consuming it. Some hunting and gathering peoples, however, have a "hungry season" because fewer resources are available at certain seasons, and stored supplies may give out before a new season brings abundance again. This is especially true in the Arctic, where a fluctuating environment and lack of vegetable foods make the failure of any game resource a potential disaster (Balikci 1968:82). Even in latitudes where plant resources are abundant, providing greater security through diversity, there is seasonal fluctuation, with many species ripening at one time of the year, while at

another there is a relative dearth. For Great Basin groups the season of hunger was early spring (Steward 1938), and this appears to be the general North American pattern, while for the G/wi Bushmen of the Kalahari desert Silberbauer (1972) found it to be the dry season.

Foraging peoples are presented with the problem of scheduling their seasonal round, that is deciding which plant species to exploit, taking into account times of ripening, as well as changing distributions of fish and game. When resources become available at the same time in different places group members must decide on which of them they will spend their time and effort. Flannery (1971) found archaeological evidence in Mesoamerica that, when a choice was required, people gave preference to the seasonal availability of plant foods and when necessary curtailed animal exploitation.

The production of food through cultivation may help people to even out seasonal fluctuations, especially if they have effective storage methods. Yet, once crops are essential to maintaining the food supply, crop failure may result in periods of hunger that are longer and more severe than foragers usually experience. In a study of skeletal remains from two North American populations living in similar habitats Cassidy (1980) found that the distribution of Harris (growth arrest) lines in long bones showed that in

the hunting and gathering population growth arrest episodes occurred at regular intervals, indicating mild food shortages, perhaps in late winter; in the agricultural population such episodes were of longer duration and occurred randomly, suggesting that they were caused by disease or crop failure (for further examples, see Chapter 5). Lee (1968:39-40) found that the mobility of the !Kung Bushmen and their wide knowledge of alternative vegetable foods allowed them to cope with a drought better than did the neighboring Herrero and Tswana, who were agriculturalists and pastoralists. When their crops failed two years in succession the Herrero women joined the !Kung women in gathering wild plants (Lee 1979:255). However, as Scudder (1975) showed, the population density of African farming groups put great pressure on the wild plants that they gathered as emergency foods at times of crop failure. The Gwembe Tonga, a farming people of the Zambeze valley, used as famine foods a number of plant species that were also found in the !Kung area, but were not eaten by the !Kung, perhaps because they require laborious processing to be made edible (Scudder 1975:211-214).

With primary dependence on agriculture a new factor enters into the scheduling of time and labor: agriculture requires that people spend time planting and caring for crops they will not eat for several months.

In regions with pronounced seasonality, planting must be done at a specific time: in the spring or at the beginning of the wet season. While they are busy with these tasks agriculturalists may not have time to collect wild foods, so supplies may run low unless enough food from the previous harvest has been stored. Thus, adopting agriculture does not necessarily solve the problem of short-term seasonal fluctuation. Even in tropical forest areas where the rainfall distribution permits planting to be done at any season agricultural tasks may conflict with wild food collecting. Hames (1980:53), for example, notes that the Yānomamō at seasons when garden-related tasks require their attention hunt more in the game-depleted areas near their village, even though this is less productive than long-distance hunting. In native lowland South America, where low-protein root crops are the most common staples, animals are not domesticated for food, and techniques for preservation, such as smoking and drying, may keep meat and fish edible for a week at most, dietary protein may fall to a low level if people do not have time to hunt and fish. For example Beckerman (1980:101-104) noted that, while the Pari did not appear to be stressed by lack of protein at any season, the lowest level of meat consumption (110 g per capita per day) was in November, when men were occupied in clearing a banana patch to grow a cash crop.

Thus, consideration of the relative costs and benefits of food collecting and food production remains an important topic of debate among anthropologists. Studies of present-day hunters and gatherers have stimulated this debate without resolving it.

One important issue is how much we can rely on studies of modern foragers to clarify the processes that led to prehistoric changes in subsistence strategies. Contemporary hunter-gatherers are not "hunters in a hunters' world." They are populations that have been pushed by expanding agricultural societies into habitats not currently desired by agriculturalists, and they have developed specific adaptations to these habitats. For this reason some archaeologists reject all analogies drawn from ethnography (e.g. Freeman 1968). Other archaeologists maintain, however, that, without assuming identity between ancient and modern foraging societies, ethnographic data may be used to test archaeological assumptions. Yellen (1977a:6) points out that "particular past processes fall within a much broader realm or spectrum, portions of which may be visible today."

1.2.2 From Foraging to Agriculture

If the relative benefits of food production over other strategies can no longer be considered self-evident, we must

look for other motivations and pressures that may have induced people to make an increasing investment in agriculture. We must also seek to understand why, in some regions, when the principles of cultivation were well understood and utilized, groups did not increase their agricultural effort, or did so very slowly, over long periods of time.

One clear difference between foraging and agriculture is that, other things being equal, agriculture supports more people on the same amount of land. Mark Cohen (1977) suggests that population growth is a constant tendency of the human species. His model implies that human populations, like those of other species, tend to expand until limited by Malthusian checks. However, humans, through invention, may exploit existing resources more intensively, and eventually open up new resources, permitting further population expansion.

Others (Cowgill 1975, Bates and Lees 1979) object that a picture either of populations inevitably outgrowing their niches or regulating themselves below carrying capacity may be oversimplified. Cowgill suggests that such sweeping generalizations may be the result of a tendency to think of prehistoric or poorly documented societies in very global holistic terms. He points out that groups are formed of people who make subsistence and reproductive decisions based

on their individual perceptions of opportunities and hazards.

Taking the widest view, we know that human populations have been expanding since the Australopithecines; *Homo erectus* spread over the Old World, and before humans became dependent on agriculture they had occupied all the continents (Deevey 1960). We also know empirically that some populations did grow rapidly in many places after sedentism and dependence on agriculture were established. Specific mechanisms have been suggested for this growth. But this does not demonstrate that population pressure was, in all regions, the only, or even the main, factor that led to the increasing use of cultivated plants for food.

In some places effective food production became the subsistence base for state formation in a relatively short space of time. In others, hunting and gathering persisted as a way of life up to the present. In still other regions, a mixed strategy, with only partial dependence on agriculture, was maintained for a long time. To understand this variation, we have to look at a number of environmental and social variables which may influence the strategies that people adopt to obtain their food supply.

1.2.3 Scheduling and Subsistence Strategies

Flannery (1971) has presented a model which suggests that the motivation for the early use of cultivated plants for food in Mesoamerica was not population pressure directly, but economic cost-benefit decisions in scheduling subsistence activities, plus genetic changes in certain plants. Among these seasonal activities was the harvesting of annual wild grasses. One of these grasses, teosinte, (Beadle 1977) was not originally a very attractive food. But it responded to the man-made disturbance of harvesting with extraordinary genetic changes which led to its eventual development into the cultigen maize. "Starting with what may have been (initially) accidental deviations in the system, a positive feedback network came into operation which eventually made maize cultivation the most profitable single subsistence activity in Mesoamerica" (Flannery 1971:95).

As planting and harvesting maize became more important, adjustments to different environments may have determined whether maize cultivators became part-time or full-time farmers. According to Flannery, in certain regions, such as along humid coasts or on river bottomlands, maize could be grown year-round. This imposed radical alterations in the scheduling of seasonal activities, since the requirements of planting and harvesting took precedence over the use of

other resources, which became limited to those that could be exploited without interfering with farm work. The more people invested in farm work the more this investment came to dominate their strategy. As population built up beyond the level that could be supported by foraging, the transition to full-time agriculture became irreversible.

Population would be likely to increase because, as Binford (1971) and others have noted, in sedentary villages some of the selective pressures are relaxed that tend to keep population density low in hunting and gathering societies. The burden, which falls mainly on women, of transporting both infants and belongings from camp to camp is reduced, so women can shorten the interval between successive births while keeping their work effort constant (Sussman 1972, Lee 1979). Weaning foods for babies are perhaps more easily available, leading to a shorter nursing period. In a sedentary village there may be more unskilled tasks that young children can perform, making them economically useful at a younger age. Most important, perhaps, the techniques, such as irrigation, that might increase the quantity of food produced per unit area are labor intensive. Increased investment in agriculture both supports a denser population and encourages population growth through labor demand. Eventually the commitment to agriculture would become irreversible.

The process of agricultural intensification itself tends to be self-perpetuating, since the gradual

modification of the original biome requires increasing dependency on cultivated and domesticated foods rather than on wild resources. Once a commitment to this way of life is made, the necessity of maintaining the food-producing economy transforms the traditional basis for society, and sometimes alters the physical environment as well. These successive transformations make a return to the original state improbable or impossible [Smith 1976:17].

Flannery (1971) suggests that, beside the regions where maize could be grown year-round, there were others where agriculture could be conveniently practiced only during the rainy season, producing only one crop a year. These were typically regions with a particularly arid climate, or higher valleys which were subject to winter frosts. Where farming was only a rainy season activity the dry season was left open for collecting. Rescheduling to allow for the planting and harvesting of crops was less drastic than in regions where agriculture dominated the entire year. The subsistence strategy remained broad-based. A short-term surplus after the harvest may have provided seasonal support for larger aggregations of people for cooperation in hunting, ceremonies, matchmaking, defense, or trade. People might have remained healthier than in a fully agricultural community since they left their wastes behind them when the collecting season came round, lessening risk of infection and disease transmission. The nutritional base might be more varied. Crop failure might have a less disastrous effect than on those completely dependent on maize, as they

could turn to alternate resources. Perhaps most important, as long as such groups were nomadic during part of the year population growth would be little stimulated by sedentism.

According to Harner's (1970) proposition, the favorable effect of an innovation that provides a new resource (in this case maize cultivation as a supplement to foraging) is prolonged until population growth catches up and causes further pressure. Flannery (1971:93) suggests that as long as scheduling for collection of wild foods was maintained, a "deviation counteracting" system remained in effect. The positive feedback effect of maize cultivation was damped, so populations for thousands of years remained only partly committed to agriculture.

Thus there are indications that in certain environments, particularly those where seasonality restricts the planting season, part-time agriculture could become a stable subsistence system rather than a transitional stage, inevitably leading to full-time agriculture. It was practised by a number of Central Brazilian societies, including the Xavante, until close to the present time. These societies developed elaborate social organizations based on cross-cutting non-kin sodalities that came into play at the time of planting and harvesting their crops, when they aggregated in villages of up to 1000 people or more. At other seasons they trekked through the cerrado

hunting and gathering, sometimes splitting up into smaller groups. Agriculture contributed more to subsistence in some of these societies than in others, but did not completely supplant trekking in any of them until after pacification.

During the early years of colonization some Central Brazilian groups apparently became more nomadic as Portuguese miners and cattle raisers occupied the strips of land along rivers that provided the only soil suitable for slash-and-burn farming. The Indians turned to raiding the crops and cattle of the invaders, while mobility allowed them to elude reprisals. However, eventually circumscription of their lands by settlers crowded the Indians, even while they were suffering depopulation from warfare and disease. When this happened to the Xavante in the 19th century, groups of them crossed the Araguaia river to territory still unoccupied by whites, where they continued a mixed foraging and cropping life style for nearly another 100 years.

Thirty years ago the Xavante were finally pacified and settled around government Indian posts and missions. After an initial period of decimation from feuding and epidemic diseases their population began to increase. The Xavante have altered their subsistence strategy not only by becoming more dependent on agriculture, but also by entering the local market economy. The upland rice they now grow

provides them with a subsistence staple, and also a small surplus that can be sold to buy tools and other manufactured goods necessary to their new life style.

1.2.4 Innovation and Work Effort

Boserup (1965) suggested that the primary moving force in agricultural intensification is population pressure on resources. This pressure leads to the adoption of new technology. Each technological advance permits a greater yield per unit of land through greater frequency of cropping, but increases the individual work effort required to produce this yield. Boserup's hypothesis, however, does not explain why people should accept an innovation that will increase work effort when other strategies that do not have that effect may be available.

Individual perception that pressure on resources is occurring may be through increased labor, using the current technology, to obtain the same amount of food. It may be that longer hours of hunting are needed to find a given amount of game, or that more time must be spent in clearing new land to produce the crop yield formerly obtained. As we suggested in a previous report (Gross et al. 1979:1050): "The time required to produce a given output is an immediate way in which environmental feedbacks are perceived by food producers." Under these conditions we suggested that people

would alter their subsistence strategy -- in the case of the four Central Brazilian native societies that we compared to increase their participation in the market economy. Other strategies that might possibly be adopted include technological innovation permitting a higher yield from land already being cultivated or the cultivation of land not arable by current methods, population control limiting the number of non-producers to be fed, reduction of the population through out-migration, or expansion of territory through warfare. The intent of the individuals making these strategic choices would almost certainly not be an increase in their individual work effort. If people perceive environmental deterioration as less food available for the same amount of labor, they should view environmental improvement as more food made available for the same amount of labor. This, of course, does not mean that they may not have to work harder in the long run. The choices that people make are primarily determined by their short-term circumstances -- the long-term results are often unforeseen, especially since each choice made will have a limiting effect on future choices. For example, increased investment in the market economy results in new needs -- clothing, tools, formal education to cope with the larger society -- that people will have to work harder in order to obtain.

Dumond (1972:292-295) points out that responses to population pressure may fall into three general categories:

1. Those that involve producing more food from the same resources.
2. Those that involve limiting or decreasing local population, such as birth control or out-migration.
3. Those that involve capturing new resources of land or labor.

Only the first of these three choices would be likely to involve increased labor for the original population, and would not necessarily have that effect immediately.

Harner (1970) maintains that when innovation provides a new means of production pressure is temporarily relieved but, since more food is produced, population growth continues, and soon catches up with the new productive capacity. Boserup (1965:54-55) admits that cultivators who adopt the use of the plow with short fallow at first work less over the year than those who attempt to produce the same amount of food by intensification of long-fallow cultivation:

Only when very high population densities have been reached will cultivators using the plough have to give up their periods of seasonal freedom from agricultural work and acquire the habit of regular daily work during long hours all the year round. This stage is not reached before the peasants have to feed their animals nearly all the year on produced fodder or must apply labour intensive agriculture and rear successive crops in order to subsist [Boserup 1965:55].

Many anthropologists (e.g. Bronson 1975

Cohen 1975; Smith and Young 1972) who have considered Roserup's view of population growth and agricultural intensification agree that neither of these should be viewed as a completely independent variable. Rather they see an increase in one stimulating an increase in the other. They differ mainly in the relative weight and determinism they ascribe to each.

Dumond (1972) and Roosevelt (1980) accept the idea that human populations have an inherent tendency to increase, but point out that some environments are much more resistant to intensification than others. Under resistant conditions, the labor cost of intensification, even using new means of production, may be perceived as high, and people will reject a relatively unproductive increase in work effort.

In that case, people under increasing population pressure on resources face making a choice that falls under either the second or the third category: to limit population by cultural means, or to capture new resources.

The first of these choices would regulate pressure on resources by maintaining the population within the "carrying capacity" of the environment. Those who support the group adaptation theories of Wynne-Edwards (1962, 1965) believe that this choice has often been adopted because it favors the survival of the group. Others (e.g. Faris 1975; Bates and Lees 1979) maintain that, since people seek to maximize

their individual advantage, they will voluntarily limit their reproductive potential only to favor the survival of children already born.

The third category of choice -- capture of new resources -- may very likely involve conflict with neighboring societies. Vayda (1969) pointed out that swidden agriculturalists might fight with their neighbors to capture land, even when there was abundant virgin forest available to be cleared, to avoid the high labor cost of clearing new land.

Success in warfare would favor the development of large, well organized local groups, even though regional population density might not increase if the groups remained mobile and continued to exploit the resources of their territory by extensive methods. I believe that this expansive strategy was often followed by Central Brazilian societies and that it led to a pattern of continuing warfare both in pre-Columbian and post-Columbian times. I shall discuss this possibility in succeeding sections.

1.3 CULTURAL EVOLUTION IN AMAZONIA

Cultural evolution in the Amazon Basin has most often been discussed in terms of the agricultural potential of two different habitats: the floodplains of the Amazon and some of its major tributaries, and the interfluvial areas

(Meggers 1954, 1971; Carneiro 1970a, 1973; Lathrap 1970; Gross 1975; Roosevelt 1980). Both of these habitats are within the tropical forest zone, which covers 2,320,000 sq. miles of the Amazon Basin. Throughout this region mean annual temperature variation seldom exceeds 50 F and relative humidity is normally higher than 80% (Meggers 1971). Rainfall is generally heavy and varies seasonally, but no season of the year is without rainfall.

A third natural division of Amazonia, the cerrado region of Central Brazil, which is watered by some of the southern tributaries of the Amazon, has seldom been considered in these discussions. The cerrado contrasts sharply in climate and vegetation with the tropical forest. There is a winter dry season of three to five months with practically no rainfall and very low humidity. While there is little variation between seasons in mean temperature, there is extreme daily variation in June and July, with a difference of about 40o F between day and night temperature. Not only does the amount of rainfall vary from year to year, there are also short dry spells which may occur unpredictably during the rainy season and affect growing crops. D. Harris (1980a:3) characterizes the cerrado as tropical savanna, a term often associated with grassland, but open grassland occurs in the cerrado only in patches. The vegetation pattern is highly zoned, with scrub and woodland forms predominating. Cerrado flora is botanically distinctive

(Eiten 1972), many species have thick bark and leathery leaves adapted to survive the rainless months and the brush fires that sweep across the land at the end of the dry season. However, in the gallery forests, usually only narrow strips along rivers and streams, a number of species grow that are also found in the tropical forest. Only the gallery forests have soils with humus and moisture enough to support slash-and-burn horticulture. In the cerrado ground-dwelling animal species predominate. These contrasts suggest that humans would adapt differently to the cerrado than to the tropical forest, and therefore that cultural evolution might take a different course.

1.3.1 The Interfluvial Upland Region

Away from the floodplains of the Amazon and its major tributaries, local populations have remained small and dispersed. The people of most of these communities grow bitter manioc as their staple crop and depend on hunting or fishing for animal protein. Both Lathrap (1970:53) and Meggers (1971:14-22) stress that the soils of the upland areas, while they support exuberant forest vegetation when undisturbed, are in delicate ecological balance. Relatively few nutrients are stored in the soil, rather they are recycled almost immediately to new growth. Swidden agriculturalists release these nutrients to the soil by felling and burning vegetation. However, plots can be

cultivated for only a few years without a drop in yield. At the end of this time the plot is usually allowed to go to fallow for up to 20 years. Meggers believes that under these conditions, which require the maintenance of a large amount of fallow land, population density must necessarily be low. Maintaining a balance between resources and population necessitates culturally-imposed limitations both on population size and population density (Meggers 1971:103-113). However, even though the Upper Xingu region was categorized by Meggers (1971:13-14) as "terra firme" or upland, Carneiro (1973) showed that the manioc growers of an Upper Xingu community that he studied had the potential to produce calories to support a much larger and more permanent population than they did. Land suitable for growing manioc was abundant and since the crop was harvested and immediately replanted, the supply of vegetable food was continuous. Carneiro concluded that soil depletion per se was not a sufficient explanation for frequent village movement (but cf. D. Harris 1972a:250). The desire for security from attack or the depletion of game animals in the vicinity of the village would be more likely reasons.

Gross (1975) cited further evidence drawn from the ecological and ethnographic literature to show that, given the distribution of game animals in the tropical forest, and the general use of high-calorie but low-protein root crops, game depletion might well be the most important factor

contributing to the small size and dispersion of local groups. Gross pointed out that the community described by Carneiro, which was dependent on fishing for animal protein, would find it difficult to support a large concentrated population, as the linear extent of river they would need to supply such a population with fish would be difficult to control (but cf. Beckerman 1979:535).

M. Harris (1975) examined the Yanomamö complex of female infanticide, polygyny, and warfare, and suggested that the Yanomamö were not really fighting over women, as Chagnon (1973, 1980) believes, but were struggling for control of scarce hunting territory. Siskind (1973) also invoked competition for women made scarce by female infanticide and polygyny as a mechanism through which communities might adjust the distribution of population to resources.

The scarcity of women is thus a cultural artifact which produces competition between men and provides incentives for hunting. It also provides the incentive for the widespread pattern in the tropical forest of raiding other villages or tribes for women. The practice of raiding itself keeps groups at a distance from one another, thus dispersing hunters, and a perennial motive of acquiring more women is a self-fueling reason to keep raiding [Siskind 1973:236].

In proposing his model, Gross (1975:544n) expressed the hope that discussion of it would stimulate more quantified empirical studies of resource capture, production, and consumption in Amazonia. It has apparently had that effect, since a number of recent studies (e.g. Beckerman 1979, 1980;

Hames 1979, 1980; Chagnon and Hames 1979; Vickers 1979, 1980; Lizot 1978) have been presented explicitly as tests of general models proposed by Meggers, Carneiro, Lathrap, and Gross. Gross (1981) has recently summarized and discussed a number of these recent studies. So far, they provide evidence that there is considerable local variation in resources, and that exploitation of these resources is influenced by new means of production, such as shotguns and steel tools. Since there are still a number of small-scale societies in the tropical forest, we may anticipate further studies by ethnologists which, as they accumulate, may lead to new syntheses.

1.3.2 The Floodplains

While ethnography can contribute to the understanding of both past and present-day tropical forest adaptations, investigation of the large sedentary populations that once occupied the Amazonian floodplains mostly falls within the purview of archaeology, with some evidence from early historical accounts. These societies were early victims of the diseases and slaving expeditions that followed European invasion.

Meggers (1954, 1971) believes that the floodplain environment, while more productive than that of the interfluvial regions, because of seasonality and

unpredictability sets a limit on the level of social evolution it might support. Moreover, she ascribes a number of cultural traits found in these societies to diffusion or migration from the Andean area (Meggers 1971:146). Lathrap (1970:67, 1977) on the contrary, believes that the cultivation of bitter manioc on the alluvial floodplains of the lowlands was the basis for "a legitimate Neolithic revolution" (1977:740). The direction of migration and cultural diffusion would be from the lowlands to the highlands. The floodplain area capable of supporting high agricultural productivity was limited in extent, and this would fulfill the condition of circumscription that Carneiro (1970b) believes to be a precondition for political centralization (Lathrap 1977:737).

In a recent book, Roosevelt (1980) accepts the floodplain as an environment conducive to cultural development but, unlike Lathrap, believes that maize rather than manioc was the staple crop on which it was based. She points out that maize is a short-term crop, less vulnerable to loss from flooding than manioc which requires many months to ripen in the ground and is intolerant to waterlogging. Maize can be stored as a surplus, and is relatively high in protein, which lessens the dependence of the population on fish and game.

On the basis of the archaeological, ethnohistoric, and ecological evidence, it can be proposed that the late prehistoric increases in population density in the floodplain regions of Amazonia

might be attributed to the inception of intensive maize cultivation there. The rise of the floodplain chiefdoms would then be explained as a response to the managerial requirements of the new cultural ecological system [Roosevelt 1980:66-67].

1.3.3 The Cerrado

The cerrado region of Central Brazil has until recently received little attention from ecologically-oriented ethnologists, and almost none from archaeologists. Anthropological interest in the region has rather centered on structural aspects of the elaborate social organization in an egalitarian context which characterizes many Central Brazilian societies.

During the 30's and 40's Nimuendaju (1942, 1946, 1967) wrote meticulously observed ethnographies of several Gê groups, describing their social organizations, history, and subsistence practices. The Bororo, a cerrado group that speaks a language of the Macro-Gê family, were described in great detail by Salesian missionaries (Colbacchini and Albisetti 1942; Albisetti and Venturelli 1962). Much of Levi-Strauss's work on fundamental oppositions in human thought is based on these sources, as well as on his own fieldwork (Levi-Strauss 1964, 1967a, 1967b, 1967c).

More recently, a number of anthropologists, including D. Maybury-Lewis and his students, have undertaken field studies among these groups which have led to new data and

interpretations of their social structures (Maybury-Lewis 1967, 1979); Lave 1967, 1979; da Matta 1970, 1973, 1979; T. Turner 1966, 1979a, 1979b; J. Bamberger 1967, 1974, 1979; J. C. Crocker 1967, 1969a, 1969b, 1979; J. Melatti 1970, 1979, etc.). Other ethnologists who have done recent studies of Central Brazilian groups are A. Seeger (1974, 1980) (the Suyá); W. Crocker (1961, 1967) (the Kanela); L. Vidal (1977) (the Kayapó Yikrin).

However, until the 1970's almost no fieldwork had been done in Central Brazil within an evolutionary-ecological framework. D. Gross (1979) held that an ecological approach was likely to shed light on many of the aspects of Central Brazilian society that had long intrigued ethnologists:

My orientation leads me to reopen the questions of why the Central Brazilians are so distinctive as a group, how their unique institutions may have evolved, and what factors may have selected for them, in an evolutionary sense. I shall look for answers to these problems in the influence of the natural habitat, warfare patterns, population pressure, and colonial expansion. It is remarkable how little of the research done so far on Central Brazilians emphasizes the relative ecological homogeneity of the region within which they occur (an exception is E. Becker 1965) [Gross 1979:324].

In 1976 Gross organized a comparative field study of four Central Brazilian societies. Fieldworkers on this study were M. L. Ritter, who studied the Kanela, D. W. Werner, who worked with the Mekranoti Kayapó, M. L. Leal, who did fieldwork with the Bororo, and I, who studied the Xavante.

The field studies were carried out in 1976-1977 under the general orientation of D. Gross. Several joint papers have already resulted from this comparative study, and more are in preparation. In "Ecology and Acculturation Among Native Peoples of Central Brazil" (Gross et al. 1979) we showed that the degree of market participation in the societies we studied was related to the difficulty of making a living from slash-and-burn subsistence agriculture, measured by the ratio of labor input to food output. In "Subsistence Productivity and Hunting Effort in Native South America" (Werner et al. 1979) we suggested that time invested in hunting was related more to the overall possibilities for production in an area than to the availability of game. In the communities where gardening was most productive men hunted more because they did not have to spend so much time in garden labor. In "Variation in Swidden Practices in Four Central Brazilian Indian Societies" (Flowers et al. 1982) we found that the four societies varied their mix of crops and gardening practices in accordance with their overall subsistence strategies. In "Village Movement in Relation to Resources in Amazonia" Gross (1983) suggested that, even though conflicts were the most frequent reason given by informants for village moves, differences in soil fertility found in the garden land available to the four groups indicated that resource depletion might be an underlying cause. Werner has written his thesis on Mekranoti

leadership (Werner 1980) and other papers on the Mekranoti (Werner 1978, 1981a, 1981b, 1982a, 1982b, 1983). I have contributed a paper on the Xavante: "Seasonal Factors in Subsistence, Nutrition, and Child Growth in a Central Brazilian Indian Community (Flowers 1983).

1.3.3.1 The Cerrado Habitat

D. Harris (1980a:3) places the Brazilian cerrado in the Intermediate Tropical or Savanna Zone, which he defines according to the length of the dry season, for while savanna plant communities vary "all tropical savanna ecosystems are adapted to a winter dry season that checks plant growth." The relatively short dry season, from May through August, and an average annual rainfall of 1750 mm (I.B.G.E. 1977:46-49) place northeastern Mato Grosso, where the Xavante live, in the category of "humid savanna" (D. Harris 1980a:4).

Not only are savanna habitats temporally variable, since the amount of rainfall tends to vary from year to year, they also are geographically patchy. These aspects of savanna environments are factors that shaped human adaptation to savanna living.

Even the more apparently uniform savanna regions contain vegetational mosaics made up of varying combinations of trees, shrubs, grasses, and forbs. Ecotones between savanna and closed-canopy forest and between savanna and water, have been favored areas for human occupation in all

savanna regions... Seasonally scheduled exploitation of a mosaic of resources has nevertheless been a common denominator of hunter-gatherer, pastoralist, and agricultural life styles in the Intermediate Tropical Zone [D. Harris 1980b:31].

The cerrado is even more diversified in vegetational forms than most other savanna regions (Parsons 1980:268), ranging from closed-canopy forest to grass with or without scattered trees and shrubs. Relatively dense low scrub is the most common form.

As a rough estimate, in 70% of the cerrado area today (discounting the up-to-now small fraction deliberately cleared by cutting) the woody plants are too dense to permit a jeep to be driven through. Despite the variation in height and spacing, all cerrado stands possess a certain distinctive appearance because of the contour and morphology of the individual woody plants in it [Eiten 1972:202].

According to Eiten, cerrado vegetation grows back vigorously after burning.

The stems of the taller shrubs and low trees have the ability to remain alive though completely charred by fire, protected by their thick corky bark, and to sprout again from these burned trunks and branches. The contrast between a new green shoot and the black charcoal-covered branch from which it sprouts is striking. For these reasons, even severe annual fires over many years will not destroy a cerrado. Such fires may lower and open out the woody layer but hardly affect the herbaceous cover except for species composition. [Eiten 1972:303-304].

This fire resistance indicates to Eiten that cerrado vegetation probably became adapted to fire before human

occupation, but burning became more frequent through the activity of Indian groups. In the dry season that I spent with the Xavante they burned over the cerrado for miles around their village. They told me that they did this every year to surround game and to make it easier to travel. D. Harris (1980b:32) points out that fire has a number of different ecological effects and humans have used it purposefully since earliest times:

There can be little doubt that fire was early used to drive game and to attract animals to the salty ash and fresh herbaceous growth of burned ground. Fire set during the dry season after tuberous plants have accumulated starch in their underground organs, also makes foraging for roots, tubers, and other plants easier [D. Harris 1980b:32].

Medina (1980:310) notes that as well as increasing above-ground organic matter by about 30%, fire apparently increases the activity of the root system, and thus stimulates higher nutrient uptake from the soil. It seems that cerrado peoples, as well as practising slash-and-burn agriculture, changed their wider environment in ways that contributed to their subsistence. This again suggests a contrast with the tropical forest, where burning is unlikely to affect large areas (Eiten 1972:286).

1.3.3.2 Hunting

Whether game resources are more likely to be abundant in savanna regions than in the tropical forest is a question

that has been recently debated (Kiltie 1980:543) and there seems to be little agreement. HersHKovitz (1972:397) states that the fauna of Central Brazil is more varied than that of any other part of the South American continent. He refers to the Brazilian uplands as a "faunal center" where the terrestrial animals that now occupy all of Amazonia evolved. In any case, because of greater visibility and the use of fire to surround game in the dry season, group hunting is more effectively practised in the cerrado than in the tropical forest. My data (see Chapter 4) indicate that collective hunting is considerably more productive for the Xavante than individual hunting. One of the reasons for this may be that the principal species captured, in numbers, is white-lipped peccary. White-lipped peccary run in herds, and are highly mobile, so that their appearance in any one place tends to be rare and unpredictable (Kiltie 1980:542). This would place a premium on cooperation and exchange of information among hunters (Dyson-Hudson and Smith 1978:24-25).

Productive group hunting might tend to exhaust game species in a given area, but since Central Brazilian groups spent much of their time on trek, moving over a wide area, predation was spread over a range of hunting zones. This extensive exploitation would be less likely to affect game resources than the typical tropical forest pattern of exploitation in which hunting parties depart year-round from a fixed settlement (Vickers 1980; Hames 1980).

1.3.3.3 Gathering

Another aspect of Central Brazilian subsistence was the extent to which wild plant resources, especially tubers, were exploited.

Without hunting, Shavante culture would have been very different; but without gathering, the Shavante could not have existed at all. In 1958 the Sao Domingos Shavante did not eat meat every day and even went without meat for a number of days at a stretch when they were too busy to hunt. A day never went by, however, when the wild products of the region were not available in the community [Maybury-Lewis 1967:43].

The Xavante in the 1950's spent as much as eight months of the year on trek, splitting up into several groups. However, they maintained a base village, where they assembled at planting time and after the harvest. During treks they subsisted on roots, nuts, and fruits. The roots were gathered in the cerrado, and provided "a nourishing, if starchy, diet." Other year-round staples were palm shoots and palm nuts (Maybury-Lewis 1967:44-45).

This stress on gathered plant foods as subsistence staples contrasts with tropical forest groups, who collect a great variety of plants for various purposes, including manufacture and medicine, but not as dietary staples.

In a paper on the determinants of sedentarization in the tropical forest, Carneiro (1970a) compared the subsistence practices of the interfluvial Amahuaca with the riverine

Kuikuru. According to Carneiro's calculations, the Amahuaca derive about 50% of their subsistence from horticulture, 40% from hunting, and about 5% each from fishing and gathering. The Kuikuru get about 80% of their diet from their gardens, 15% from fishing, about 1% from hunting, and therefore less than 5% from gathering. Amahuaca settlements are small and move frequently, apparently in response to game depletion, while the Kuikuru village, with a population about 10 times larger than that of an Amahuaca community, has remained in the same locality for 80 or 90 years. "Riverine peoples, finding it possible to subsist heavily on fish and other river animals, became more sedentary, embraced agriculture more fully, and developed larger villages" (Carneiro 1970a). However, both of these types of community, since they depended almost entirely on their gardens for vegetable food, were forced to plant new gardens whenever they moved, while Central Brazilian groups could remain nomadic for an indefinite period as they could provide themselves with plant foods by gathering wherever they camped.

Did tropical forest groups cease to gather simply because they could obtain plant foods more easily by cultivating them? Or does the tropical forest not supply plant foods with the reliability and abundance that would allow human groups to rely on them? Lathrap (1970) suggests that it does not:

Through a complete knowledge of the properties of the wild plants of the Amazon Basin the Indians were able to extract a wide range of powerful poisons for hunting, fishing, and warfare. Equally remarkable was the formidable array of narcotics derived from wild plants which played an important role in the religious and aesthetic life of the aborigines. On the other hand, with the important exception of the fruit of several wild or semi-domesticated palms, the tropical forest was less bountiful in terms of naturally-occurring vegetable foods, offering far less than either the hardwood forests of the Northern Hemisphere or the thorn forests of the arid tropics [Lathrap 1970:33-34].

In contrast with the apparent paucity in the tropical forest of wild plants that might provide staple foods, it appears that a variety of edible tubers are found in tropical savannas, like the cerrado, that have pronounced wet and dry seasons.

Tuberous plants with underground organs for food storage are adapted to survive dry or cold seasons and to grow quickly to maturity once the rains return or the ground warms up again. They achieve this by accumulating starch in their roots or stems during the growth period, and many of these bulk foods are relished and sought by man and animals. Such plants occur wild in temperate as well as tropical seasonal environments and are used for food by most hunter-gatherers. But they are particularly characteristic of the intermediate tropical zone between the equatorial evergreen rain forests and the perennial deserts, and it is among tropical hunter-gatherers that specialized dependence on this resource of wild food is most evident [D. Harris 1977a:209-210].

For example, while the hearth of manioc cultivation is most often believed to be the lowlands of northern Colombia (Lathrap 1977; C. Sauer 1952), more wild manihot species are found in eastern and central Brazil than in any other South American region (Rogers 1963:53).

Giaccaria and Heide (1972:65), in their ethnography of the Xavante give native names for 14 different kinds of roots that the Xavante distinguish as edible. They also make the intriguing comment: "Two or three varieties of these roots are gathered and also cultivated; the small tubers are kept in baskets hung on the posts of the hut, or placed outside on poles until planting time¹." In the appendix of his book on the Xavante, Maybury-Lewis (1967:334) sketches and gives the Xavante name for seven kinds of commonly-eaten roots. However, he was unable to obtain a botanical identification for these tubers. The Xavante still gather these tubers occasionally; I saw and tasted several of them, but as I could not obtain specimens of the entire plant they could not be classified.

Werner (1978, 1983) found that the Mekranoti, who belong to a Kayapó branch that moved into the tropical forest from the cerrado sometime around the beginning of the 19th century (Vidal 1977:43), still go on trek, but carry garden produce -- sweet potatoes, bananas, manioc roots and processed manioc flour-- with them. However, according to Lukesch (1976:247), his Kayapó informants maintained that when their people lived on the cerrado they subsisted entirely on wild food when on trek.

¹ Duas ou três variedades de batatas são recolhidas e também cultivadas; os tubérculos pequenos se conservam recolhidos em cestos postos na cabana ou colocados fora em cima de paus até o tempo da plantação.

1.3.3.4 Scheduling

Xavante treks, as observed by Maybury-Lewis in the late 1950's were far from being haphazard:

A trek starts from the base village and may last as little as six weeks or as much as three or four months. It is deliberately planned by the elders in the men's circle so that the community may move over certain country with a view to exploiting specific resources. It is not unusual for a community to split into bands that travel in different directions but come together again after a comparatively short interval. It seems that each trek moved in a different direction from others that had been undertaken in the same year, so that the rhythm of Shavante life was not seasonal but approximately annual. Roughly speaking they exploited the territory dominated by their own community in the course of the year. Alternatively, it might be said that the territory of any particular community was that area which it was able to exploit in the course of a year's wanderings [Maybury-Lewis 1967:53].

Maybury-Lewis's map (1967:54) of Xavante trek routes in 1958 indicates that they went up to 80 miles from their base village, following routes that took them to the north and east (see Figure 12). As they traveled in a loop that took them away from the base village and back, the distance traveled in one trek might be more than 200 miles.

Treks were apparently planned to take advantage of several resources, not all of which were foods. On one trek the specific resources to be collected were buriti bast and scleria seeds to manufacture ceremonial regalia, and arrow canes. A band that traveled in a different direction was attracted by the abundance of game to be found there. It

seems, however, that wherever they went, they could count on gathered plant foods for subsistence.

1.3.3.5 Agriculture

Central Brazilian groups have been considered "incipient agriculturalists" in that they depended to a large extent on gathering wild foods. Yet there is little reason to believe that they were hunter-gatherers only recently converted to the use of cultivation. One indication that they have been cultivating for a long time is that several Central Brazilian groups grow an archaic variety of maize known to botanists as interlocked soft corn. This race of maize is found only around the western and southern margins of the Amazon Basin (Brieger et al. 1958:199-214). Brieger suggests that the interlocking of neighboring alveoli may indicate an independent trend in the early stages of maize domestication. Other possible indications of independent experimentation with plant domestication are the Xavante custom of planting wild tubers, and the existence of a xerophile crop plant, *Cissus* sp., grown by the Western and Central Cê, which is not cultivated elsewhere and does not grow in the wild (Nimuendajú 1946:59). It appears that the limited commitment to agriculture of many Central Brazilian groups was not due to lack of knowledge of the techniques of cultivation.

While Central Brazilian groups varied in their degree of reliance on agriculture, none of them, until recently, was reported to be dependent year-round on crops for its food supply. Cultivated crops provided the main food supply at specific times during the year. For example, Maybury-Lewis (1967:44) reported that in April, 1958 the Xavante had gathered their maize harvest. But after eating part of it they went off on trek, subsisting on wild tubers and palm shoots, while they saved the rest of the maize for the middle of the dry season when they would assemble in the village to celebrate the boys' initiation.

In the 1950's the Xavante were probably among the most nomadic of Central Brazilian groups. The only crops they grew were maize, beans, and pumpkins. When Maybury-Lewis (1979:333) asked the Xavante why they did not grow manioc, since they were so fond of eating manioc flour, some of them replied that the cultivation of manioc required too much attention and it would prevent them from going out on trek. However, the Apinayé who, according to Nimuendaju (1967:87-90), raised an extensive repertoire of crops, including bitter manioc with which they were familiar before their first contact with Brazilians, did not intensify agriculture to the point where it would interfere with seasonal trekking. After planting their clearings, most of the villagers went on trek until harvest time, leaving only two ritual guardians to watch over and perform ceremonies to

promote the growth of the crops. As soon as they had determined that the crops were ripe, one of the guardians took samples of first fruits out to the hunters' camp. Then, after one more communal hunt, the entire group returned to the village to commence harvesting.

It appears that the procurement of wild species, including game, plant foods, and materials for manufacture, was at least as important a determinant in Central Brazilian scheduling of activities as were the needs of agriculture.

One reason why Central Brazilian groups failed to intensify agriculture beyond a certain point may be that suitable soils for gardens are limited to those of the gallery forest along watercourses. As the plots nearer the village were fallowed, people would have to walk farther and farther to reach their gardens (Nimuenđaju 1946:59). Labor cost in time required to walk to gardens would build up more quickly than in the tropical forest where the village was surrounded on all sides by arable land (Gross 1979).

Rainfall in the planting season is also less reliable in the cerrado than in the tropical forest. The short rainless periods that occur unpredictably during the growing season may have deleterious effects on the growing crops (Warming 1973:30-31). In the eastern part of the cerrado region, in the states of Maranhão and Piauí, drought lasting several years may result in complete crop failure (Porto n.d.:106; Nimuenđaju 1942:94).

Central Brazilian groups, then, rather than depending on crops to support them year-round, used them to provide food for the season when they assembled in their base village, which was also the time when the major ceremonials of the year, such as initiations, were held. Among the Kanela the major ceremonial season was during the three months after the maize harvest (Nimuendaju 1946:163). Maybury-Lewis (1967:48) stated: "The harvests were thought of less as providing the essentials for the life of the community than as bonuses to be used for celebrations." These rituals are accompanied by community-wide distribution and exchange of food in ceremonial context.

1.3.3.6 Aggregation and Dispersal

Aggregation of nomadic hunter-gatherers into multi-band groupings at certain seasons and dispersal at others are commonly referred to in the literature (Thomson 1939; Helm 1968; Wilmsen 1973; Lee 1972b; Steward 1976; Stuart 1977). In almost all cases the larger groups are formed when some resource is seasonally concentrated. These periods of concentration are characterized by more intense social interaction and economic cooperation (Lee 1972b:181). Steward 1976:135). However, some ethnologists have held social interaction to be the primary motive for aggregation (e.g. Woodburn 1972; Turnbull 1968).

As Flannery (1971) has noted, this seasonal pattern of aggregation and dispersal may continue even when agriculture is considerably developed, as long as the seasonal cycle includes a period of dependence on wild plant foods. MacNeish (1972) found that prehistoric bands in the Tehuacan Valley, as agriculture increased, assembled into macrobands at planting time.

In their calendar-round it appears that in the spring, groups of microbands usually coalesced to form macrobands in the Humid River Bottoms, Dissected Canyons, or Alluvial Slopes to gather wild seeds and pod fruits as well as hunt. While collecting in the spring they probably planted gourds, squash, corn, and beans that allowed them to live as macrobands in the same spot through the summer [MacNeish 1972:76].

Central Brazilians had base villages with populations that might exceed 1000 where they lived at the times of planting and harvest, and for several weeks or months after the harvests. These base villages were relatively stable: the Kanela moved theirs about every 10 years, apparently in response to the growing distance they had to walk to tend their crops (Nimuendaju 1946:59). There was a tendency to return to the same location after the surrounding land had fallowed for about 20 years. Less than three kilometers from the present Xavante village there are two earlier village sites, one occupied during the 1930's, the other during the 1950's. The period spent in the village was one of intense social activity, when roles that cross-cut kinship groups were acted out in elaborate ceremonies.

Gross (1979:330) points out that this period of aggregation is costly in terms of human energy and depletion of natural resources. He believes that "people would not engage in such costly activities unless there were some substantial benefit vis-a-vis survival." The benefits that he suggests are more effective defense of their gardens against attackers who, in the pre-contact period, might have been riverine groups making forays upstream from the densely-populated Amazon floodplain, and environmental unpredictability: "The risk of occasional crop failures or game fluctuation could favor the occasional formation of large aggregates in localities where resources have not failed in a given season." Central Brazilian social organization, then, would have developed as a means of periodically integrating kin-based social units into larger groups which could cooperate economically and socially.

This explanation is based on the observed fact that all Central Brazilian groups we know of practised agriculture to some extent, and therefore had gardens to defend. But if, as Maybury-Lewis (1967:53) indicates, hunting and gathering in the cerrado could supply small groups with a satisfactory livelihood, why did they adopt agriculture in the first place? One possibility is that limited agriculture supplied garden foods to support short-term aggregation after the harvest, when men joined together for communal hunting. Collective hunting was particularly advantageous during the

dry season when game surrounds using fire were practicable. In the Xavante village where I lived, every able-bodied man joined in such hunts, some using bow and arrows as there were not enough guns to go round. My data (see Chapter 4) show that such game drives were much more productive than individual hunts. Similar game drives are reported by Nimuendaju (1967:90-93) for the Apinayé, and by Nimuendaju (1946:65) and Paula Ribeiro (1841:188) for the Eastern Timbira. These game drives were held at the end of the dry season.

The opening of the hunting season is ushered in by the *čóčóre* dance. Even before the dance a medicine-man led in the singing of hunting songs, the words of which referred to the game species. The same medicine-man also superintends the hunt itself, allotting to each hunter a particular segment of the circle. The first smoke to rise forms a signal for all. The game fled from the fire toward the center, where it was stupefied by the smoke or perished in the flames, would-be fugitives being killed by the hunters. The spoils were all put together and distributed among the several households by the counselor [Nimuendaju 1967:91].

Wilmsen (1973:9) suggests that the pursuit of large mobile animal species favors collective hunting techniques: "These animals, when in herds, are most effectively hunted by groups of men who are temporarily assembled in band aggregates. Increased chances of hunting success for all hunters are obtained by cooperative search procedures for resources located at a single unknown point."

The principal herd species hunted by cerrado groups was the white-lipped peccary which, as I have already noted, is highly mobile and unpredictable in its movements. Hunters might search for days without locating a herd or, on a lucky day, kill enough animals to provide all their families with enough meat for several days of feasting.

A concentrated supply of vegetable foods would allow the hunters with their families to stay together during the period of cooperative hunting. Wild plant foods might be too scattered to easily support the collected groups, but a harvest of crops would supply all their needs for a short time.

Steward (1976:109-110) wrote that the collective hunts occasionally held by the Shoshone produced much more game than individuals using the same effort could have done. But such hunts could be held only occasionally, because it was not often that rabbits or antelope, the species hunted, were sufficiently numerous in any one location. Game drives did not result in the formation of territorial groups, because it was seldom that the same groups of people took part. The participants were drawn from any families that happened to be in the vicinity, usually collecting seeds or other wild foods. Bands that assembled regularly each year, as Central Brazilians did, to plant and harvest a crop and to cooperate in hunting, would be much more likely to develop lasting social bonds.

Lee (1972b) writes that the !Kung camp in larger groups during the dry season, because at this time fewer wells have water. Lee calls this the "public life" phase, which people enjoy because it is a time for holding ceremonies, exchanging news, trading, and making marriage arrangements. But, the longer such a group stays together, the higher labor costs become, because people have to forage farther and farther from the camp to find food. As people perceive that they are working harder day by day to get the same amount of food, tensions lead to increased quarreling, and before long people "vote with their feet to walk out of an unpleasant situation. And they do so, not when the food supply is exhausted, but well before that point when only their patience is exhausted" (p. 182). Thus the perception of increased labor cost in food getting is likely to pull a large group apart, unless there is a food surplus at the time of aggregation. The production of a short-term surplus through crop cultivation is not necessarily costly. The Xavante in 1958 devoted only about three weeks to agricultural labor that supplied them with food for the ceremonial season. (Maybury-Lewis 1967:48).

When cerrado groups broke up and went on trek, they lived on wild plant foods, principally roots. These plant foods are stable resources and, as Wilmsen (1973:6) notes: "...for stable resource distributions a spacing strategy such that each user position controls an equal but limited

and nearby set of resource locations is about twice as efficient (in terms of roundtrip distances) as a strategy of central location for all users." Cerrado groups exploited their total environment in different ways in different seasons. Seasonal agriculture enabled Central Brazilians to hunt more effectively. But they had little incentive to remain sedentary year-round.

As we have suggested (Werner et al. 1979), the efficient exploitation of one resource may favor or discourage investment in another. Given the limited amount of arable land available in the cerrado, a mixed economy probably allowed cerrado peoples to support a larger population than would either horticulture or foraging alone (see Gross 1979:329). If population growth eventually put pressure on resources they might attempt to enlarge their total territory rather than intensify agriculture. This would bring them into conflict with other groups.

1.3.3.7 Warfare and Social Organization

There is evidence from historical sources that, at least after contact, some Central Brazilian groups were engaging in warfare not merely to defend their lands, but were expanding (see Chapter 2).

As the more sedentary and exposed Tupians near the coast were wiped out by disease and Portuguese slaving, cerrado

peoples expanded eastward, where they raided the European farms and cattle ranches of Bahia. At this time Portuguese settlers were moving up the rivers into the interior of the country, and as they controlled the riverbanks they deprived the Indians of soils suitable for agriculture. At the same time they provided resources that could be captured by mobile groups -- fields of crops to raid, and cattle that could be hunted as game or driven off to Indian villages and held as a supply of food. Not being dependent for their food supply on growing crops, semi-nomadic cerrado Indians could join together to attack settlements, and then disperse. The soldiers who pursued them, after arduous marching during which they were harassed by Indians who killed from ambush, found only empty villages to burn.

Central Brazilian social organization, with its emphasis on cross-cutting ties, facilitated recombination, so that if a group was defeated in battle, decimated by disease, or pacified and settled at an "aldeia" (mission village), those that escaped could be incorporated into groups that remained free.

At the end of the 18th century, when part of the Portuguese population of Goias emigrated as a result of the exhaustion of the gold mines, Indians abandoned the missions, and a number of groups expanded their territory and raiding activities.

Morey and Morey have shown that in the lowlands of northern South America it was the foraging Guahibo who have survived up to the present, while the horticultural and sedentary Achaqua, who lived along major rivers, succumbed.

[The Achaqua] continued to try to keep their villages and plant their gardens even when they had to flee and hide in the marshes, coming out only to find their gardens cleaned out and turned into weed patches for lack of care. They were forced to make smaller and smaller gardens because during the dry season, when they should have been preparing them, they were forced to hide from the Spanish and the Guahibo.

The Guahibo did not face the same difficulties as the Achaqua. They had no strong identity as cultivators to impede their movements, and they had a large and little known territory into which to retreat. Although they were also faced with disease and massacres, their smaller mobile groups kept them from being as severely affected as were the Achaguas [Morey and Morey 1973:241].

It is quite possible, as Gross (1979) has suggested, that Central Brazilian villages became larger and social organization more elaborate as a result of colonial warfare. At times the Indians were apparently able to organize a large number of warriors to attack settlements in force. In 1762 the Governor of Goiás reported that a large band of Xavante warriors had besieged a mining settlement for several days (RIHGB 1918:83). The Indians outnumbered the 300 miners available for defense, who therefore feared to counter-attack. Gardner (1970:319) wrote that in 1788 a mission village was attacked by 200 Xerente who killed 40 people.

Gross (1979:338) also suggests that colonial warfare might have led to the intensification and expansion of native horticulture, but this probably did not occur until the definitive circumscription of native groups.

1.3.3.8 Summary

Central Brazilian native groups became adapted to the cerrado environment, probably over a long period of time. As Nimuendaju (1946:2) wrote of the Timbira: "...the true home of the Timbira lies in the arid steppe: only there -- not in the primeval Amazonian forests -- was it possible for the peculiar Timbira culture to evolve."

The cerrado offered a different distribution of resources from the evergreen tropical forest: while land suitable for slash-and-burn agriculture was limited, there were probably more wild plant foods in the cerrado, especially tubers, on which small groups of people could subsist. Game, while probably not abundant, could be hunted more effectively than in the tropical forest, especially using cooperative strategies.

I suggest that, if population increased over time cerrado groups would probably not respond by intensifying agriculture, which would be costly in labor and probably unproductive, but would attempt to expand their total territory and continue to practise a mixed economy. This

would probably lead to conflict with other groups, and this conflict would favor the formation of large villages and non kin-based social organization for more effective attack and defense (Ritter 1974).

Invasion of Central Brazil by Portuguese miners and cattlemen who settled along rivers deprived cerrado native groups of part of their agricultural land. The Indians responded by becoming more nomadic and predatory. Their pre-existing pattern of aggregation and dispersion had value for survival in the context of colonial warfare, since it permitted both the assembling of relatively large bodies to attack in force, and tactical dispersal into small bands that could subsist by foraging and elude pursuit. As some groups were extinguished, their remnants were absorbed by others, avoiding the collapse of social life that often has resulted in the disappearance of native populations (D. Ribeiro 1956).

However, each surviving group eventually became circumscribed, as the Brazilian frontier of settlement advanced. This circumscription produced population pressure in the Indian communities, even as their numbers were declining due to disease and the stresses of contact.

Choices involving extensive exploitation of their environment are no longer open to the Indians of Central Brazil. Their attempts to adjust to the new circumstances

have included intensification of agriculture through increased labor input, and entrance into the regional market economy (see Gross et al. 1979).

Chapter II

THE CENTRAL GÊ IN HISTORY

2.1 INTRODUCTION

In this chapter I give an account of the history of the Xavante and related Gê groups as we have a record of it. Interaction between the Xavante and white colonists goes back over 200 years, and related groups were in contact for some 100 years before that. Survival became problematic for native peoples of Central Brazil as they were subjected to pressure from colonial expansion. But their response to loss of resources was not to intensify subsistence on a reduced land base, but rather to expand their territory whenever possible. At several different historical periods -- at the end of the 17th century, at the end of the 18th century and the beginning of the 19th, and again toward the middle of the 19th century -- we find the Central Gê expanding into regions left open by the decline or extinction of other groups, in most cases Indian, but colonists when the end of the gold rush caused an exodus from Goiás. This strategy implied increased nomadism, both for defense against the colonists' aggressions and for raiding their cattle and crops.

Gê groups that did settle during the colonial period either resumed hostilities after a short period, perhaps with some advantage from having acquired knowledge of the whites' weapons and customs, or declined in numbers and eventually succumbed to stress and disease. As the Gê groups most severely affected by contact declined in numbers, the survivors were absorbed by related groups that were still numerous enough to defend themselves.

Forced into competition for resources with the colonizing population, the Indians used to good advantage the principal tactical superiority they held over the invaders: mobility. The colonists were geographically tied to their resources -- mines, cattle, and crops. The Indians exploited theirs -- game, gathered plant food, the colonists' cattle and crops -- while on the move.

This strategy seems to have had survival value for the cerrado peoples over a long period of time. Their flexibility allowed them to adjust to changing conditions and endure longer than other indigenous groups which, at the time of contact, were much more numerous. In the long run, however, the colonists overwhelmed the nomads by sheer force of numbers. While Gê populations apparently increased whenever they expanded into new territory, this increase was necessarily limited by the extensive nature of their subsistence strategy. Eventually they were surrounded, by

settlement. Deprived of the nomadic alternative, they were forced to intensify agriculture to get a living from their reduced land base.

It seems likely that similar conflicts have had similar results on other occasions in history when fully agricultural peoples have come into contact with others only partially dependent on food production. It was probably one of the mechanisms that led to the expansion of agriculture.

2.2 PREHISTORIC EVIDENCE

Very little archaeology has been done in the cerrado region, however such evidence as we have suggests that the present-day speakers of Gê and related languages are the descendants of those who lived in the same region in prehistoric times.

The earliest evidences of humans in this region fall within the East Brazilian Upland tradition, which was characterized by a hunting-gathering way of life and a percussion-flake industry (Willey 1971:61-65 and 440). This tradition lasted from about 9000 B.C. into late prehistoric times. From about 5000 B.C. "sambaquis", large mounds of shell refuse, appear along the Brazilian coast. It is not yet clear whether the people who ate the shellfish and discarded the shells that form these mounds represent populations separate from inland groups, or whether these

sites indicate seasonal occupations (Willey 1971:442; PRONAPA 1970:12).

A number of non-Tupian regional pottery traditions have been identified for Eastern Brazil. Pottery of one of these traditions, the Periperi, is found in shell middens on the Bahia coast and has been radio-carbon dated to around 800 B.C. (PRONAPA 1970:12). We do not know whether the use of pottery in this case was accompanied by agriculture. If so, it might indicate the existence of a regional agricultural tradition separate from Tupiguaranian tropical forest agriculture brought after 500 A.D. by groups migrating from the Amazon (Willey 1971:440).

Other sites which include pottery in the East Brazilian tradition are more than 1000 years later in date than the Periperi sites. Willey (1971:448) believes that most of these regional traditions are interrelated, and that they represent "an old resident pottery-making tradition in the Eastern Brazilian area."

In reference to continuity of cultural tradition in this region, Willey points out that prehistoric burial mounds found in southeast Brazil are very similar to those made by the contemporary Kaingang, a group defined by Nimuendaju (1942) as Gê, and by Greenberg (1956) and Mason (1963) as Macro-Gê.

Kaingano Indians, who occupied this same region in historic times, made such mounds for burial.

Within them they placed the bodies of their chiefs in wooden tombs or crypts, and the dead were accompanied with textiles, bows and arrows, and other perishables. Such burials and such grave goods might leave little or no trace. Certainly, the presence of such burial customs among the Caingang -- presumably one of the old pre-Tupiguarani tribes of southern Brazil -- suggests the possibility of a continuity of tradition between them and the earlier mound-builders, a continuity that was never completely broken by Tupiguaranian peoples or the Tupiguarani culture [Willey 1971:447].

Parallel to the regional pottery tradition, pottery in the Tupiguaranian tradition appears in sites dating from about 500 A.D. Tupiguaranian sites are usually in areas suitable for tropical forest agriculture, and the presence of manioc griddles indicates that this crop was probably the staple of their economy (Willey 1971:449).

In late prehistoric and into historic times Tupiguaranian groups were expanding from the Amazon, and along the coast of Brazil. Lathrap (1970:75-79) believes that the source of this expansion, as well as that of the Arawakans northward, was population pressure on the Amazonian floodplains. In any case, as a result of their presence on the Atlantic coastal plain, these Tupiguaranians became the first Brazilian Indians to suffer the impact of European contact. It was only later, as the coast became depopulated of native groups, that the Gê-speakers of the interior faced the invaders.

2.3 DIVISIONS OF THE GÊ AND THEIR RELATIONSHIPS

From the 17th century onward, when the Portuguese started pushing into Central Brazil, the names of a number of interior groups began to appear in documents as they came into contact with the settlers. These were described as distinct tribes, but it was often noted that certain of them were "parentes", that is closely related.

In the early 19th century Martius (1867, Vol. 1, pp. 256-260) recognized the linguistic and cultural similarity among a number of these Central Brazilian groups, and introduced the general term "Gê" to characterize them. The modern classification of Gê groups generally follows Nimuendaju (1942:1-2) who divided them into three main branches:

1. The Northern Gê: The Eastern Timbira (including the Krahó, the Kanela, the Gavião, and other groups), the Western Timbira (Apinayé), the Northern and the Southern Kayapó, and the Suyá.
 2. The Central Gê, divided into two sub-branches, the Akwẽ, which included the Xavante, Xerente, and Xakriabá, and the Akroá, comprising the Akroá proper and the Guequé².
-

2

In early accounts two branches of the Akroá were usually distinguished: The Akroá-Assu were neighbors of the Guequé in Piauí west of the Gurqueia river (Nimuendaju 1946:3). This group was forcibly settled during the 18th

3. The Southern Gê, who were the Kaingang and the Aweikoma (Botokudo).

More recently, Mason (1963:287) and Greenberg (1956:794) placed the Kaingang and Botokudo languages within the wider classification of Macro-Gê, rather than considering them as a branch of Gê proper, and Mason (1963:290) added the Jeicó as a separate branch of the Gê.

2.3.1 Genetic and Linguistic Evidence

Although not easy to interpret in detail, the geographic distribution of languages may give us some indication of the migration routes of their speakers. In contrast to the scattered distribution of two other major South American language families, Arawakan and Tupiquaranian, it appears that until recently Gê speakers occupied contiguous territories.

The Gê languages form a nearly solid block dominating the drier sections of the Brazilian Highlands. They are highly distinctive when compared to the languages of Tropical Forest peoples. The cultural patterns and economic systems of the Gê-speaking groups show a

century in Piauí and Goiás. The Akroá-Mirim, according to Cunha Mattos (1875:20) were not involved in this settlement. Numbering about 2000 they migrated west towards the Araguaia. Pohl (1951, Vol.2, p.132), writing in the 1830's, stated that the Akroá-Mirim were defeated and absorbed by the Xavante, but Nimuendaju (1942:74) doubted that this occurred since it was not mentioned by any chronicler of Goiás. Martius (1867, Vol. 1, p. 274), however, noted that in the 1820's the Xavante, Xerente, and Akroá-Mirim, though formerly hostile, were living in one another's villages.

considerable internal conformity, and contrast sharply with those of the Tropical Forest peoples. It is likely that the Gê-speakers have held their present homeland for a long time [Lathrap 1970:81-82].

What Lathrap writes here probably applies not only to speakers of the Gê languages proper such as the Central Gê, the Timbira, and the Kayapó; but also to other Central Brazilian groups, such as the Karajá and Bororo, whose languages have been classified as related to Gê (Greenberg 1956:794). Further to the southeast, and separated from the Central Brazilians by Tupiguaranian speakers, lived speakers of Macrô-Ge languages, including the Botokudo and the Kaindang (Greenberg 1956:794; Mason 1963:291).

Evidence that Ge-speaking tribal groups have remained closely related over wide geographic distances and long time intervals has been presented by geneticists (Salzano et al. 1977; Ward et al 1975). They compared genetic distances between villages within the same tribal group, and genetic distances between tribal groups. They also correlated genetic distance with linguistic distance, as shown by cognates shared by the languages of the Xavante, Krahó (an Eastern Timbira group), and Kayapó.

Salzano et al. (1977:343-344) found that the genetic distances among villages of the Gê-speaking Xavante, Krahó, and Kayapó were considerably smaller than those among other lowland South American Indians. The smallest mean 6-locus

genetic distance found was 0.199 among three Xavante villages. The mean genetic distance among five Kayapó villages was 0.223; and that between two Krahó villages was 0.208. The investigators contrasted these with the relatively large genetic distances, averaging 0.356, found among seven Makiritare villages, and 0.330 found among seven Yanomamö villages. They also found that the mean 6-locus genetic distance among the three Gê-speaking tribes, when villages were pooled, was 0.307 between the Xavante and the Krahó, 0.229 between the Krahó and the Kayapó, and 0.246 between the Xavante and the Kayapó. These distances between Gê-speaking tribes are considerably less than those found between villages of the Makiritare and the Yanomamö.

Salzano et al. (1977:344-345) also compared the Swadesh 100-word list of the languages of the same Gê-speaking tribes, using linguistic data collected by Summer Institute of Linguistic missionaries. They found that the percent of cognates shared by the Xavante and Krahó languages was 60%, Xavante and Kayapó shared 55%, and Kayapó and Krahó shared 81%. Salzano et al. concluded that "in this instance, vast though the area over which the Gê-speakers are dispersed (1,000 km from the southernmost Xavante village studied to the northernmost Krahó village sampled), membership in the same linguistic family does imply genetic similarity" (Salzano et al. 1977:344).

Ward et al. (1975) noted that if a weighted mean is calculated of the 6-locus genetic distance among the 20 Central and South American tribes for which data are available, the Xavante and the Kayapó depart least from the weighted mean. They found "a general tendency for the genetic distance of a tribe from the centroid to be correlated with its geographic distance from a central 'corridor' running from Meso-America to the Mato Grosso of Brazil" (1975:22). They noted that this presented the possibility that the "corridor" might be interpreted as a relic of the original pattern of colonization of South America. Such a tentative interpretation would suggest, according to Salzano et al. (1977:346) that "the above designated gene characteristics of the Xavante and Kayapó (and now the Krahó) are more representative of at least one of the stocks which originally entered South America than the frequencies of any other defined group of Indians."

2.3.2 Relationships Among the Central Gê

Since all the Central Gê except the Xavante and Xerente have disappeared, we must go to earlier accounts to investigate relationships among the Central Gê up to the time of the Xavante migration across the Araguaia river around 1850. In the early 19th century Martius (1867, Vol. 2, pp 134-146) compiled word lists obtained from informants identified as Xavante, Xerente, Akroá-Mirim, and Xakriabá.

Comparison of these word lists suggests that differences among Central Gê languages were little more than dialectal³.

While the different groups may be distinguished, it appears that during the 18th and into the 19th century a flexible network of Central Gê base villages covered the region from the western tributaries of the São Francisco to the Araguaia. Alliance, fission, and recombination among these villages took place in response to varying pressures that resulted from attacks by the colonists, the extinction of pacified groups, opportunities for predation on the colonists' cattle, and hostilities that arose from rivalries in leadership. A recent example of this process can be seen in the group splitting and recombination among the Northern

³ Evaluation of Martius' word lists is difficult, since they were collected by different non-Gê speakers, some of whom transliterated with German values and some with French values. Some concepts were apparently not understood, and therefore were mistranslated. However I compared 102 words common to the Xavante and Xerente word lists collected by Martius, and found that 74.5% were cognates. (This finding is similar to that reached by Maybury-Lewis [1966] who compared the same two word lists, and concluded that the close correspondence between the vocabularies of the two groups supports Martius' statement that they were closely related.) The other word lists are shorter and permit fewer comparisons. There are only 39 words common to the Xavante and Xakriabá word lists, but 94.9 % of these are cognates. The Xavante and Akroá-Mirim word lists have 59 possible comparisons, of which 74.6% are cognates. However, the large percentage of cognates found in comparing the word lists of groups which are historically considered to be closely related can be contrasted with the low percentage of cognates found in comparing the Xavante word list with those obtained from the Southern Kayapó and from the Jeicó who belong to different Gê branches. Of 51 Xavante words that can be compared with the Southern Kayapó only 47.0% are cognates,

Kayapó branch of the Gê (Werner 1980:41-54; Vidal 1977:13-42).

2.4 CONTACT AND CONFLICT

The experience of the Central Gê with the European colonizers of Brazil can be broken down into several historical phases:

2.4.1 1500-1650

This period was characterized by European occupation of the coastal plain, and the beginnings of a plantation economy. The coast was rapidly depopulated of native groups through epidemics, famine, and the intensified warfare that resulted from European demand for slave labor (Marchant 1966). By the time of the Dutch occupation of northeast Brazil in the early 17th century there were few settled Indians left near the sea. "In 800 miles of the Brazilian coast the native population had sunk in a century from many hundreds of thousands to under 9000" (Hemming 1978:286).

The Indians were replaced by scattered settlements of whites, their Black slaves, and their cattle. Even this dispersed settlement penetrated only a short distance inland (Marcorave 1942:261). When the Dutch took Rio Grande do

and of the 37 words that can be compared with Jeicó 35.0% are cognates. What evidence we can gain from the word lists, therefore, supports historical accounts.

Norte, Laet (1916, Vol. 2, p.460) wrote, the hinterland was practically deserted because the Portuguese settlers had fled, from fear either of the Dutch or of the "Tapuya", whom "for their cruelty they fear more than they do the devil, knowing that they give quarter to no one, and that they kill and destroy the beasts as well." On one farm a Tapuya hunting party drove a herd of cattle into a gully and killed a large number, leaving 200 carcasses unconsumed.

From the times of early contact the Portuguese described as "Tapuya" the nomadic and warlike tribes of the interior that could not be identified as Tupian. As Lowie (1963a:566) pointed out, Tapuya became a blanket term that does not identify any specific cultural or linguistic group.

Nineteenth century writers such as Martius (1867) and Ehrenreich (1894) who were acquainted with Gê peoples tended to equate the Tapuya with Gê. But later investigators (Schuller 1913; Nimuendaju 1946; Maybury-Lewis 1965a), basing their opinions in part on the tradition that the Tapuya were the original inhabitants of the coast who were driven inland by the advancing Tupiguaranians, found the identification unlikely, since the specific adaptations of the Gê to the cerrado indicated a long-standing association with that environment.

However, it does not seem unlikely that, given the vagueness of the term "Tapuya" as used in early accounts,

some who became known to Europeans may have been Gê from the interior who, as the Tupians disappeared, extended their seasonal wanderings toward the coast to exploit resources -- including the settlers' cattle. The Dutch traded with, and eventually made their allies in the wars against the Portuguese, a people from the interior called the Otshukayana with whom the Dutch first became acquainted when groups of 20 or 30 came down to the coast in December and January to harvest cashew nuts (Barleus 1940:202).

We have excellent descriptions of the Otshukayana from Dutch eyewitnesses. The Dutch artist Eckhout made paintings that show them with cap-like haircuts, earplugs and flat-sided clubs almost identical to those of the Timbira of Nimuendaju's time (Nimuendaju 1946:271, 279, 305).

The descriptions of the Otshukayana given by Barleus (1940) and by Marcgrave (1942) were based on the accounts of Jacob Rabe, a Dutchman who lived in their inland villages for four years, married a woman of the group, and became their interpreter. As Maybury-Lewis (1965a:341) noted, parts of these descriptions could as well be derived from contemporary observation of a Central Brazilian group such as the Xavante.

They wander like nomads, generally at will, but within determined limits, within which they move their camps according to the variation of the seasons of the year... The King of these people, who are called Otshukayana after the major river that flows through their lands, bears the heathen

name of Iandui. At morning and at evening he announces what they shall do during the day, where they are to go and where they shall meet, having previously taken counsel with his seers and shamans...

At a stone's throw from the King's hut two logs lie on the ground, about a pace apart. All the people, divided into two groups, stand in front of these logs. Each team chooses one of its strongest, and these two bear the logs on their shoulders, and they carry them as far and as swiftly as they can; then each relays the log to another of the same team. Those who arrive first at the place where they have determined to camp mock the slower ones.

At this place they cut branches and build shelters near a running stream to protect them from the great heat of the sun. As they are doing this the women arrive with the rest of the baggage. The men go out to hunt or fish, depending on the place where they have camped, and to collect wild honey. The old women go to pull up roots from which they will make flour and bake bread. In the camp all the women help one another to prepare the food and drink.

Later in the day some men pass their time jousting with lances, wrestling, and running races. Two women chosen for the purpose preside over these games [see Nimuendaju 1946:167-168] and judge the valor of each of the contestants. When night comes the young men meet in various groups and sing before the huts, but the girls come and go and, singing and dancing, they follow the young men...

When the young men wish to marry they go hunting and bring wild honey and other things to the parents of their betrothed... The King calls together the young men who wish to be married, and many young men and women meet outside the camp and go together to the place where they have decided to hunt. After they have planned the hunt, a few hunters go ahead to seek out the hiding places of the game. Then all the hunters, with their arms and their dogs, stealthily surround the game, and they do this so skillfully that they sometimes capture and kill as many as 200 animals at the same time [Nimuendaju, 1946:70, mentions the participation of girl associates in ceremonial collective hunts]....

In the months of March and April the greatest force of water comes down from the hills so that the river Otschunogh rises and overflows its banks, and its water fills lake Bayatag. At this time the Otshukayana catch so many fish that the women have difficulty in carrying the fish back to camp, as well as the principal fruits that are then ripe.

But when the river returns to its bed, they go back to their customary dwellings, and they devote their efforts to planting. They plant mainly maize, various vegetables, and pumpkins. Before they put the seed in the ground their principal seers and prophets cross the fields from east to west, and they heat the seeds with tobacco smoke, which they believe to be good for growth [see Apinaye planting rites described in Nimuendaju 1967:89]. With anxiety and superstition they consult their seers about the fertility of the year; these men, decorated with varied ornaments of feathers and other necklaces, with admirable illusions convince the credulous people who spend their time in singing. When the crops are ripe, and the fruits of the earth are harvested, they separate as much seed as they judge necessary for the next sowing; the rest they eat [Marcgrave 1942:279-281].

A firm linguistic identification of the Otshukayana with any more recently described Gê-speaking group is probably not possible, as Rabe provides only a few plant and place names, and names of chiefs. This is probably less important than the fact that their subsistence system and many elements of their social organization are identical to those that have been recognized as specific adaptations to the cerrado environment. We have, therefore, in these Dutch accounts, eyewitness descriptions of a cerrado people at the time when these previously isolated groups were making their first contact with Europeans. These accounts make clear

that the Central Brazilian type of social organization, as indicated by the presence of log races, and other ceremonial competitions, was fully developed at this time. They also indicate that the Otshukayana pursued a mixed subsistence strategy which alternated cultivating with hunting and gathering phases, each accompanied by its corresponding aspect of ceremonial life. This helps to dispose of any idea that Central Brazilian peoples were hunters and gatherers only recently turned farmers (cf. Steward and Faron 1959:362-364). Since these observations were made before the Otshukayana had suffered the more severe effects of contact, they also make clear that nomadism was an integral part of their subsistence system, and not merely the result of disruptions and depopulation, although nomadism might increase as new resources were exploited, and later, as cattle ranches occupied the land along streams which provided the Indians with their agricultural base.

2.4.2 1650-1730

After the Dutch withdrew from northeast Brazil in 1654, plantation agriculture flourished along the coast. This agriculture was geared to the production of export crops, principally sugar and tobacco, and labor was now provided mainly by slaves from Africa.

A constant supply of cattle became necessary to provide the plantations and towns of the coast with food. Cane growers also required oxen to haul their cane to the sugar mills, and millowners to turn the millwheels. But the croplands of the coastal plain were too valuable to use as pasture.

Cattleraisers, therefore began to penetrate the hinterland of the northeast in search of pasture for vast herds of cattle. In Bahia and Pernambuco in the 17th century "cartas de sesmaria" -- extensive land grants -- were made by the colonial authorities to coastal landowners (Boxer 1964:227). These men, who became known as the "Poderosos do Sertão" became rich and powerful by parceling out and leasing their vast holdings. The Crown tried to halt the growth of these cattle empires by limiting the size of sesmarias, but this was largely ineffective. By 1711, according to the Jesuit chronicler Antonil (quoted in Boxer 1964:229), there were more than 500 large ranches strung along the course of the São Francisco river. There were already more than half a million head of cattle in the hinterland of Bahia, and 800,000 in Pernambuco.

Settlement proceeded along the major rivers, the ranches succeeding one another like links of a chain. This settlement pattern was dictated by the character of the country. The sertão, or backlands, was dry, open country,

the vegetation thorny scrub which offered sparse pasturage, but sufficient to support low-density cattle-raising. The greatest problem was lack of water which became disastrous during the periodic droughts. This encouraged settlement along rivers where water was permanently available. Between these favored strips of land great expanses of country were left deserted, crossed only by the trails along which cattle trains were driven to the coast (Prado 1963:185-188).

The rapidity with which cattle ranching spread westward, reaching Piaui before the end of the 17th century, is explained, according to Prado (1963:186), not only by the growing demand for cattle from the coast and from the gold-mining regions, but also by the simplicity and speed with which a new ranch could be founded. All that was needed was to build a thatch-roofed hut to shelter the cowhands, put up rough corrals, and bring in the cattle. A head cowboy and a few hands provided all the labor needed. The head cowboy could look forward to founding his own ranch within a few years, as he was paid in cattle, one-fourth the increase of the herd. However, much of the land remained in the hands of the cattle barons. Antonil at the beginning of the 18th century reported that most of the Bahia hinterland was controlled by two families (Boxer 1964:23).

The cattle were given minimum care. The average ranch covered 11,000 hectares, and the cattle foraged widely for

pasture. Most of the work of the cowhands was to keep track of the location of the cattle, protect the young calves and brand them, and keep the animals accustomed to the presence of humans lest they go completely wild and become impossible to round up. Each ranch produced a yearly surplus of no more than 200-300 head to be driven hundreds of miles to coastal markets. Only about 50% of these ever reached the coast due to the distance and perils of the way (Prado 1963).

Inevitably the intrusive movement of settlement along rivers affected Indian subsistence. They were denied access to fishing and to agricultural land, while at the same time the cattle that occupied these lands became a tempting resource. The half-wild cattle on isolated ranches were easy game, as the handful of men who guarded them could put up little resistance to concentrated Indian attack.

A series of campaigns against the Indians of Bahia made such attacks relatively rare. These campaigns were led by "bandeirantes", backwoodsmen, mostly from São Paulo, who made a profession of exploring for gold and to take Indian captives. Expeditions for such purposes were called "bandeiras." Many of the defeated groups were settled in "aldeias", settlements of pacified Indians administered by Catholic missionaries of various orders. The "aldeia system" was generally supported throughout the colonial

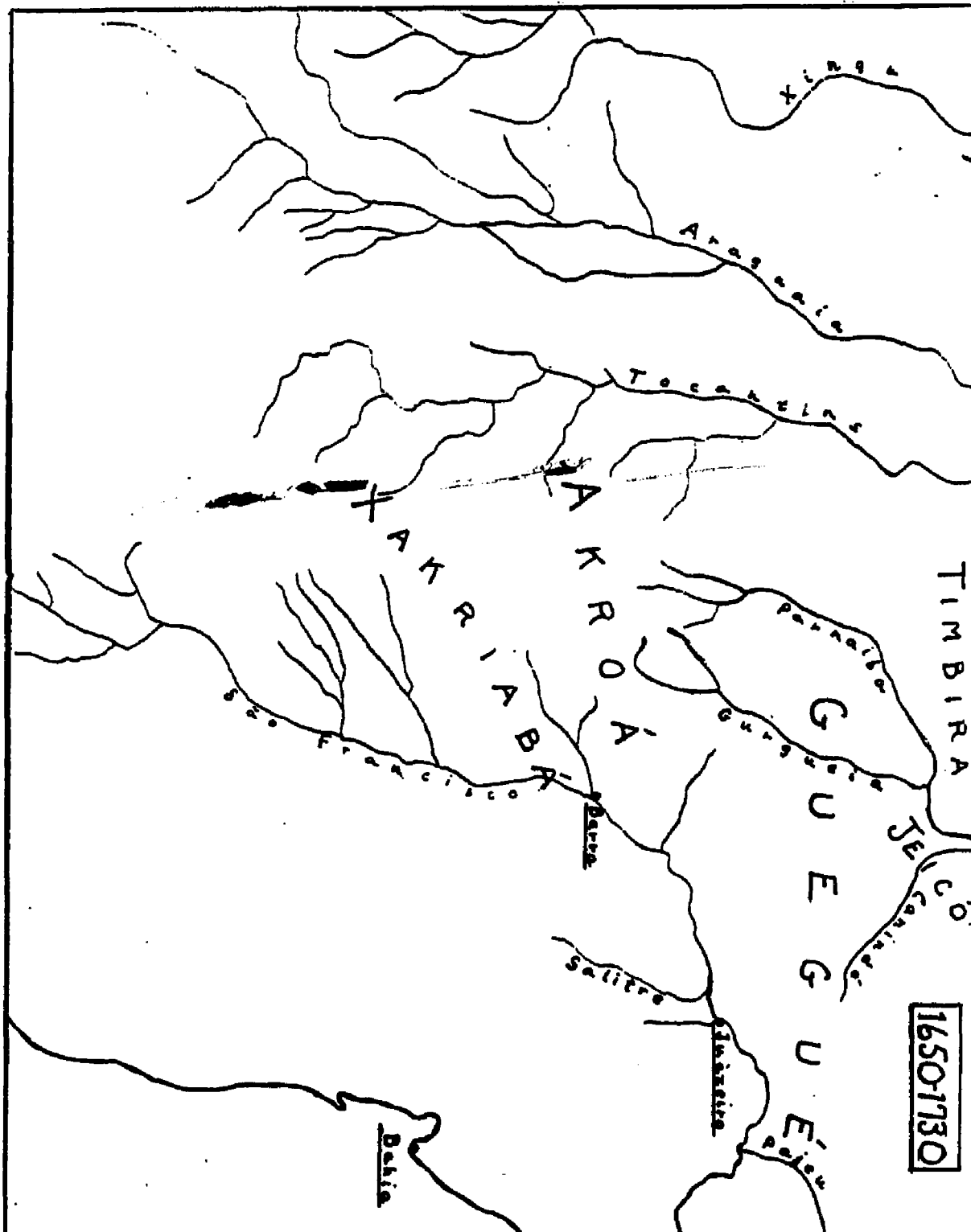
period by the Lisbon government as a means of subordinating the Indians, "civilizing" them, and making them productive subjects of the Crown. But it was resented by the colonists, who coveted the lands set aside by the Crown for maintenance of pacified Indians and the missionaries who ministered to them. The Jesuits, because of their policy of resisting efforts to exploit Indian labor, became the particular targets of the colonists' hostility (Alden 1969). Some Indians became docile and industrious converts, but even when protected against the worst abuses of the colonists many did not survive settlement long, for the aldeias were often swept by epidemics of diseases against which the Indians had no resistance (see Hemming 1978:140-146).

By the 1680's most of the Indians of the Bahia hinterland who were not settled at missions had been exterminated, were enslaved, or had fled (Boxer 1964:232; Hemming 1978:350-351). Possibly at this time, as 50 years earlier, the extermination of Indians closer to the coast opened the way for nomadic groups from further inland to trek eastward. In the 1670's a group from the Gurgueia river in Piauí approached the Pernambuco coast⁴ (Barbosa Lima 1946:114). (See Figure 1).

4

The name of this group is variously spelled in documents of the time as "Guaiguais" or "Guasguas". According to Barbosa Lima (1942:54-56) they were probably the Guequé, a Central Gê group. Nimuendaju ((1946:3) refers to them as the Gurgas.

Figure 1: Map of Central Gê Locations 1650-1730



Soon they began a series of raids on cattle ranches along the Pajeu river, a Pernambuco tributary of the São Francisco. They killed 85 colonists and seized their cattle.

The governor of the captaincy raised a force which included colonists and missionized Indians to punish the raiders. The leader of the expedition was Francisco Dias de Ávila, of the Casa da Torre, the most powerful family of cattle barons of Bahia (Boxer 1964:232-233).

We have an account of this campaign written by Fr. Martin de Nantes, a Capuchin missionary who accompanied the troops (Barbosa Lima 1946:54-57). Within a few days the expedition caught up with the Indians, who were apparently withdrawing westward, at the mouth of the Salitre river, near Juazeiro. In the battle that followed, the Indians had the greater mobility, but they were defeated by Portuguese musketry. However, they eluded capture, and again retreated westward. The troops continued to pursue them, and caught up with them six or seven days later, when they were already in southern Piauí. The Indians were exhausted and hungry; they surrendered on condition that their lives would be spared. But, according to the narrative of the Capuchin: "After the warriors laid down their arms the Portuguese tied them up, and two days later they killed all the warriors in cold blood, about 500 in number, and enslaved their wives and children" (quoted in Barbosa Lima 1946:55).

This campaign, which took place in 1676, led directly to the settlement of Piauí. In the same year, Francisco Dias de Ávila and other leaders of the expedition were granted sesmarias of 12 square leagues each on the Gurgueia river. Five years later they obtained further grants of 10 leagues each (Barbosa Lima 1946:57).

These men became the early colonizers of Piauí. The most prominent among them was Domingos Afonso, nicknamed Sertão, because he had spent most of his life pioneering, fighting Indians and cattle raising in the backlands. From his fazenda of Sobrado upriver from Joãozeiro, he explored as far as the upper reaches of the Piauí and Canindé rivers. "He entered those lands previously not penetrated by Portuguese and inhabited only by wild heathen, with whom he had many battles, emerging from one dangerously wounded, but from all of them victorious, killing many heathen and making the rest retreat to the interior of the sertão." (Rocha Pitta, quoted in Hemming 1978:354). At his death in 1711 Sertão left all his ranches to the Jesuits of Bahia. These estates comprised nearly 100 square leagues of land, with 30,000 head of cattle and 1500 horses. From this we can gain an idea of how swiftly the occupation of Piauí had proceeded.

Again the Indians, by the advancing chain of ranches along rivers, were cut off from riverine resources and from the soils of the gallery forest. A Brazilian historian,

writing in the mid-19th century, pointed out that rivers were essential to native subsistence.

Piauí at the time of its discovery... had along its rivers sufficient forest land to support numerous tribes, supplying them with game and sheltering them from the heat of the climate. We know that the native villages were along the banks of the numerous tributaries of the Parnaíba, and only there, because to the resources of game the Indians added fishing, which they practised a great deal [Alencastre 1857:22-23].

From the time of the first settlement of Piauí, the names of some Central Gê groups begin to appear in documents. A priest, Pe. Miguel de Carvalho, who went to Piauí at the end of the 17th century to set up a parish, wrote a description of the region in which he named and located a number of tribes. The "Acoroás" were in the far south of Piauí (see Barbosa Lima 1946, map following p. 104). They were also apparently in northwest Bahia, for in the 1690's the Governor of Bahia founded a settlement at Barra, at the junction of the Rio Grande (of Bahia) with the São Francisco, as an outpost against the raids of the Akroá (Hemming 1978:612). The villages of the Guegué were to the northwest, beyond the Gurgueia river. In the 18th century, when all the Guegué and part of the Akroá were settled at aldeias in Piauí they were considered as branches of the same tribe. "The Guegués and the Acoroás, it appears to us, were descended from the same line; they spoke the same language, and they had the same habits and customs; because when they were settled together in aldeias, as always

happened, they lived as friends, or as if they were kin." (Alencastre 1857:30).

The Jeicó, another Gê group, though not closely related to the Central Gê (see language section) were located, according to Pe. Miquel de Carvalho, on the upper Canindé river, in central Piauí. Further west, there were some Timbira who according to Nimuendaju (1946:3) were driven out of Piauí during the Akroá wars of the 1760's. Figure 1 shows the approximate location of these groups.

By the early seventeen hundreds mining centers of the interior were added to the coastal plantations as markets for cattle from Piauí. Minas Gerais, where gold-mining was already booming, received much of its cattle supplies from Piauí (Boxer 1964:237-238). It was about this time that the first gold strikes in Goiás brought a rush of gold-seekers into the region between the Tocantins and the Araguaia rivers. The Indians were caught within the two arms of a vast pincer movement of settlement, on the east the cattlemen, and to the west the miners.

2.4.3 1730-1790

The first gold strike in Goiás was made by a stubborn and flamboyant old bandeirante nicknamed Anhangüera ("Old Devil" in Tupi). When he was a boy he had gone with his father on a slave-raiding expedition to the country of the Goyaz

Indians, where the women wore gold ornaments. More than 50 years later Anhangüera determined to rediscover the source of this gold (Boxer 1964:267-268).

The first bandeira that Anhangüera organized to seek for the gold of Goiás was unsuccessful. One of the members of the party kept a journal (Taunay 1954:122-137) which recounts the events and dangers of the journey. Almost three months were spent in an Indian village from which the inhabitants fled, leaving the maize and sweet potatoes in their fields to be eaten by the Portuguese. The members of the expedition tried to lure the Indians back to capture them, but they slipped away into the forest. After another three months of marching north, some of the party dispaired of improving their fortunes either by the discovery of gold or the capture of slaves. They left Anhangüera and those who chose to remain with him, and set off in two canoes down the Tocantins, believing that this was the only way to escape dying of hunger and thirst in the wilderness. On the way they passed Indian villages of 30 or 40 large round houses, and log rafts of the type that Gê peoples use to cross rivers. Eventually they reached Pará.

The rest of the bandeira was assumed to have perished. But three years later Anhangüera and a few survivors turned up at Cuiabá where there was already a settlement, gold having been discovered in Mato Grosso in 1718. But

Anhangüera, now in his sixties, was not finished yet. He returned to São Paulo, outfitted another expedition, and set off again for Goiás in 1726. There he captured some women of the Goyaz tribe, and holding them hostage forced the Indians to show him where they got the gold from which they made their ornaments. He returned to São Paulo with 8000 drams of alluvial gold, according to one account (Boxer 1964:268).

A gold rush into Goiás followed the news of Anhangüera's discoveries. As with the earlier strikes in Mato Grosso, "From Minas Gerais, Rio de Janeiro, and the whole Captaincy of São Paulo, flocked many people, leaving their houses, goods, wives and children, pouring into these backlands as if they were the Land of Promise or the hidden Paradise in which God placed our first parents" (Barbosa de Sá, quoted in Boxer 1964:255).

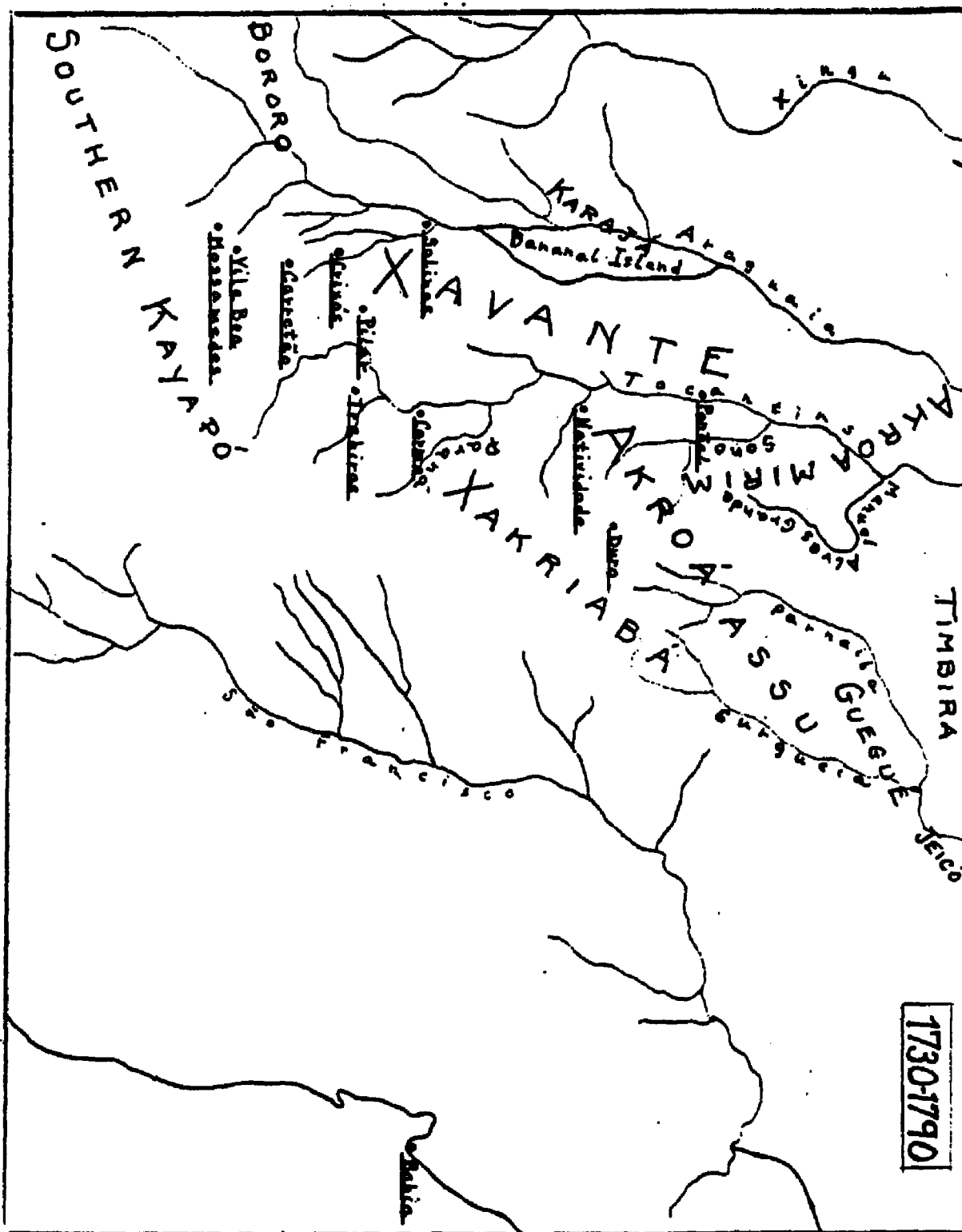
Mining camps sprang up along the tributaries of the Araquaiá and the Tocantins. But the population was unstable. Placer mining was the only technique used, and when miners heard rumors of a new strike they packed up their few tools and possessions and moved on in the unending hope of the fortune that would make them rich. As a result, "mining camps were likely to appear suddenly, flourish briefly, and to vanish overnight" (Boxer 1964:269).

The settlement pattern that resulted from the mining operations in Goiás was quite different from the cattle raising regions. In contrast to the connected chain of cattle ranches, mining camps, though also located near rivers, were isolated nuclei, their location determined by the discovery of gold-bearing gravel (Simonson 1967:266-267). Between the mining camps the only signs of settlement were the lonely trails that connected them. In their eagerness to work at mining, the miners often neglected to plant adequate crops, and as a result in the early years the settlers in Goiás suffered great privation, to the point of starvation (Alencastre 1864:65).

New settlements in mining regions attracted considerably more attention from the government in Lisbon than those where cattle raising was the chief economic activity, for the collection of the royal fifth that was due to the Crown from all gold-mining operations was of prime importance. Formal government was set up in Goiás soon after the early gold strikes. In 1748 both Mato Grosso and Goiás were separated from São Paulo and made independent captaincies, with governors appointed by Lisbon (Boxer 1964:270). The seat of government of Goiás was established at Vila Boa, central to the mining district. (See Figure 2)

A map of the captaincy of Goiás dated 1751 (Chaim 1974, following p. 39), showing the mining settlements and their

Figure 2: Map Showing Locations of the Central Gê 1730-1790

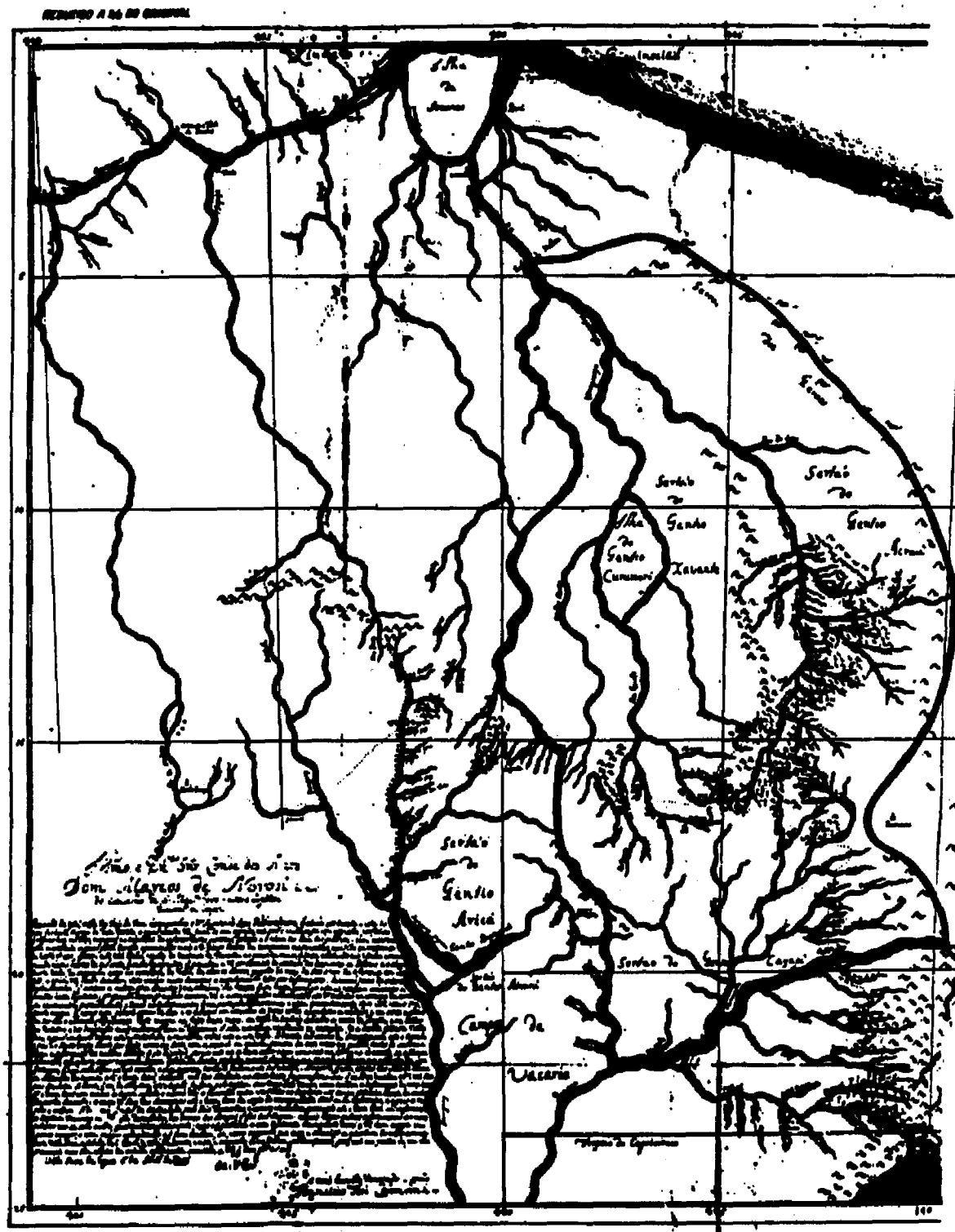


linking roads, demonstrates how rapidly settlement had proceeded (see Figure 3). Most of the settlements were along the tributaries of the Araguaia and the Tocantins. This map probably shows Goiás at its population maximum for the 18th century. According to Castelnau (1850-51, Vol. 2, p.121) there were 100,000 Black slaves working in the Goiás mines at this time.

On the 1751 map several Indian groups are located, the Xavante between the island of Bananal and the Tocantins, well to the north of the settlements; the Akroá at the same latitude, but east of the Tocantins, between that river and the Paranaíba. The Southern Kayapó were placed on this map between the Paraná and the headwaters of the Araguaia and the Tocantins. The Indians who were in southern Goiás when the mines were discovered, the Crixá, the Goyaz and Araé, by this time must have been exterminated or have fled. According to Mello, the second governor of Goiás, (RIHGB 1918:61) these groups withdrew west as settlers moved into southern Goiás. As they retreated they met the Kayapó, who destroyed them.

In the early days of the captaincy the Southern Kayapó, who were already notorious for their raids on the canoe flotillas that crossed their territory on the way to the Mato Grosso mines, made hazardous the newly opened overland route from Cuiabá to Goiás. The bandeirante Antonio Pires

Figure 3: Map of Goiás in 1755, Showing Mining Settlements and Locations of Indian Tribes



Map from Chaim 1974.

de Campos, with a private army of Bororo warriors that he had organized, destroyed many Kayapó villages, and settled the survivors in two aldeias in Minas Gerais (Alencastre 1864:62-79).

By the 1750's the Kayapó who had not been settled or exterminated were pushed out of Goiás toward the west. But to the east the Akroá and the Xakriabá were reported to be "devastating and depopulating" settlements along the tributaries of the Tocantins. Campos and his Bororo were invited to suppress them, but the Bororo warriors, who had willingly fought against their Kayapó neighbors, refused, saying that the region affected was too far north and remote from their own territory (Alencastre 1864:84-89). (See Figure 2).

In 1751 Noronha, the first governor of Goiás, wrote to the King:

They [the Akroá] are killing Blacks and whites, destroying the crops, eating the cattle; and lately, so that they can continue their insults with greater ease, the Indians have taken to stealing horses from their pastures, and have entered the cattle ranches on horseback, where they have made great destruction, not only by killing cattle, but by driving cattle off to their villages where they keep them for their consumption [Letter quoted in Chaim 1974:184-185].

It appears that the Akroá, who had been in contact with ranchers for some 50 years by that time, had become expert cattle rustlers.

The settlers protested bitterly and called on the governor for aid. They wanted him to petition the King to declare an offensive war, which would justify making slaves of Indian captives. But the governor was caught between the demands of the colonists and directives received from Lisbon. Having recently signed the Treaty of Madrid which established Portuguese sovereignty over vast regions to the west, Portugal wished to populate these lands with settled Indians who would become the King's faithful and industrious subjects, and best defense against a still feared Spanish invasion from Peru and the progress of Spanish Jesuits in converting the Indians of the frontier zone (Davidson 1973:85).

Noronha, therefore, sent emissaries to the Akroá, telling them that if they made peace they would be "civilly treated, and would receive lands, and neither they nor their kin would be subject to any law of captivity" (quoted in Chaim 1974:292-293). After several attempts, a number of Akroá and Xakriabá agreed to settle.

Two aldeias were built at Duro, in the Natividade district, and between 1751 and 1753 some 1200 Akroa and Xakriaba were settled there, near the farms they had previously been raiding (see Figure 2). But over the next few years a series of epidemics and uprisings in the Duro aldeias discouraged succeeding governors of the Captaincy

regarding the possibility of making the Akroá and the Xakriabá peaceful subjects of Portugal.

By 1760 one of the aldeias was completely abandoned, and the other had only 60 Indians "of both sexes, but all either very old or very young." In effect, both the Akroá and the Xakriabá were free, and hostile, and further attempts to settle them appeared futile. Governor Mello, who succeeded Noronha, wrote to the King in 1760: "Experience has shown that the settlement of the the Akroá and the Xakriabá is useful neither for Religion nor for the the State; from the former they have become apostates, and from the latter rebels" (RIHGB 1918:61).

The colonists claimed that the Akroá and the Xakriabá had killed more than 200 people since the first uprising. Moreover, to save their lives the settlers were abandoning their mines and their fields, so that they suffered from lack of food. In fact the situation was worse than before the attempt at settlement, for the Indians were now carrying firearms, which they had learned to use while in the aldeias and which they took with them when they rebelled (RIHGB 1918:60). The colonists told the governor in no uncertain terms that they had had enough of raising money to finance pacification bandeiras: they wanted the Indians killed or driven out of the district. The Governor was sympathetic and wrote to the King:

It seems to me that the best thing is for Your Majesty to authorize offensive warfare, obliging the Indians to retreat into their former territory from which Wenceslau Gomes [the bandeirante who pacified the Akroá and the Xakriabá] brought them, which he alleged was a great service. It would have been better to push them further away, rather than bring them within the Natividade district [RIHGB 1918:61].

The King did authorize offensive warfare, not only on the Akroá and Xakriabá, but also on the Southern Kayapó who had again been troubling southern Goiás. It was to be nearly 15 years before a governor of Goiás would make another attempt at peacefully settling Indians.

In 1762 Governor Mello reported that the settlers on the Paraná river, a tributary of the Tocantins south of Natividade, had raised a bandeira at their own expense to fight the Xakriabá. The bandeira pursued the Xakriabá into Akroá territory (These were possibly the Akroá-Mirim, who had not been involved in the experience of settlement.) The Akroá received the Xakriabá in their villages, but behaved treacherously, massacring the Xakriabá while they slept. "Only 40 escaped, and these came to our bandeira asking to make peace. This was granted them. The women and boys were shared out among the most wealthy households of the surrounding settlements to serve in bondage, while those capable of bearing arms offered to join our bandeira, saying that they wish to avenge the death of their kinsmen" (RIHGB 1918:83). From a report given by two Portuguese

speaking Akroá the Governor estimated that some 600 Xakriabá had been killed and that "few remain of this inconstant nation."

Little more is heard of the Xakriabá as a group. Years later, in 1773, some 200 were resettled at their old aldeia (Alencastre 1864:286). Three years later they were transferred to another aldeia in northern Minas Gerais. There they became peasantized, and by the early 19th century, when Saint-Hilaire (1848:283-293) and Eschwege (1830:95-96) visited the Xakriabá aldeia they found only a few who still spoke their native language.

However, it was almost immediately after the Xakriabá defeat of 1762 that the Xavante, who had been living fairly peacefully north of the mining camps in western Goiás, began attacks on the settlements. These attacks may well have been instigated by Xakriabá whom the Xavante absorbed into their villages as "alien clans." In 1937 Nimuendaju found that the Xerente, a Central Gê group that does not appear in historical accounts until the end of the 18th century, had two "supplementary clans" which, according to tradition, were derived from groups who came from the southeast (Nimuendaju 1942:19); roughly the region that the Xakriabá occupied before their pacification.

2.4.3.1 Campaign Against the Xavante

In letters to the Marquis of Pombal, the powerful Prime Minister of Portugal, Governor Mello (RIHGB 1918:83-88) blamed the recent change in the relationship between the colonists and the Xavante, whom he described as "less barbarous" than the other tribes of Goiás, on the influence of Indian emissaries supposedly sent by Spanish Jesuits to subvert the Xavante. Since he produced no evidence beyond the sudden outbreak of hostilities, his suspicions might seem farfetched, as the nearest Spanish missions were over 1000 miles to the west on the Guaporé river. However, war had just broken out between Portugal and Spain. There was some fighting on the Guaporé frontier in which one of the strategies employed by both sides was to attempt to win the allegiance of the Indians of the region (Southey 1970: 572-584). Mello also knew that any accusation against the Jesuits, in the political climate of the time, would be well received at court.

Mello (RIHGB 1918:83-84) wrote to Lisbon describing a Xavante attack on the mining camp at Crixás. The Indians' advance on the settlement was only halted by arming 300 slaves who were employed in the mining operations. The Xavante withdrew, but after a few days again began raiding the plantations with a larger number of warriors, many of them armed with muskets. The miners were on the alert, and

went out to drive the Indians back, but they feared to attack as the Xavante were now so numerous and well-armed. The miners were reluctant to risk the lives of the slaves on whose labor they depended. The opposing forces remained facing each other for two days, without attack on either side, until the Xavante finally withdrew. The settlers then appealed to the Governor for help, maintaining that they were too few to resist attack by such large numbers of Indians.

Mello (RIHGB 1918:84) proposed that the miners should raise a *bandeira*, which would include men not only from the Crixás mine, but also from Anta and from Pilar, the largest mining camp in Goiás. There were to be 500 men, placed under the command of João de Godoy, "the most resolute and most intelligent Paulista this Captaincy has for such enterprises". Mello noted that sending a *bandeira* into unexplored territory was doubly advantageous, since they could prospect for gold as well as seek out and punish the Xavante.

The *bandeira* did not set out for another two years, apparently because of disputes about how much of its cost should be borne by "spontaneous contributions of the people." In the end it was made up of only 200 men instead of the 500 originally planned. However, the Governor quickly sent the *bandeira* into action after he received

reports that when a party of Xavante captured some Black slaves working in the fields they did not kill their captives, but took them to the Xavante village, treated them with kindness, and provided them with wives (RIHGB 1918:88-89). The Governor noted that if this sort of thing became customary it would have a pernicious effect on the mining operations. Black slaves were already escaping in numbers and forming "quilombos" -- colonies of escaped slaves. If they found a secure refuge and allies in the Indian villages there was no telling what the effect might be.

So the bandeira set out, and after many days of searching the Indian trackers that accompanied it found a trail that led to a populous Xavante village on which the bandeirantes made a dawn attack. The Indians were caught by surprise; a number were killed and the rest fled, leaving some children in the village. But they did not go far, and when the Xavante saw that their attackers were few they prepared to counterattack. João de Godoy then sent an Indian who spoke Xavante to carry a message to the headman that the Portuguese were prepared to make peace if the Xavante would declare allegiance to the King of Portugal and embrace the Catholic faith. The Xavante chief pretended that he could not hear the message and called the messenger to come nearer. When the man did so, the chief and his warriors shot and killed him (RIHGB 1918:89).

The Xavante then retreated slowly, drawing the bandeira in pursuit through difficult terrain, until they reached a wide and swift river which the Indians crossed, halting on the opposite bank. Any enthusiasm among the troops for continuing the campaign was now washed out by the rains, which then broke as it was the end of September. As Mello (RIHGB 1918:89-90) pointed out, in the rainy season muskets got wet and would not fire, giving the advantage to adversaries armed with bows and arrows. So the bandeira retired to Pontal, and João de Godoy informed the governor that in the next dry season they would attempt to destroy two other Xavante villages in the region. According to Mello this was the only effective way of dealing with the Indians: "For experience has shown that when we burn their villages and capture their children all these Heathen seek out more distant wildernesses in which to live, and cease to invade our lands" (RIHGB 1918:90).

Hostilities with the Xavante, however, did not cease. Ten years later, in 1774, Mello's successor as governor of Goiás, José d'Almeida e Vasconcellos (RIHGB 1918:96-97), reported that in the previous dry season the Xavante had raided Pilar, Trahira, São Felix, and Natividade. This indicates that the Xavante at that time, far from seeking out "more distant wildernesses" had expanded their activities eastward toward the Tocantins, into a region that 20 years before had been Akroá territory.

It appears that at this time, perhaps because they could muster large numbers of warriors, the Xavante attacked openly and in force. Vasconcellos contrasts the Xavante style of warfare with that of the Kayapó: "[The Xavante] have shown themselves to be more industrious... attacking equal opponents face to face; they capture and take with them any isolated child or Negro they come across; while [the Kayapó], in accordance with their ancient custom, kill without being seen, sparing neither humans nor animals, without regard for age or sex." (RIHGE 1918:96).

2.4.3.2 The secular Aldeias of Goiás

In 1758 a new system imposing secular control on Indian aldeias, was extended to all of Brazil. The legislation for this system, designed to eliminate the temporal power of the Jesuits, was written by Pombal's brother, at the time governor of Grão Para and Maranhão. This legislation, known as the "Directório", suppressed all forms of Indian slavery, encouraged mixed marriages, and envisioned the gradual conversion of the aldeias into townships. The aim was the gradual incorporation of Indians into the general population. With this legislation the Portuguese Crown placed its own interest, which was to populate its vast dominions in Brazil with Portuguese subjects -- Indian or white -- above those of the colonists who regarded pacified Indians only as a supply of manual labor (Prado 1963 88-89).

In Goiás, however, there was no attempt to put the new system into effect until the 1770's, because after the defection from the Duro aldeias of the Akroá and the Xakriabá there were no pacified Indians in Goiás. Mello (RIHGB 1918:62), writing in 1760, maintained that the new legislation was intended to apply to peaceful village cultivators and not to such "nomadic pirates" as the Akroá, the Xakriabá, and the Kayapó.

According to Mello, one of the mistakes made by Noronha, under whose administration the Akroá and the Xakriabá were settled in the 1750's, was to set up the aldeias in the Indians' own territory, so that they remained in contact with their former villages and their kin still living there, so that there was constant coming and going. The administrators (who were still Jesuit missionaries at the time) encouraged this, Mello wrote, because: "On the days when the Indians in the aldeia were counted in order to estimate the rations of meat and manioc flour necessary to feed them, the administrators told them to invite all their relatives and friends for their accustomed festivities, and thus their numbers were increased to as many as 400, and when the occasion had passed these others were granted permission to return to their own lands, and there were fewer to eat the rations" (RIHGB 1918:73). Mello implied that the Jesuit administrators were enriching themselves by selling off surplus rations, which were provided at

government expense. Mello complained that the aldeia plantations were worked by Black slaves rented from a trader, to the further expense of the Crown, since the Indians refused to cultivate, even though "they know very well how to plant, as that is how they support themselves in their own villages" (RIHGB 1918:74).

There is probably some exaggeration in Mello's account, which amounted to an accusation against his predecessor, Noronha, who was appointed by King João V. Mello owed his appointment to the Marquis of Pombal, the powerful minister of King José I, whose anti-Jesuit policy was soon to lead to the expulsion of the order from Brazil.

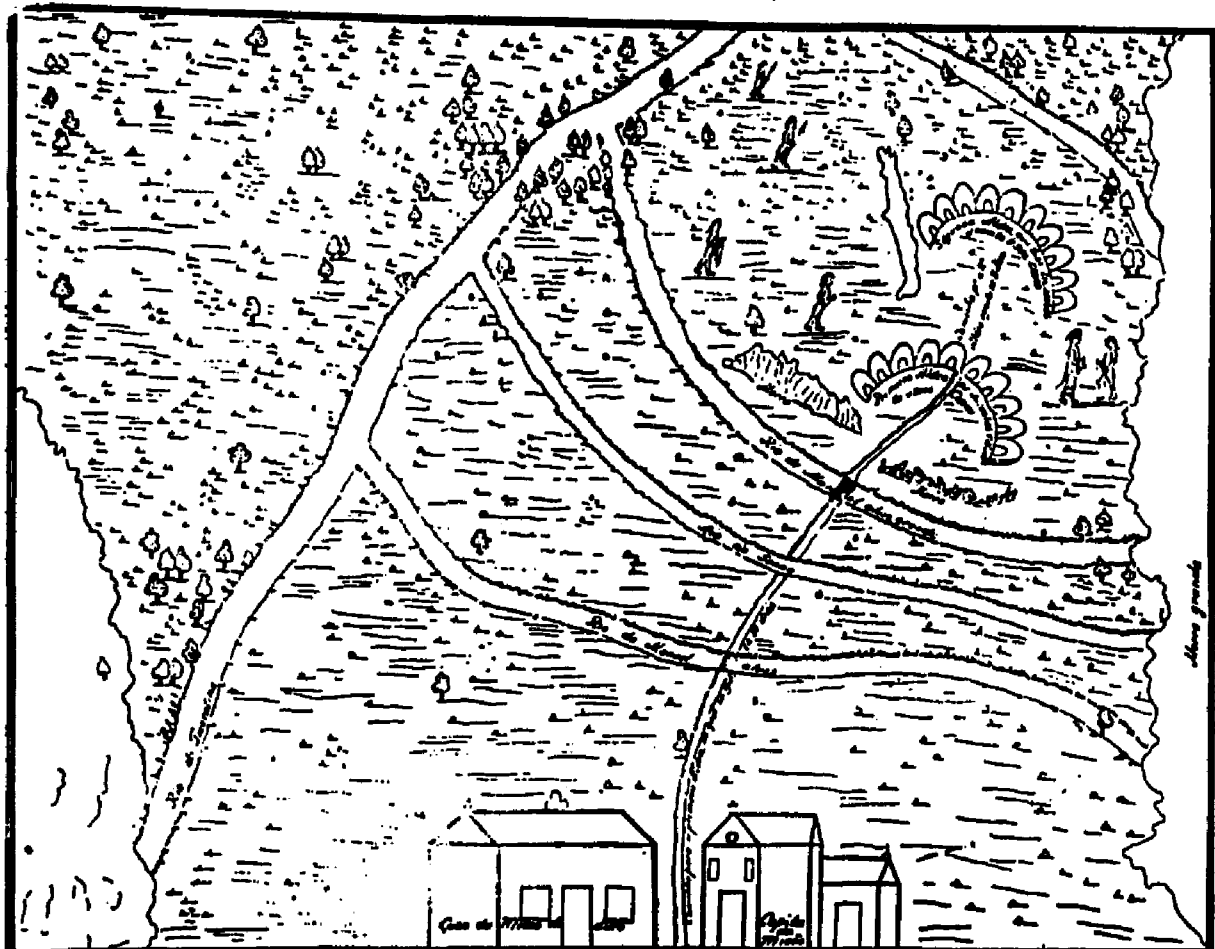
However, the account appears to indicate that the Akroá and the Xakriabá had managed to turn their "pacification" at least to their temporary advantage, for they must have reckoned the food generously provided as a great convenience when it allowed them to hold ceremonies without the effort of hunting or of planting extra food.

A pictorial map of the period, (see Figure 4), possibly drawn by one of the Jesuit missionaries (Chaim 1974:111) shows the Duro missions and the Tocantins tributaries to the north. Two Indian villages are shown, with captions indicating that one lay 31 days' journey to the north of the mission, and the other three days' journey further. The villages are drawn with beehive-shaped houses, arranged in

Central Gê horseshoe formation. The caption for the first village indicates that it had 276 houses, and the second village 396 houses. Small figures of Indians carrying bows and arrows are sketched on the map; one is talking to a Portuguese officer wearing a sword. The villages shown, each of which must have had well over 1000 inhabitants, may well have been those from which the "friends and relatives" came who joined the Indians at Duro for ceremonies.

Mello supported the colonists in their contention that any attempt to pacify and settle the Indians of Goiás was futile, and that peace could be attained only by killing them off or driving them far from settled regions. But Vasconcellos, who succeeded Mello as governor in 1772, was given a firm directive by Pombal's government to encourage the settlement of Indians in order to populate the captaincy. By the third quarter of the 18th century gold production in Goiás was entering a decline from which it never recovered. The new governor was urged not only to seek out new mines, but also to stimulate agriculture and the exploitation of new resources such as salt deposits. In his instructions, Vasconcellos was told that "the civilizing of Indians is an objective much more important in its consequences than all other wealth... since the mining of gold, diamonds, and other precious metals involves considerable expense, while the civilizing of Indians may be easily accomplished as soon as the correct method of

Figure 4: Pictorial Map of Missions and Central Gê Villages
Circa 1750



Fonte: Adolpho J. A. A cartografia da Região Amazônica - Catálogo Descritivo (1800-1841) volume 2 Instituto Nacional de Pesquisas da Amazônia - Rio de Janeiro 1965 - pags. 640-641 -

Map from Chaim 1974.

proceeding is arrived at" (quoted in Chaim 1974:94). The methods used by the French and the English were held up as an example to follow, since they had succeeded in "civilizing and subjugating four million Indians as fierce and indomitable as the Kayapó." Vasconcellos wrote to Lisbon of his resolve to carry out the royal instructions, though he anticipated little cooperation from the colonists (RIHGB 1918:95).

Vasconcellos took up his task with enthusiasm. Near the capital he built a large aldeia which took its name from the Governor's title: Baron of Mossâmedes. For a frontier captaincy the design of the settlement was grandiose. The plans (Chaim 1974:235-336) show a large church and a palace-like building which was to serve as the Governor's summer residence. A cotton-spinning workshop is indicated, as well as a sugar mill and a "casa da farinha" for processing manioc flour. There were long barracks to house the Indians.

The first inhabitants of Mossâmedes were a group of Akroá who had fled back into Goiás from Piauí in 1774 to escape the brutality of a bandeirante who had massacred some 800 Indians after promising them land and peaceful settlement (Alencastre 1857; RIHGB 1918:99-100). In the following year Vasconcellos sent a mission to the Karajá on Bananal Island. The Karajá agreed to sign a treaty of peace with the

Portuguese in return for a promise of protection against the Xavante who were harassing them by fording the river in the dry season and raiding their plantations and villages (RIHGB 1918:116-117).

Under succeeding governors the effort to settle Indians continued. Governor Luiz de Menezes moved 718 Karajá to Mossamedes and settled a large number of Kayapó at another new aldeia called D. Maria I.

By the early 1780's the only major group still hostile in Goiás was the Xavante. The Xavante were most active in the north of the captaincy where 14 cattle ranches had been abandoned because of Xavante depredations, and because of Xavante raids on plantations the miners were running short of food supplies (RIHGB 1918:156).

(The following account is from Alencastre 1864:328-337.) In 1782 Governor Tristão de Menezes raised a bandeira, which included 40 Kayapó, to pacify the Xavante. The bandeira succeeded in reaching a Xavante village, but not in persuading the Xavante to make peace. The commander then gave the Kayapó orders to take prisoners, which they were only too pleased to do. They captured one warrior, four women and several children, and returned to the capital. The Governor treated the captured Xavante man so well that he promised to attempt to persuade his fellow villagers of the whites' good intentions. This Xavante, who was now

called Tristão after the Governor, was allowed to return to his village the following year to carry the Governor's peace message. As Tristão returned to the capital with a favorable report, preparations were begun to provide an aldeia for the Xavante at Carretão.

A large number of Xavante showed up at the agreed place to meet the escort that was to accompany them to the new aldeia. But they came armed and ready for battle, showing that they had little confidence in the good faith of the Portuguese. According to Alencastre, it was the headman of the Kayapó who persuaded the Xavante to lay down their bows and arrows, for he declared that if they did not do so the Kayapó, with the Portuguese, would seek out and destroy all the Xavante villages, no matter how distant.

Two groups of Xavante settled at Carretão, the number estimated to be 3000-3500 (Cunha Mattos 1874:245-246). The fealty oath of a Xavante chief called "Arietomô-Saxé-Qui" was recorded. He promised to become "a faithful vassal of the Queen of Portugal D. Maria I whom I recognize as sovereign lady, mother, and protector; and to have perpetual peace, union, and eternal alliance with the whites..." (Alencastre 1864:336).

The population at Carretão continued to grow for a few years, as more Xavante came in to settle. A local priest baptized 412 Xavante children on one visit (Alencastre

1964:336). However, within a few more years Carretão was almost deserted. The immediate cause was a measles epidemic that killed 120 to 400 Indians according to different sources (Maybury-Lewis 1965a). The Indians then abandoned the aldeia.

In the 1780's there must have been well over 10,000 Indians settled at the various aldeias of Goiás. By the end of the century only a handful remained, and any attempt to "civilize" them in accordance with Directório guidelines had collapsed. Most of the Karajá at Salinas and Mossamedes had disappeared, though whether they died out, or deserted and returned to Bananal is not recorded. The Kayapó at D. Maria I became so reduced in numbers that those who remained were transferred to Mossâmedes and D. Maria I was abandoned (Cunha Mattos 1874:244-245). By the end of the century the situation was much as it had been 50 years before: there were no pacified Indians in Goiás. Again, there were constant hostilities between Indians and settlers.

The governors of Goiás who wrote such enthusiastic letters to Lisbon about their successes in settling Indians were much less communicative about the desertions. However, in a letter written in 1781 (RIHGE 1918:160-170), Tristão de Menezes attempted to justify the high expenditure on aldeias at a time when the product of the royal fifth levied on mined gold was declining every year.

Menezes pointed out that the Indians of Goiás were difficult subjects, "fierce, ungrateful, and rebellious." They showed no interest in learning trades, and only remained settled as long as they were supported by the royal treasury. The government should understand that the situation was very different from that in Pará and Maranhão, Menezes went on. There the labor of Indians was advantageously employed in collecting forest products (see MacLachlan 1973).

In this way each of the colonists for his trade uses the labor of salaried Indians, and thus with little trouble and almost no expense the Indians become civilized and begin to be useful to themselves, to the colonists, and to the State. But in this captaincy to the present day no one cares about anything except mining, and for this labor only Blacks are considered to be of use, so no colonist wants a single Indian in his household [RIHGB 1918:169].

But the continued expense with the aldeias was justified, Menezes maintained, if only to keep the captaincy at peace.

Because one of the causes of the general backwardness of this captaincy has been the great hostilities practised against the colonists by these rational wild beasts, and the continued killing of their slaves. For this reason until recently the best parts of this region remained impenetrable. Today, under the shadow of peace with almost all the Indian nations it seems that the colonists are beginning to breathe freely. But this felicity would be destroyed by the natural inconstancy of the Indians if we should cease to support them, for they would then return to the wilderness and wage on us the most cruel and disadvantageous war, making our subsistence precarious and doubtful [RIHGB 1918:169].

This, in fact, was what happened. The Lisbon government was fast losing interest in this distant captaincy that no longer contributed significant sums to the treasury. Government support for the aldeias declined until it was practically non-existent (L. de Souza 1953a:14-15).

2.4.4 1790-1850

In Goiás, as mining declined, the colonists failed to exploit new resources which might have developed internal trade. In Minas Gerais, even while the mines were still productive, people began to produce locally the commodities needed to provision the mining camps (Maxwell 1973:88). This led to a fairly smooth transition from mining as an economic base to generalized agriculture and cattle-raising. A similar transition failed to occur in Goiás. With labor always in short supply, the miners preferred to use the slaves they had on mining operations. River transport was difficult and dangerous because it was hard to assemble boat crews, and there were few river settlements from which to obtain supplies. The constant risk of Indian attacks made a troop escort necessary (Barata 1848:343). Also, life on isolated farms was hazardous because of Indian raids which often caused them to be abandoned (Cunha Mattos 1875:14). Therefore, as the mines ceased to be productive, much of the population simply left the captaincy (Prado 1963:53).

The colonist population of Goiás in 1772-1782, when it was already declining, has been estimated by Alden (1963:191) at 55,514. A census taken in 1804 (Silva e Souza 1974:482-494; Pohl 1951, vol. 1, p. 293) shows that the population at that time was 50,153. As Alden notes, this indicates that Goiás lost population during the last quarter of the 18th century, contrary to the general trend toward population increase throughout Brazil. The failure of the colonist population of Goiás to grow by natural increase in the 18th century was ascribed by Cunha Mattos (1875:16) to the fact that most of the migrants into the captaincy were men who came as miners. They brought only male slaves, who left few descendants. In 1824 Cunha Mattos (1874:303) wrote: "The parish of Crixás once had 4000 inhabitants; today there are scarcely 1000... In the district of Pilar there were once more than 9000 slaves, today the total population, in continuous decline, is less than 3000 souls... the land is full of the ruins of abandoned houses." The distribution, of population was very unequal. The more populous district was the southern one, with 36,000 inhabitants, and this population, which was formerly distributed according to the gold workings, was condensed in the southeast corner (Prado 1963:53). There were practically no Indians in this region. The north, where the population was only 14,000, had apparently suffered greater depopulation. As the economy there had become based on cattle raising, the population was also more dispersed.

The expansion of ranching westward from Piauí continued during this period, into the southern part of Maranhão known as Pastos Bons, and along the eastern tributaries of the Tocantins. Navigation on the Tocantins was established around the end of the 18th century. Although river transport suffered from the problems mentioned by Barata (1848), a few new settlements, such as São Pedro de Alcântara (now Carolina), (see Figure 5) and a number of cattle ranches appeared along the river. Some of these cattle ranches were very large, sending as many as 6000 head of cattle a year overland to Bahia, where they sold for 15-20 times their value in Goiás (Pohl 1951, Vol. 1, p. 295). However, most of the population survived by subsistence agriculture and what little gold they could wash from the gravel of the rivers (RIHGB 1918:278). In this region there were constant clashes between Indians and settlers.

To the west of the Tocantins in the north of Goiás there were no settlements -- only the villages of unpacified Indians (Casal 1945:338). Pohl (1951, Vol.1, p. 299) estimated the unpacified Indian population of Goiás in 1820 to be around 50,000, roughly the same as the colonist population. This is perhaps a high estimate, but it does indicate that, after 80 years of warfare, resettlement, and epidemics, the Indian population was still large and vigorously defending its habitat.

The most powerful and active Indian group in Goiás at this time was the Xavante, who were apparently expanding eastward. Around this time the Xerente first begin to be mentioned in the literature. According to Pohl (1951, Vol.2, p.132), one of whose informants was a colonist who was captured by the Xavante and who lived among them for several years, the Xavante, the Xerente, and the Akroá-Mirim, formerly distinct groups, were now united into one. They ranged over a wide territory on both sides of the Tocantins, from Porto Real downstream to São Pedro de Alcântara, and over into the region of Pastos Bons, in Maranhão (see Figure 5).

A number of European men of science traveled through Central Brazil in the early years of the 19th century, and wrote accounts of their experiences and observations. Among these were Pohl (1951), Spix and Martius (1824) Castelnau (1850-51), Gardner (1970), and Saint-Hilaire (1847-48). From them we have eyewitness reports of the economic decline of the region and the hostile relations between colonists and Indians. There is considerable disagreement among these observers about the location and organization of the Central Gê groups, indicating that they may have been in a state of flux. Pohl's observations refer to the time of his travels, in 1817-21. Martius (1867, vol 1, p. 275), referring to the same period as Pohl, believed that the Xerente, rather than having recently joined the Xavante, were recently separated

from them. According to Martius, the groups in the Duro region, who ranged as far eastward as Paranagua in Piauí, were generally referred to as Xerente. In the 1930's the Xerente on the Tocantins told Nimuendaju (1942:94) that they formerly lived farther east toward the São Francisco. In 1977 the Xavante at Pimentel Barbosa said that part of the Xerente, after their final separation from the Xavante, went eastward into Bahia.

Cunha Mattos (1875:18) estimated in 1824 that the Xavante, the most numerous group of Indians in Goiás, had 4000 fighting men. This would indicate a total population of at least 12,000. He described the Xerente as a "numerous group and a little different from the Xavante both in custom and language." But they understood one another's dialects. He calculated the number of Xerente at 4000, living in the same territory as the Xavante, but in separate villages. There were still some 2000 Akroá-Mirim, over toward the Araguaia. The Xakriabá Cunha Mattos believed to be almost extinct. Cunha Mattos (1875:22) calculated the total number of unpacified Indians in the northern district of Goiás in the 1820's to be in the neighborhood of 20,000 -- probably a more realistic estimate than Pohl's. The only Indian group in the south was the Southern Kayapó, which still had some populous villages (Cunha Mattos 1874:307).

According to Nimuendaju (1942, frontispiece map) the early 19th century was the period of greatest expansion of the Xavante-Xerente. Neighboring groups who were hostile to the whites at this time included the Karajá on and around Bananal Island, and the Canoeiro, a group of unknown origin that survived into the 20th century without ever making peace. Further east the Timbira were described by Paula Pibeiro (1841:185), writing in 1819, as "superabundantly numerous; they have absorbed with innumerable villages almost all the central part of these lands [in Maranhão] which are not inhabited by us."

All these groups retaliated against slaving raids, which were again semi-legalized (Prado 1963:93-95) by raiding and destroying farms and lifting cattle. Paula Ribeiro, an officer who served along the frontier from 1800 to 1823, gives us eyewitness accounts of Indian-colonist relations at this time (Paula Ribeiro 1841, 1849, 1870). He noted that the Timbira peoples were moving northward and westward into Pará and Goiás, this movement being generally north of the Xavante-Xerente.

The government gave little support any more either to military defense against Indians, or to attempts to pacify and settle them. Rather, the settlers were encouraged to take matters into their own hands. Ribeiro quotes a letter from the King to the Governor of Goiás written in 1811:

"...for the present, assuming that the reasons for their [the Indians'] hostility lie in the bad treatment that they received at the hands of some of the aldeia commanders, there remains no other option but to intimidate them, and even to destroy them if need be, to avoid the damage that they cause us" (Paula Ribeiro 1841:315).

According to Ribeiro, bandeiras raised for Indian campaigns were largely ineffectual. They included a few regular soldiers, and were usually under the command of an army officer such as Ribeiro, but the settlers contributed most of the supplies, and the bulk of the force was made up of militiamen pressed into service. These men, rather than serving, often deserted and fled into another captaincy. The fact that the farms and settlements were so dispersed increased difficulties and delays in getting a bandeira organized.

At last the recruits appear, bearing their own arms. Some have ancient muskets, others only sticks, because they don't even have muskets. Four or six ounces of powder are issued -- often the powder has gone bad because time and dampness have leached out the saltpetre -- and a handfull of birdshot.... Almost all the militiamen are barefoot and barelegged, and they must carry all their food supplies for a week on their backs, and their water as well if the march is across dry country... to attack several thousand savages on their own ground who are well armed with bows and arrows and clubs in the use of which they are highly skilled. Aided by the thickness of the bush, the Indians make a mock of those ancient muskets, and shoot the exhausted militiamen from ambush [Paula Ribeiro 1841:445].

What such expeditions were really after was not the pacification of Indians or opening up new lands for cultivation, but rather capture and enslavement, mainly of Indian children. Ribeiro (1841:449) saw Indian captives sold at public auction both at São Pedro de Alcântara and at Caxias. As Ribeiro saw, this policy and treatment could only have the effect of perpetuating hostilities.

However, Pohl's eyewitness account of the Xavante he met as his expedition sailed down the Tocantins, shows that the Xavante, between hostilities, were accustomed to trade, and even to make a little sport with the whites. Pohl hoped for a meeting when his party began to see fires in the distance. He was told that these fires were set by the Indians "who frequently leave their villages in the dry season and go along the river in groups of 40 or 50 men with women and children, and practise a kind of circular hunt" (Pohl 1951, Vol.2, p 121).

Pohl (1951, Vol. 2, pp. 126-130) and his party finally met some Xavante hunters near the mouth of the Rio do Sono. The Indians appeared unarmed, for they knew that if they were captured with arms they could legally be enslaved. As a sign of friendship, one which is still customary among the Xavante, they took off their cotton neckcords and tied them around the necks of the members of Pohl's party. Soon they were challenging one of Pohl's rowers, a Xavante who had

been captured by the whites as a child, to foot races along the riverbank, but Pohl called his man back, as he feared he might be drawn into the forest by the wild Xavante and disappear with them. Later, as Pohl and his party traveled back upriver, a group of about 200 Xavante appeared near the same place (Vol. 2, p. 173), and a few came to the boats with maize, peanuts, and palm nuts which they exchanged for salt, manioc flour, and beads. On another occasion (Vol. 2, p.176), some Xavante arrived when Pohl and his men had broken off trading and taken to their boats because the crowd of naked warriors around them had become uncomfortably large; the latecomers became angry at receiving nothing and began shooting at the boats from the riverbank. When Pohl's men shot back they disappeared.

Hostilities between the Xavante-Xerente and the colonists continued into the 1840's, with most of the attacks along the Tocantins and its tributaries. But the Xavante were also active along the Araguaia, where their presence discouraged attempts to open the Araguaia to navigation. A combined attack by Karajá, Xavante and Xerente forced the abandonment of in 1811 of a fort and settlement that the colonists attempted to set up on the Araguaia downstream from Bananal (Alencastre 1865:91-97).

One of the aims of Castelnau's expedition of the early 1840's was to explore the possibilities of again attempting

to open navigation on the Araguaia (Castelnau 1850-51, Vol. 1, pp 334-335). To procure guides for his journey Castelnau visited Carretão on his way from Vila Boa de Goiás to the Araquuaia. He found there only a few Christianized Xavante, some of them descendents of those settled in the 18th century. The aldeia no longer had a military commander, but was administered by the Xavante capitão, an old man who on ceremonial occasions sported a Portuguese officer's uniform and an immensely long rapier that was so firmly rusted into its sheath that it required the efforts of three strong Indians to unsheath it (Castelnau 1850-51, Vol. 1, p. 351). Castelnau also met free Xavante at Carretão where groups often camped, indicating that ties between free and pacified Xavante were maintained.

Castelnau's expedition, which traveled down the Araguaia to the junction with the Tocantins, up the Tocantins, and crosscountry to Vila Boa, demonstrated that navigation on the Araquuaia was potentially better than on the Tocantins. But for nearly another 100 years the Xavante presence was to make Brazilian settlement along the banks of the Araguaia precarious.

It seems clear that at this time the Xavante were already moving westward, for Castelnau (1850-51, Vol. 2, p.114-116) heard of a large Xavante village west of the Araguaia. The people of this village crossed the river and made incursions

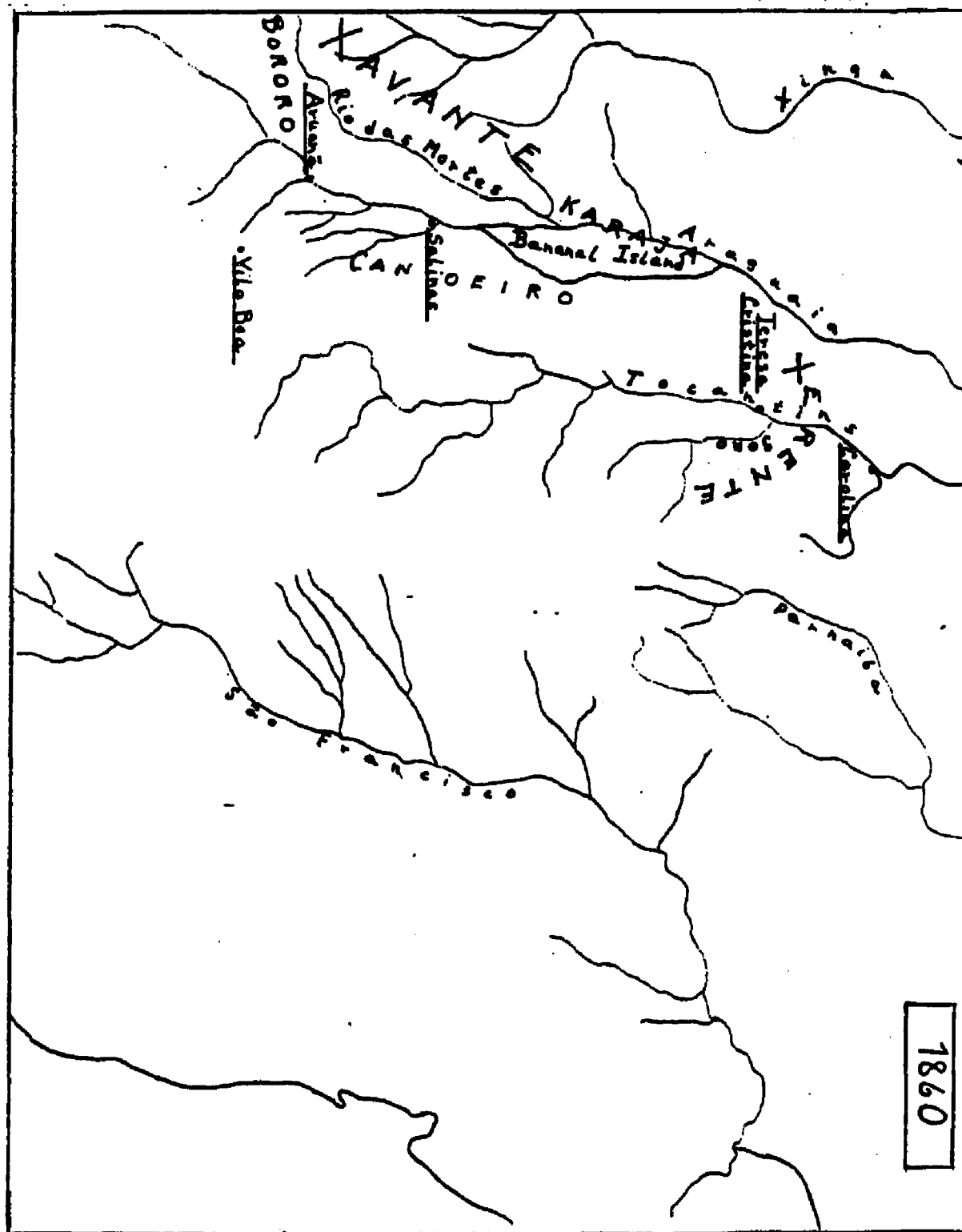
eastward as far as Crixás. However, from the Crixás-Uassu river on the south to Boa Vista (now Tocantinópolis) on the north, the lands between the Tocantins and the Araguaia were still almost completely controlled by the Xavante. On the north their territory bordered that of the Apinayé with whom they were on hostile terms. The Canoeiro were on the upper Tocantins from Peixe in the north to the vicinity of Amaro Leite in the south. Xerente villages were on the right bank of the Tocantins from Peixe north to Carolina, and eastward into Bahia (see Figure 5).

Castelnau (1850-51, Vol 2, p. 121) quotes the population figures from the census of 1824, the most recent available. It shows the population of Goiás to be 62,518. The population had increased by 25% since the 1804 census. Moreover, the imbalance of sexes referred to by Cunha Mattos was no longer apparent, as there were 31,129 males and 31,389 females. There were only 623 pacified Indians (presumably those still living in aldeias). Castelnau reckoned the number of free Indians (in the 1840's) to be 15-20,000. But, clearly the Indians were fast becoming outnumbered, and the land available for their subsistence activities decreased and circumscribed. The Xavante were already separating from the Xerente as the Xavante began to withdraw across the Araguaia, and Brazilian settlement began to surround the Xerente on all sides.

In the 1850's Italian Capuchin missionaries established two large mission settlements on the Tocantins. In a census dated 1856 they reported that 2,139 Xavante and Xerente were settled at Maria Cristina (Taggia 1856). They wrote that although the numbers of Xavante-Xerente had been much reduced by disease and bandeira attacks, their numbers were already increasing as they were very fertile, and more land would soon be needed for their support. This judgement seemed supported by the census, as almost half the settled Indians were under the age of 16. At about the same time another Italian missionary set up a much smaller mission for the Xavante near Salinas on the Araguaia.

By the 1860's it appears that the separation between Xavante and Xerente was complete. Those who were now known as Xerente were pacified and settled in the vicinity of the Tocantins, particularly in the Rio do Sono region (see Figure 6). The Xavante were distinguished as those who had gone over toward the Araguaia and were mostly free. General Couto de Magalhães (1938) visited in the 1860's the Xavante aldeia on the Araguaia where there were some 200 Xavante. Brazilian settlers who lived there told Magalhães that a column of smoke seen to the north indicated the camps of the Xavante along the Rio das Mortes, smoke to the south indicated Kayapó, and to the east Canoeiro, who apparently now roamed over some of the lands to the east of the Araguaia that the Xavante had abandoned (Couto de Magalhães 1938:99).

Figure 6: Locations of the Central Gê in 1860



The Brazilian population of Goiás continued to increase rapidly through the rest of the 19th century. The census of 1872 showed a population of 160,395, which by 1890 had grown to 227,572 (Anuário Estatístico do Brasil 1939-1940).

The great increase which was anticipated by Taggia in the number of Xerente settled at Maria Cristina on the Tocantins apparently failed to take place, for a French traveler who visited the mission in 1888 gave their number as 2,723 (Basílio de Magalhães 1927:16) an increase of only around 600 in 30 years. By 1927 the remaining Xerente, who were then living in 12 scattered villages along the tributaries of the Tocantins, numbered only about 1400 (Vianna 1927:135). In 1930 Nimuendaju (1942:11) found only nine small Xerente villages, and in 1937 only seven. Many Xerente by this time were apparently no longer living in their villages. Nimuendaju (1942:8) found the Xerente demoralized, and living conditions in their villages deplorable: "Economically and socially ruined, hemmed in by Neobrazilian settlers... His native village has turned into a place of scarcity..."

There seems little doubt that the Xavante separation from the Xerente and their withdrawal across the Araguaia was due to pressure from the growing Brazilian population. In the 18th century aldeias, the settled Indians remained in contact with their free relatives, whose villages were

located in the same region. It appears that free Indians visited the aldeias when on trek, and left again. The authorities deplored this custom, but as long as the region was unsettled by colonists, and the Indians free to move about, could do little to control it. At Maria Cristina this contact was no longer possible, for the region was becoming constantly more densely settled with Brazilians. But in the west of Goiás there were still relatively few settlers, and beyond the Araguaia, none. It was therefore in that direction that the Xavante migrated.

2.4.5 1850-1950

2.4.5.1 The River Porpoises and the Turtle

In the old days the Xavante and the Xerente were together⁵. But the Xavante quarreled with the Xerente, over there by the Tocantins. The Xavante told the people that those who wanted to go to the other side of the river and stay with the Xerente should cross, and those who wanted to come over to this side should do so, but they would never again go back on the other side, and those who crossed to

5

This legendary account of the separation of the Xavante from the Xerente was told me in 1977 at Pimentel Barbosa by Isidázé and Waróli, and recorded on tape. A running verbal translation into Portuguese was made by Pasílio da Silva Barros, a worker at the Indian post who was brought up at São Domingos with Xavante children as companions, and therefore had a good knowledge of Xavante language and culture. My translation is from the taped interview.

the other side of the river should never again come back on this side.

Then the porpoises appeared in the river, in the Tocantins. Five porpoises appeared. And they say that one porpoise swam over to the riverbank and spoke: "Climb on my back; I'll take you over to the other side." There were two porpoises on this side of the river and two on the other side. But everyone was afraid to get on the porpoises' backs. Then the porpoise spoke again: "Get on my back; we will help you. But if you try to get on the rafts to cross, we will eat you. You won't live on this side of the river or on that side -- we will eat you up in the middle."

The people were still afraid. But then, those who wanted to go to the other side of the river climbed on the porpoises' backs. They trembled with fear, but they went, and the porpoises slowly swam with them over to the other bank.

So those people who were on the other side of the river and wanted to come over to this side also climbed on the backs of the porpoises, and they crossed. At last, those who wanted to go to the other side of the river were all over there, and those who wanted to come to this side were over here.

After the exchange was all finished, the porpoise spoke to the Xavante: "You shall go away westward to the Rio das Mortes, and the Xerente shall stay by the Tocantins and make their villages here. We, the porpoises, belong with the Xerente, but you belong with the turtles, over there by the Araguaia."

But some Xerente came along with the Xavante as far as the Araguaia; they came with their Xavante wives. When they all got to the Araguaia, the porpoises appeared again. The porpoises carried the Xavante across the river, but the Xerente men turned back. Then the Xavante women were sad, and they sang to the porpoises: "Don't throw us in the water, don't eat anybody up. For we are crossing, but our husbands are not." (Here Tsidadzé sang, in a falsetto voice, the nostalgic song of the Xavante women.)

After that, the porpoises left, and the Xerente men went back. They say that after that time the Xerente split. Half of them stayed by the Tocantins and made their villages there, and the others went farther eastward, over into Bahia. They changed their language, and they went over toward the sea. Those Indians who are over in Bahia changed; they are not Xerente any more, they are a different people.

The Xavante were wondering what this turtle was that the porpoise had spoken about. The old men already knew, but they didn't tell the young men.

Soon, as the Xavante traveled along the bank of the Araquaia, they saw Karajá swimming in the river. But they didn't know then that they were Karajá. They saw Indians out there in the middle of the river floating, shouting, diving and coming to the surface at another place. (The Karajá are famous for their skill at underwater swimming.) The Xavante were afraid.

Then the Karajá came out of the water and began to talk to the Xavante, but the Xavante didn't understand. The Xavante were afraid, and they thought: "These must be porpoises in the shape of men, for they swim like porpoises. They have taken on human shape to trick us, for they want to kill us. Let us kill them first".

So the Xavante attacked the Karajá. When the Karajá shot their arrows at the Xavante the Xavante fled upriver along the bank. But the Xavante could not escape, for the Karajá chased them faster in their canoes.

Then the Xavante begged the Karajá not to pursue them farther. They told the Karajá that they, the Xavante, were few, and they wanted to leave the Araguaia and come over here, over to the Rio das Mortes. An old man, a Xavante elder, had dreamed that a turtle, a Xavante turtle, had carried him here on its back. The old man had seen all the land over here, and it was beautiful. Then the turtle brought the old man back to the others so that he could guide them here to the Rio das Mortes.

So the Karajá turned back and let the Xavante pass, but the Karajá told them never again to set foot on the banks of the Araguaia, or the Karajá would kill them all.

Then the Xavante made a village at a place called Barawede, on this side of the Araguaia. After they had stayed there one or two seasons they left that place and came to the Rio das Mortes. They were afraid to stay at Barawede because it was too near the Karajá. When they got to the Rio das Mortes they crossed the river at Wededze, where the old Indian post, São Domingos, used to be. This all happened in the time of Apowẽ's grandfather. (Apowẽ was the village headman at the time of my fieldwork, and was about 75 years old.)

2.4.5.2 Xavante Expansion in Mato Grosso

This legend is one version of the 'great migration' which has come down in Xavante oral tradition. There are others. Xavante elders at São Marcos told Giaccaria and Heide (1972:22-23) that the Xavante crossed the Araguaia because they were persecuted by Brazilian settlers. A group of Xavante discovered that the whites planned to kill them all. They abandoned their village and escaped across the Rio das Mortes. There may have been several separate migrations by different groups across the river.

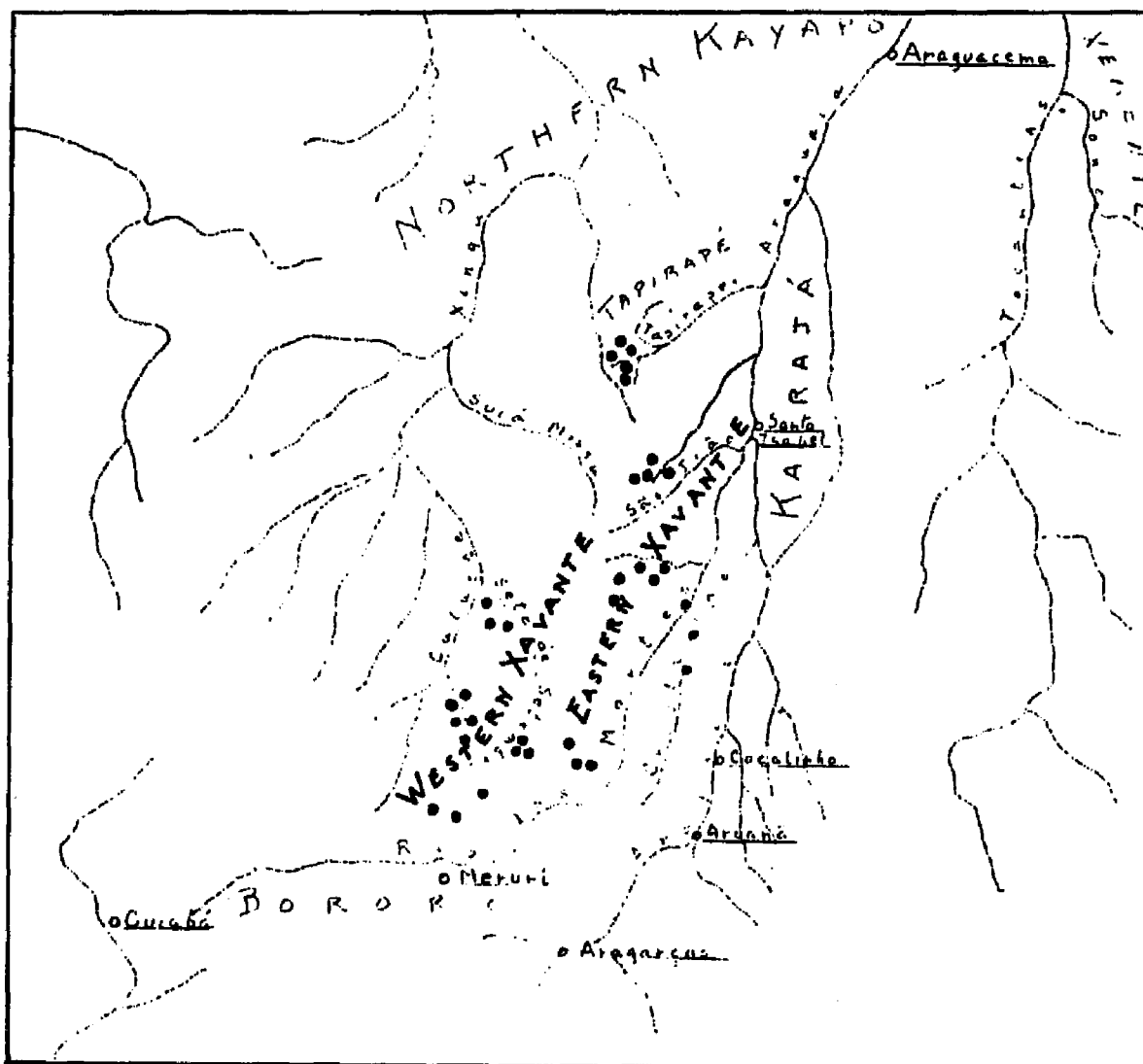
The territorial expansion of the Xavante in Mato Grosso appears to have been rapid, for when they were again contacted in the 1940's they occupied a range almost as wide as that they roamed over in Goiás in the 18th century (see Figure 7).

According to my informants at Pimentel Barbosa, after the Xavante abandoned Barawede and crossed the Rio das Mortes the group split. Some went north towards the Rio São João. It was probably this group, or a part of it, that migrated still further north and founded villages along the Xavantina river, one of which was Marawatsede. These Xavante remained in fairly close touch with their relatives to the south, both fighting and intermarrying with them (Maybury-Lewis 1967).

Other Xavante of the Barawede group remained in the region of the river crossing and founded a village, which grew to be very large, at a place called Tserepré. Apowẽ grew up and was initiated at this village, probably around 1920. This village is regarded as a kind of ancestral seat by the Xavante of this region, for when it broke up -- Apowẽ said it had become too large -- the groups which split off radiated into other parts of eastern Mato Grosso.

Informants' accounts of village movements are often difficult to unravel, especially since the Xavante name places, not villages, and the same village site may have

Figure 7: Locations of Xavante Villages Shortly Before Second Contact



Drawn from information provided by Pe. Pedro Sbardelotto, map in Giaccaria and Heide 1972, and informants' accounts. Locations are approximate.

been occupied several times. When their movements were not limited by white settlements they would build a village, clear and plant gardens in nearby gallery forest, and remain as long as there was new land to clear within convenient distance of the village. Then they would leave and build a village at another place, but after the land had lain fallow for a number of years, they might return to the first village site.

Another group of Xavante, somewhat different from the eastern group in dialect and details of social organization, is known as the Western Xavante (Maybury-Lewis 1967:13). The two groups may represent different migrations across the Araucaia. The Western Xavante spread along the upper reaches of the Rio das Mortes, and eventually northward toward the Culuene, one of the upper tributaries of the Xingu. By the end of the 19th century they were reported to be fighting with the Bororo (Colbacchini and Albisetti 1942:206-211; Albisetti and Venturelli 1962; Baldus 1948:157). These hostilities continued into the 1940's. The Bororo called the Xavante "Kaiano", possibly a variant on Kayapó. Baldus (1948:159), noting that these hostilities were in the region into which the Southern Kayapó were said to have retreated, thought that the two related groups might have fused. On the other hand, the Bororo may simply have transferred their term for their old neighbors and enemies to the new ones who were similar in language and custom.

There is no record of the Xavante having fought with any native groups except the Bororo and the Karajá who were on the fringes of the territory occupied by the Xavante (Baldus 1948). Among the Xavante themselves, however, there were many village splits and movements (Giaccaria and Heide 1972:23-29), probably indicating a fast-growing population.

From the 1860's to the 1930's the Xavante were left practically undisturbed by the outside world in their chosen isolation. Ehrenreich (1891) reported that in the 1860's free Xavante occasionally appeared on the Araguaia, where they attacked the Karajá. Since that time nothing had been heard of the Xavante on that river. However, in 1887 they attacked with "unbelievable audacity" a Brazilian expedition that was exploring the Rio das Mortes. The leader and other members of the party were seriously wounded, and the expedition was forced to turn back (L. da Souza 1953a:17).

2.4.6 1940 to present

2.4.6.1 Resistance and Pacification

The interior of Mato Grosso into which the Xavante had withdrawn was a sort of no man's land when they entered it, and the intransigence with which they defended their isolation prevented its exploration. By the 20th century it was regarded as one of the world's most mysterious regions.

Since no one knew what was there, anything might be. The disappearance in 1925 of an English explorer/adventurer somewhere in the vicinity of the upper Xingu provided a heyday for the English press. The story was particularly intriguing because Colonel Fawcett was looking not only for lost mines but for lost cities. Shortly before his disappearance Fawcett wrote: "It is certain that amazing ruins of ancient cities -- ruins incomparably older than those of Egypt -- exist in the far interior of Mato Grosso" (quoted in Fleming 1934:18). As Fleming, who took part in an expedition to search for Fawcett, wrote:

Less, probably, is known about the interior of Mato Grosso than about any other inhabited area of equal size in the world. It was in 1925, it is to-day, and it is likely to remain for some time very largely virgin territory. Between the headwaters of the great northward-flowing tributaries of the Amazon -- between the Araguaya and the Xingu, between the Xingu and the Tapajoz -- there are huge tracts of jungle which no white man has even attempted to enter. You can believe what you like about those regions: no one has authority to contradict you. You can postulate the existence in them of prehistoric monsters, of white Indians, of ruined cities, of enormous lakes. Fawcett plumped for ruined cities [Fleming 1934:17-18].

The Xavante were soon faced with less quixotic invasions of their territory than those of Fawcett and his would-be rescuers. Homesteaders were pushing into Mato Grosso and settling along the Rio das Mortes. Xavante occasionally ambushed and killed people from these isolated farms. Gradually the Xavante acquired a national reputation for

ferocity. A 1940's cover of *Cruzeiro*, the Brazilian newsmagazine, shows a backwoodsman kneeling piously by a graveyard cross on which is written a list of settlers who had fallen victim to the Xavante. Reprisals against Xavante villages were violent (L. da Souza 1953a 25-26; Giaccaria and Heide 1972:25-26; Maybury-Lewis 1967:2-3).

Economic and political pressure on the Brazilian government to open up eastern Mato Grosso to development was increasing. The Indian Protection Service undertook the pacification of the Xavante in the early 1940's. The leader and several other members of the first pacification team sent to the Rio das Mortes were killed by men of Apowẽ's village. The Brazilian press gave this attack wide publicity, and the pacification of the Xavante assumed even greater urgency in the eyes of the government. A large base was set up at São Domingos on the Rio das Mortes, and Francisco Meireles took on the task of pacification.

Meireles and his men penetrated Xavante territory, leaving caches of "presents" -- knives, cooking pots, axes, machetes, beads, spools of thread -- along trails that they knew the Indians frequented. However, it was six months before the Xavante began to take these gifts, leaving in exchange arrows with broken points to indicate peaceful intention to trade. By 1949 the men of Apowẽ's group were making regular visits to the base at São Domingos. Planes

of the Brazilian Air Force flew in journalists to document the progress in domestication of this once-redoubtable people (L. da Souza 1953b; Fonseca 194?).

Once Xavante resistance began to crumble, collapse was rapid. By the late 1950's all Xavante villages except Marawatsede were attached either to Salesian missions or to Indian Protection Service posts. Epidemics of diseases from which isolation previously protected the Xavante were reducing their numbers. Hostilities among Xavante villages continued for some years, probably intensified as a result of the increase of deaths -- deaths that were attributed to the sorcery of members of opposing factions (Maybury-Lewis 1967) -- and jealousy over the distribution of largess by the Indian Protection Service.

The last Xavante village to be pacified was Marawatsede in 1966. Their land in the upper Xingu region was occupied by a São Paulo corporation which planned large-scale cattle raising. The entire group of 300 Indians was transported by the Brazilian Air Force to the Salesian mission at São Marcos. A third of the group died the following year in a measles epidemic (Maybury-Lewis 1974; Pedro Sbardellotto, personal communication).

The lands which the Xavante had once controlled were soon sold off to private investors by the state government of Mato Grosso, isolating the remaining Xavante villages from

one another. Eventually the federal government allocated tracts of land, varying in size, as Xavante reservations. But these lands are held precariously, and their boundaries are under constant dispute.

Chapter III

XAVANTE POPULATION AND COMMUNITY

3.1 INTRODUCTION

In this chapter I look at the effect on the Xavante population of recent events, especially the shock of contact and the epidemic diseases that followed. I show how the community was affected by the factionalism and violence that apparently increased at this time. Comparing my data with studies made shortly after pacification, I find that in the 1960's fertility dropped, and mortality rose due to the introduction of infectious diseases. At present the population of the community I studied is growing rapidly, and tuberculosis, rather than acute infectious disease, appears to be the major threat to health. I suggest that population fluctuation and regional redistribution, rather than population control of local groups at levels adjusted to resources, may have characterized Central Brazilian populations, at least during the historic period. Since colonial times they have been affected by wars of extermination and by epidemics which probably caused population crashes, followed by expansion whenever conditions became more favorable. This flexibility was probably important to their survival.

3.2 THE PRESENT VILLAGE AT PIMENTEL BARBOSA

The Xavante group that I studied from May 1976 through July 1977 occupies the single village on a reservation (Pimentel Barbosa) of 205,000 ha located in the eastern part of North Mato Grosso State (see Figure 8). This reservation, bounded on the east by the Rio das Mortes, is part of the territory occupied by the Xavante when they migrated westward across the Araquaiá River from Goiás into Mato Grosso toward the middle of the 19th century.

The total Xavante population, which has been estimated at 5000 at the time of second contact in the 1940's (Ismael Leitão, personal communication) suffered abrupt decline in the 1950's and 1960's due to contact diseases and feuding, but it is now rapidly increasing (see Table 1). A recent census (Queiroz 1980) put the total Xavante population at 4058, living on six separate reservations. Four of these are attached to government Indian posts, and two to Salesian missions.

The Pimentel Barbosa community is probably the most conservative culturally of the present Xavante groups, since missionary influence -- Catholic in some, Protestant in others -- has tended to suppress ceremonial activities, either absolutely or selectively, in the other communities.

TABLE 1
Censuses of Total Xavante Population

<u>CENSUSES OF XAVANTE POPULATION</u>					
	^a <u>1958</u>	<u>1962-64</u>	^c <u>1969</u>	<u>1975-76</u>	^e <u>1980</u>
<u>Western Xavante</u>					
Batovi or Marechal Rondon	no info.	^a 300	275	^d 273	---
Simões Lopes or Paraíso	no info.	^b 226	257	^d 297	---
Kuluene	---	---	---	---	908
São Marcos and Meruri	200	^b 392	798	no info.	1387
Lagoa	no info.	no info.	77	---	---
Sangradouro	200	^a 175	367	no info.	545
<u>Eastern Xavante</u>					
Areões	80	^a 175	191	276	336
Capitariquara	150	---	---	---	---
Santa Terezinha	100	---	---	---	---
Couto Magalhães	---	---	---	no info.	371
São Domingos	220	^a 110	195	---	---
Ô Tô	---	^a 80	---	---	---
Pimentel Barbosa	---	---	---	244	332
Maravatsede	no info.	^a 150	---	---	---

a. D. Maybury-Lewis 1967.

b. F. M. Salzano et al. 1967

c. Giccaria and Heide 1972

d. FUNAI reports

e. Quairoz 1980

n.b.: --- indicates that village had not been established or was extinct.

The Xavante group at Pimentel Barbosa is substantially the same one that was studied by Maybury-Lewis and by Neel and others between 1957 and 1962 when their village was located at São Domingos on the Rio das Mortes, some 30 km from the present site.

When Maybury-Lewis did research among this group they had built a village near the Indian post, but spent little time there. At the time of Maybury-Lewis's fieldwork, Xavante territory was still largely unoccupied by whites. The routes that the Xavante followed on trek were determined by the presence of game, and by the localized distribution of specific plant resources.

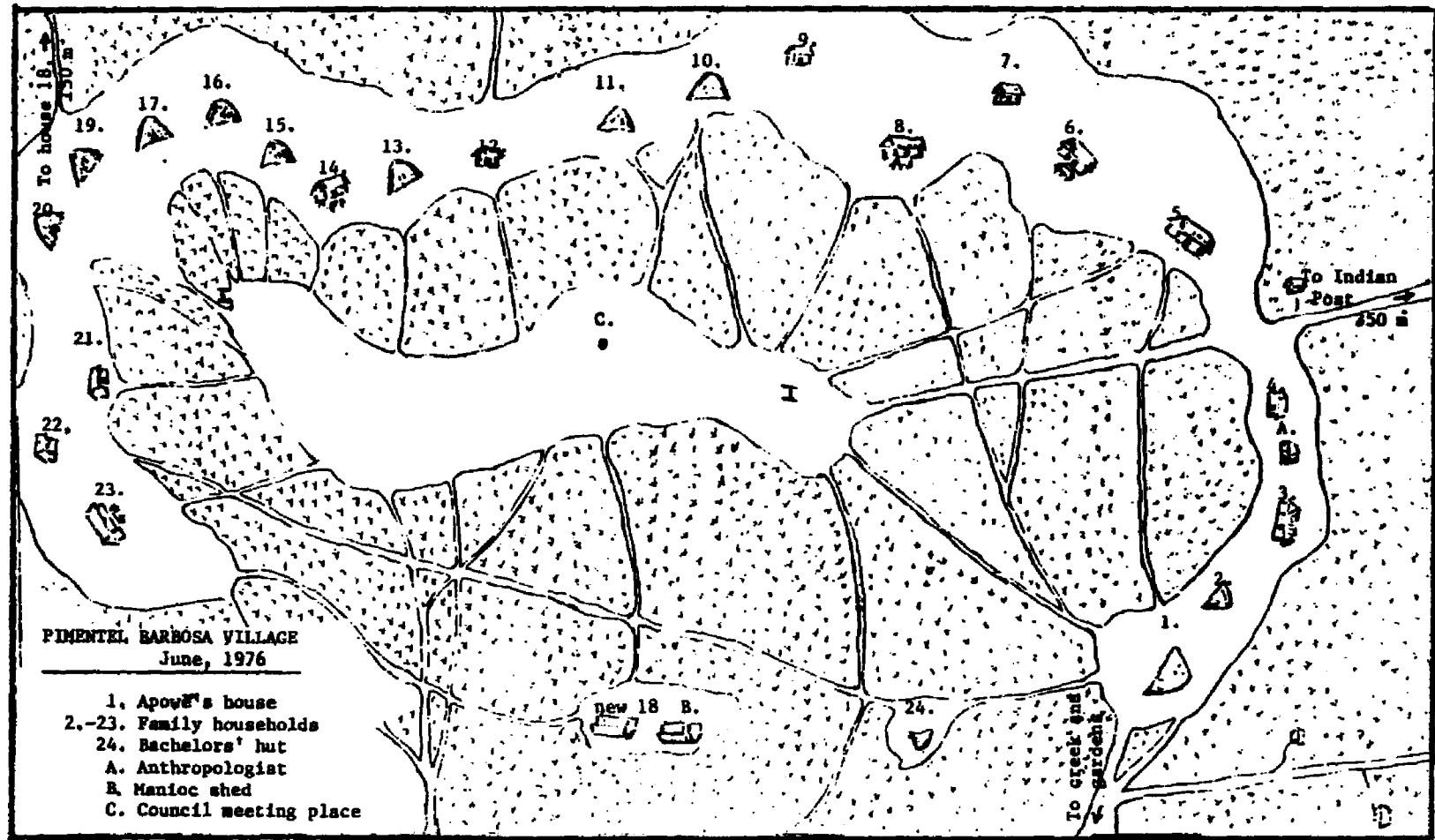
Between the time of Maybury-Lewis's research and my fieldwork with the Xavante their life underwent radical changes. Hunting and gathering activities are now limited to the area of their reservation. This tract is surrounded by Brazilian cattle ranches and farms where upland rice is grown on a large scale, making use of the relatively barren cerrado soils by means of modern machinery, fertilizers, and special tillage techniques. In this region settlers are not generally small-scale subsistence farmers, but investors who seek to assemble a substantial parcel of land and to take advantage of the low-cost loans advanced by the Banco do Brasil to buy mechanized equipment for growing rice and planting improved fodder grasses for cattle-raising.

The Xavante now go on trek for only a few weeks before the planting season. In the late 1960's they took up the growing of rice, which is now their major crop. Some Xavante families are growing a small surplus of rice for sale on local markets, and the men work occasionally for wages on nearby farms.

In 1972 the Pimentel Barbosa Xavante moved to the site of their present village, which they had occupied on at least two previous occasions. In the 1930's a group headed by Apowẽ's brother Pratsé had a village about 3 km to the northwest of the present village location. At that spot we picked up sherds of the pottery that the Xavante made before they acquired manufactured articles. From around 1950 to 1956 Apowẽ and his people had a village located about 1 km to the east of the present village. In 1976-77 the population of the village was around 250, living in 24 houses which were arranged in the traditional open-sided circle (see Figure 9).

The village was on cerrado land, about 200 meters from a watercourse. Xavante fields were cleared from the gallery forest along this stream, but some were already about an hour's walk away, as the land nearest the village went to fallow. In the 1976-77 agricultural season several families planted gardens on another stream some three hours' walk from the village and lived there until the harvest. They did this, they said, not only to get access to unused

Figure 9: Sketch Map of Village on Pimentel Barbosa Reservation



agricultural land, but also to keep an eye on the reservation boundaries, which were being encroached upon by the neighboring Brazilian ranchers.

When I arrived at Pimentel Barbosa most of the village houses were built in the traditional beehive shape, but during the year the older houses, as they were torn down, were replaced by rectangular pole and thatch houses resembling those of local Brazilians. A few weeks after my arrival, a house in this style was built for me in the village circle where I lived for the rest of my stay.

The focus of public activities, as in other Central Brazilian Indian villages, was the "plaza", the central area surrounded by the houses, where the men's council met twice daily and ceremonies were held. The plaza was also the soccer field, with its two ends bounded by goalposts.

The village was located on a height of land and commanded a broad view over the gallery forest to the scrublands beyond the stream and to distant rocky outcroppings. The Xavante called the site Tentiprepá (Large Red Hill) in reference to a flat-topped hill east of the village which glowed a dull red when it was lit by the setting sun on dry season evenings.

The open side of the broken circle of houses faced the stream. At the back of the houses was the airstrip, occasionally cleared of weeds by a community work party.

The buildings of the government Indian post were about 350 m away from the village. Only the Indian agent, Ismael Leitão, was regularly at the post during my stay. A schoolteacher and a medical aide, who were there when I arrived, left shortly after. The elementary school classes, conducted in Portuguese, which the teacher had begun to organize, dispersed, not to meet again during my stay. The medical aide was eventually replaced, after an interval of about nine months. The stock of drugs in the infirmary, a standard selection which is issued to all Indian posts, was chronically depleted of the more usually needed medicines, such as aspirin, oral antibiotics, and antimalarials, while there were plenty to treat ailments such as stomach ulcer and high blood pressure from which the Xavante do not yet suffer. Indians who became seriously ill were taken out, usually by light plane, to hospital in Goania.

The nearest Brazilian settlement was Matinha, about 40 km away along a dirt road passable at most times by truck. This settlement was a waystation on the frontier highway running from Barra do Gargas north to São Felix. Although transit on the highway was often interrupted during the rainy season by the collapse of log bridges, there was a more-or-less regular bus service, and heavy trucks lumbered through dust or mud, according to season, carrying cattle, and sacks of rice after the harvest.

Internal factionalism was much less apparent during my stay at Pimentel Barbosa than at the time of Maybury-Lewis's study. The leadership of the village was solidly in the control of Apowẽ, his eleven grown sons, and the eight grown sons of Apowẽ's dead brothers. Apowẽ, who was about 75 years old, was the only remaining male representative of his generation. He was formally "retired" -- that is he no longer painted for ceremonies nor sat in the daily men's council. But almost every afternoon several of his sons were to be found in Apowẽ's house, stretched out on sleeping mats, smoking and discussing the affairs of the village.

3.3 SOCIAL ORGANIZATION

3.3.1 Clan and Lineage

The Xavante have a patrilineal clan system. There are three non-localized clans, recognized in all Xavante villages: the Pereya'ono, the Ö Wawẽ and the Topdató. In 1958 Maybury-Lewis (1967:75) noted that was a difference between the Eastern and the Western Xavante in the clans that were considered exogamous: the Eastern Xavante held that a member of one clan could marry into either of the other two clans, while the Western Xavante divided the three clans into two exogamous moieties: the Pereya'ono in one moiety, and the Ö Wawẽ and the Topdató in the other. Each clan is represented in a given village by one or more lineages. Lineages are formally defined by common

patrilineal descent, but as Maybury-Lewis (1967:168-171, 187-189) found, lineages are also the corporate groups which form political alliances. An individual Xavante may change lineage affiliation, and therefore sometimes his identification with a given clan, when he associates himself with a given political faction.

At the time of my fieldwork the Xavante at Pimentel Barbosa had an effective moiety system, because there were no Topdató men in the village, and the remaining Topdató women were all married to Pereya'ono men. As a group, the Topdató were wiped out by Apowẽ's faction in the early 1960's (Maybury-Lewis 1967:176). Only the youngest of the Topdató Wahi brothers appears to have survived. He returned to the village, after years spent living and working on a Brazilian's farm, shortly before my arrival at Pimentel Barbosa. He married two girls from the household of Tridzandi, a Pereya'ono man who was friendly to the Topdató, and he declared that he belonged to the Ö Wawẽ clan.

Due to Apowẽ's ousting of other factions while the village was still located at São Domingos, the village was even more homogeneous in 1976 than it was at the time of Maybury-Lewis's research. It was dominated politically by the Wamãri lineage of the Pereya'ono clan. Members of this lineage were Apowẽ and his descendants and the descendants of Apowẽ's dead brothers. The Ö Wawẽ clan was represented by two lineages: the Uhö and the Dzutsi.

The exogamous clan system was still closely adhered to in marriage. I could identify only two "incestuous" marriages, that is between a man and a woman of the same clan. In one case a Wamãri man married a Wamãri woman after she divorced her Dzutsi husband. Several women pointed out to me censoriously that Prepi had married his sister. However, Maybury-Lewis's genealogy of São Domingos shows that the woman's father was a Topdató clansman who "went over" to the Wamãri some 20 years ago when Apowẽ was threatening the Topdató and who subsequently moved to another village (Maybury-Lewis 1967:173). The other "incestuous" marriage was between a Wamãri widow and a younger man who recently moved into the village. Although he identified himself as a Wamãri, he was extremely reticent about his background, and I could not establish any genealogical connection with Apowẽ's lineage. I suspected that he, too, might be an assimilated Topdató. It would appear that men may be more willing to admit to "incestuous" marriage than to connect themselves with a political outgroup.

3.3.2 Household Composition and Matrilocal Residence

The Xavante have a rule of matrilocal residence. A young man is expected to move into his wife's parents' household after the birth of their first child. At Pimentel Barbosa this rule was followed -- with but one exception -- when the wife's father was alive and resident in the village.

However, when the sons-in-law become the senior men of the household it is they who determine its lineage affiliation. At this point, they tend to move the position of their house in the village semi-circle to live closer to any brothers from whom they might have been separated by marriage. Such moves occurred three times during the year of my stay at Pimentel Barbosa.

The cumulation of such moves resulted in a rough segmentation of the village according to lineage (see Maybury-Lewis 1967:172-174). Apowẽ's house (no. 1) was at one end of the village horseshoe (see Figure 9). The houses (nos. 2, 3, 5) of several of Apowẽ's sons who were household heads adjoined Apowẽ's house. Three house moves while I was in the village brought brothers closer together. Warodi (no. 18), who had been living at an isolated spot near the airstrip, built a new house at one horn of the village. Soon after, his brother, Paheri, moved his house (no. 13) to a new location between Warodi's new house and house 23. After Tsidaneri's wife died as the result of a log-racing accident, he abandoned his house (no. 21), and moved, with his mother-in-law and his two small children (his father-in-law had died several years earlier) across the village, building his new house between those of his brothers (nos. 2 and 3). A block of three houses (nos. 8, 9, 10) was occupied by sons of Apowẽ's brothers and their families. The positions of Tsidzandi's house (no. 20) and those of

his brothers (nos. 16 and 22) suggested, although they were sons of another of Apowẽ's brothers, political separation from the rest of the Wamãri, for they were surrounded by houses (nos. 12, 15, 19) whose heads were Dzutsi. In 1962 Tsidzamdi joined the Dzutsi when they broke away from São Domingos and founded a village at Ö Iõ. They rejoined the main village two years later.

The Xavante are polygynous, but the incidence of polygyny has declined since 1958 (see Table 2). Most of the younger men who are married polygynously belong to the Ö Wawẽ clan. This is due to demographic imbalance between the two exogamous clans which I will discuss in a subsequent section.

TABLE 2
Polygyny in 1958 and in 1976

^a
POLYGyny IN 1958 AND IN 1976^b

	<u>MALE</u>									<u>FEMALE</u>							<u>BOTH SEXES</u>
	<u>N</u>	<u>M</u>	<u>P</u>	<u>T</u>	<u>F</u>	<u>W</u>	<u>D</u>	<u>U</u>	<u>Total</u>	<u>N</u>	<u>M</u>	<u>C</u>	<u>W</u>	<u>D</u>	<u>U</u>	<u>Total</u>	<u>Total</u>
1958	5	19	12	7	0	1	0	4	48	1	19	45	5	1	0	71	119
1976	19	34	10	0	1	0	1	0	65	6	34	24	7	1	0	72	137

- a. At São Domingos. Data from Maybury-Lewis (1967) genealogy and household census (adults only).
b. At Pimentel Barbosa. Census of all over age 10.

CODES

N Unmarried
M Monogamously married
P Man married to two wives
T Man married to three wives
F Man married to four wives
C Woman polygynously married
W Widowed
D Divorced
U Unknown

3.3.3 Age Sets and Age Grades

The Xavante have eight named age sets, spaced approximately five years apart (see Table 3). The Western Xavante use the same names for age sets as the Eastern Xavante do, but the sequence is slightly different. The age set system allows one to estimate the ages of adults, and also to place events in time. The Xavante themselves use this system, saying that such and such an event occurred when the Nodzö'u were in the bachelors' hut, or when the Atẽpá were Ritai'wa, that is, they were in the young men's age grade.

Young boys, approximately between the ages of 8 and 13 become Wapté. They leave their family households when the previous age set is initiated and go as a group to live in the hõ, or bachelors' hut: a house at one end of the village semi-circle and somewhat separated from the other houses (see Figure 9). They live there for the next five years or so, until the time comes when their age set is initiated and allowed to marry. The boys' mothers bring them cooked meals and they may visit their family households. At times they work in their family gardens. On one occasion the Wapté at Pimentel Barbosa went on a joint fishing trip, and distributed the catch among the older men. During the few weeks that the post school functioned they went to school.

TABLE 3

Table of Age Set Positions in 1958 and in 1976

<u>AGE SET POSITIONS IN 1958^a AND IN 1976^b</u>		
<u>1958</u>	<u>1976</u>	<u>AGE GRADE</u>
Nõdzõ'u Rada	Nõdzõ'u Rada	
Abari'u Rada	Abari'u Rada ^c	
S'daró	S'daró Rada ^c	
Anõrowa	Anõrowa Rada ^c	Predú (Mature Men)
Tõrã	Tõrã	
Al'riri	Al'riri	
Atẽpa	Atẽpa	
	Tirowa	
Tirowa	Nodzõ'u	Ritai'wa (Young Men)
	Abari'u	
Nodzõ'u	S'daró	Wapté (Batchelors)
Abari'u	Anorõwa	Watebramí (Children)

a. At São Domingos (Maybury-Lewis 1967:338).

b. At Pimentel Barbosa

c. There were no living malgrepresentatives of these age sets

But generally speaking the boys in the bachelors' hut have a carefree and idle life.

The girls of the same age set as the Wapté are not separated from their families, nor do they have the same restrictions on marriage. They will probably all be already married by the time the boys of their age set are initiated.

When I left Pimentel Barbosa in July of 1977 the series of ceremonies that would culminate in the initiation of the Šiaró age set was beginning. These ceremonies would succeed one another for about a year.

After their initiation the boys become Ritai'wa -- members of the young men's age grade which consists of the two youngest initiated age sets. At the time of my stay these age sets were the Abariu and the Nodzö'u. Both men and women of these two younger age sets make up teams which compete in loq races. The teams are not mixed: women race against women and men against men. The young men no longer hold their own council meetings, as they did at the time of Maybury-Lewis's fieldwork. They sit in the outer circle of the general men's council, but are expected not to speak.

The intermediate age grade consists of the men of the next two older age sets: in 1977 they were the Tirowá and the Atěpá. They are visible as a group only during the Wai'a ceremony when the men of this age grade "attack dance"

at the Ritai'wa. During another part of the ceremony they carry their weapons, rifles or bow and arrows, while the Ritai'wa carry down-tipped "baby arrows" symbolizing their potential for increasing the fertility of the group.

Men belonging to age sets older than the Atẽpá express their role as elders in the Wai'a ceremony by carrying the staffs on which they lean to speak in council. During the part of the Wai'a which takes place in a jungle clearing they sit and chant, beating time with rattles. With the exception of Apowẽ, who belonged to the Nodzö'u Rada age set, that is Nodzö'u of the previous age set cycle, the only older age sets that had living representatives among the men were the Airiri and the Tõrä.

However, some men of the Atẽpá, and even the Tirowá age sets were acknowledged community leaders, with the formal title of Idzu. All of them were men of Apowẽ's lineage. They were expected to discuss community affairs at the evening men's council with the other elders and to represent the community to outsiders.

3.4 GROUP FISSION AND RECOMBINATION

3.4.1 Social Antagonism and Village Splits

In his monograph on Xavante Society Maybury-Lewis (1967) stressed structural opposition between the age set system and the lineage system:

For the Shavants the age-sets represent an ideal of harmony whereas the clans represent the actuality of discord. If the social fission of the lineages triumphs in the end over the social fusion of the age-sets, then this is because the ideal cannot be realized (Maybury-Lewis 1967:164).

Maybury-Lewis found that there was a shift, as men grew older, from primary identification with their age set within the young men's age grade to primary identification with their lineage faction. Young men were relatively uninvolved in factional struggles, and it was safe for them to visit other villages, which they often did. Moreover, the young men as a group resented the material and sexual benefits enjoyed by the mature men. Because of polygyny the older men were married to women of the young men's age group, while the young men had to wait for their immature "brides" to grow up. The young men also complained that they came out on the short end of distributions of food or of manufactured goods, which were invariably held in the mature men's council. During the Wai'a ceremony the subordination of young men to older is stressed when youths have to endure without stirring or blinking the attack dancing of their elders.

When a young man marries, the structural opposition between old and young coincides with the opposition which often places the lineage of the young man entering the household of his wife's parents in conflict with the lineage of his wife's father. The young man has labor obligations

to hunt, plant, and housebuild for his wife's family. Most important, perhaps, as long as the wife's father lives he can attempt to control his son-in-law through his daughter. If the wife's father decides, perhaps because he belongs to the weaker of opposing factions, to leave the village and form or join another, he will try to take his daughter and her children with him. If he succeeds the son-in-law must also go, leaving behind the social support of his own lineage, or lose his wife and children, since a separation of this kind is tantamount to divorce. My conversations with women informants indicate that the wife is not merely a pawn but on occasion may resolve to remain with her husband, leaving her father's household where she has always lived. A split of this kind is described in the migration legend, when the Xavante women followed their fathers across the Araquaiá river, leaving their Xerente husbands behind. Their song to the porpoises expresses the nostalgia felt at parting.

Even when a village splits up into trekking groups anxiety may rise, since there is always the possibility that one or more of the trekking groups may not rejoin the village. Maybury-Lewis (1967:177) reported that the breakaway from São Domingos of a group that formed a separate village at Ö Tõ was preceded by that same group going on trek together. Giaccaria and Heide (1972:241-245) describe the re-integration rites that followed the return

of trekking groups to the base village to harvest their crops together. In 1976, when groups that left Pimentel Barbosa village for a short trekking season returned to the village several log races and soccer games were held in which the opposing teams were made up of "people who went on trek" and "people who stayed in the village."

The position of the headman (who is usually the leader of the dominant faction) is particularly delicate. His political support comes from the men of his lineage. But if antagonism builds up between the headman's lineage and others to the point where other lineage leaders leave the village they may take with them some young men of his own lineage. He then may find both the population of his village and the strength of his lineage diminished. A strong headman will try to hold his sons and the other young men of his lineage in the village, even if the fathers of their wives leave. A radical solution to this dilemma is to kill older men of the opposing factions, which leaves the young men free to remain in their paternal village while retaining their wives. This course was apparently taken on several occasions by Apowé and as a result his lineage dominates the village.

3.4.2 Conflict and Exogamy

In a recent paper Gross (1983) suggested that the internal conflict that is often cited as the primary reason for village splits and movements may be a mechanism that precipitates moves of which the underlying cause is resource depletion. In this case there would presumably be a gradual build-up over time of awareness that people were working harder to obtain a similar amount of food, which would result in increased discontent and tensions leading to quarrels (see Lee 1972b). Other environmental crises might, by increasing anxiety, have a similar effect. Such crises might be epidemics, external attacks, or natural disasters such as floods, drought, or earthquakes. In one instance cited by Giaccaria and Heide (1972:23 and 28) the plaza of a village was hit by lightning killing a number of men. The group then abandoned the village and attacked another one whose people they blamed for the disaster. Then they remained on the move and did not build a village for a year.

In many cases the Xavante accept illness, accident and death as natural events, and their occurrence does not lead to retaliation against others, but when tensions build up such events are likely to be blamed on individuals against whom resentments already exist, often through the medium of sorcery accusations.

Neel and Salzano (Neel and Salzano 1967

Salzano 1972; Salzano et al 1977) refer to the demographic and genetic consequences of the type of migration found all over lowland South America, by which a group connected by kinship breaks away from the main group but may then join another group. They call this the fission-fusion model:

At any one time, the bands into which populations of hunters and gatherers are subdivided may appear endogamous. However, as social tensions accumulate, a fission may take place. These fissions generally occur along kinship lines, leading to a highly non-random migration effect. The smaller product of this fission, numbering about 40-60 persons, may join another village, rejoin the original one after some time, or form a new village. Whenever a fusion of groups occurs, interbreeding between members of the original band happens. This behavior has important consequences. Instead of individuals, the unit of diffusion is a group of related individuals. Since these are nomadic populations, the geographic distances separating them at a given moment are not very important. And over a period of several generations there should be so much exchange between groups that the entire tribe should be considered as the breeding unit [Salzano 1972:235].

At the time of Maybury-Lewis's first fieldwork in 1958, São Domingos was already dominated by Apowẽ's lineage. Tensions within the group were probably increasing because of jealousy over the distribution of government gifts by the Indian agent. Apowẽ was the principal beneficiary of these gifts, which he in turn distributed, favoring his own lineage (Maybury-Lewis 1967:28). Around 1956 Apowẽ's group, which had been living at Tentiprepá in a village about 1 km to the east of the present village location, built a village

at São Domingos near the Indian post, apparently to secure more direct access to these handouts. I found evidence that they were already becoming dependent on manufactured goods when I walked around the area where the 1950's village was located. I picked up from the charred earth that marked the location of old fireplaces rusty wire from sieves and the battered remains of an aluminum pot, but no pieces of the pottery that the Xavante made before contact. Although for some years after 1956 Apowẽ's group spent most of their time at São Domingos or on trek, they traveled to Tenteprepá, a day's journey from São Domingos, to plant their crops (Maybury-Lewis 1967:48). Informants have told me that there was little good agricultural land near São Domingos. It appears that the Indians were exchanging access to food resources for access to goods provided by the post, but this did not benefit all segments of the group equally. The Indian agent also distributed manioc flour, and occasionally ordered a steer killed for the Indians. The distribution of these foods fell outside the formal system that governed game distribution -- rather such foods were "up for grabs." The older men in general and the men of Apowẽ's lineage in particular apparently received a share of these outside supplies that others considered inequitable. Maybury-Lewis reported that in the distribution of a steer

Men who were idzu often took a leading part in the killing and quartering of the animal, but they did so simply because they too wanted to be as near as possible to the source of supply, and their prestige enabled them to get closer than most.

Once they were in the thick of things, however, they acted for themselves and their closest kin... The chief's household thus invariably came off best; and, though care was taken that every household got some, and every child received at least a handful of meat or hide, the difference in the shares was such that some households would have meat sufficient for one or two days longer than others' portions would provide for [Maybury-Lewis 1967:202].

Again, the young men complained that the older men were getting more than their share of the manioc flour that Maybury-Lewis (1967:158) brought on trek as his contribution to the general food supply. Thus, even if resources were not objectively in short supply, people perceived them as being inequitably distributed within the group.

Apparently Apowẽ felt that he had sufficient support from his faction to react to discontent by eliminating the less powerful. Around 1956 Apowẽ carried out a purge of the Ö Wawẽ Dzutsi lineage when his brother died. The Wamãri killed eight men in one night, including the fathers of two of Apowẽ's daughters' husbands, and the son-in-law of Apowẽ's dead brother (Maybury-Lewis 1967:187-188).

During the next few years, as deaths from epidemic disease increased, violence also escalated. A group of Topdató Wahi brothers left with their families and went to the Cristalino river. A year or so later a remnant returned, but most of the group had died, including several Wamãri women who were married to the Wahi men and had gone

with them. An epidemic of influenza had swept through both São Domingos and the new village, so sickness was probably responsible for some of the deaths (Maybury-Lewis 1967:176), but could hardly account for the fact that all the Wahi brothers died, except for one who was a young boy at the time.

There was another split of São Domingos around 1960, when the leader of the Dzutsi lineage of the Ö Wawẽ clan led a disaffected group which included Tsridzamdi (Apowẽ's brother's son) to Ö Tõ. Several of Apowẽ's sons followed their wife's families to the new village. Others stayed and succeeded in keeping their Ö Wawẽ wives with them (Maybury-Lewis 1967:176). A number of people died at this time, as indicated by Maybury-Lewis's analysis of changes in household composition between 1958 and 1962 (Maybury-Lewis 1967: Appendix 4). Which were victims of violence and which of disease it is again difficult to say. After about two years most of the Ö Tõ group, including all of Apowẽ's sons, returned to Apowẽ's village, which by this time had moved to another location, while others went to the Salesian mission at São Marcos.

A short time before the Ö Tõ split a Xavante group which had been attracted to another government Indian post burned the post and left, after their headman Öribewẽ (a kinsman of Apowẽ) had been killed by men of a Xavante group at Areões.

Öribewẽ's group, now under the leadership of a man called Sebastião, joined Apowẽ's people at São Domingos, and together they attacked the mission which was sheltering the Areões group. A number of men were killed in these hostilities.

The result of these conflicts was to eliminate from Apowẽ's village all the male members of the Topdató clan, and to reduce the Õ Wawẽ to the point where they could no longer think of challenging the hegemony of Apowẽ's Wamãri lineage. Finally, around 1964 Apowẽ killed or drove away all but one member of the Tebe lineage of his own clan.

Apowẽ's Wamãri lineage completely dominated Pimentel Barbosa village in 1976. By comparing Maybury-Lewis's censuses and genealogies taken at São Domingos in 1958 and 1962 with the present composition of the village, the direction of change becomes very clear. Table 4 shows that 17 (74%) of the 23 Wamãri men who were at São Domingos in 1958 were still in the group in 1976, while only seven (28%) of the 25 men of other lineages were still present. The difference between Wamãri women and those of other lineages is less striking. Twelve (52%) of the 23 Wamãri women and 20 (42%) of the 48 women of other lineages were still present. It would appear that the Wamãri have been relatively successful in retaining both wives and sisters.

TABLE 4

Fate of Adults Present at São Domingos in 1958 by Clan and Lineage

	Pereys'ogo Clan				O'Nene' Clan				Topedat' Clan				Unknown		Total non-TV		Total			
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F				
Adult population at São Domingos in 1958	23	23	2	6	7	6	9	17	0	3	3	6	4	5	0	5	25	48	48	71
Died between 1958 and 1976	4	7	1	1	4	1	3	9	0	1	2	2	4	3	0	1	14	18	18	25
Moved between 1958 and 1976	2	1	1	1	0	0	0	1	0	0	1	0	0	0	0	1	2	3	4	4
Unknown what happened between 1958 and 1976	0	3	0	2	1	0	1	3	0	1	0	0	0	0	0	1	2	7	2	10
Living in present village in 1976	17	12	0	2	2	5	5	4	0	1	0	4	0	2	0	2	7	20	24	32

a. Data from Maybury-Lewis (1967), genealogy and household census.

CODE FOR LINEAGES

PU Pereys'ogo Unat'ri
 PT Pereys'ogo Tohe
 OU O'Nene' Unat'
 OD O'Nene' Deutal
 OF O'Nene' unknown
 TA Topedat' Alut'e' member
 TH Topedat' Unat'

FATE OF ADULTS PRESENT AT SÃO DOMINGOS IN 1958, BY CLAN AND LINEAGE

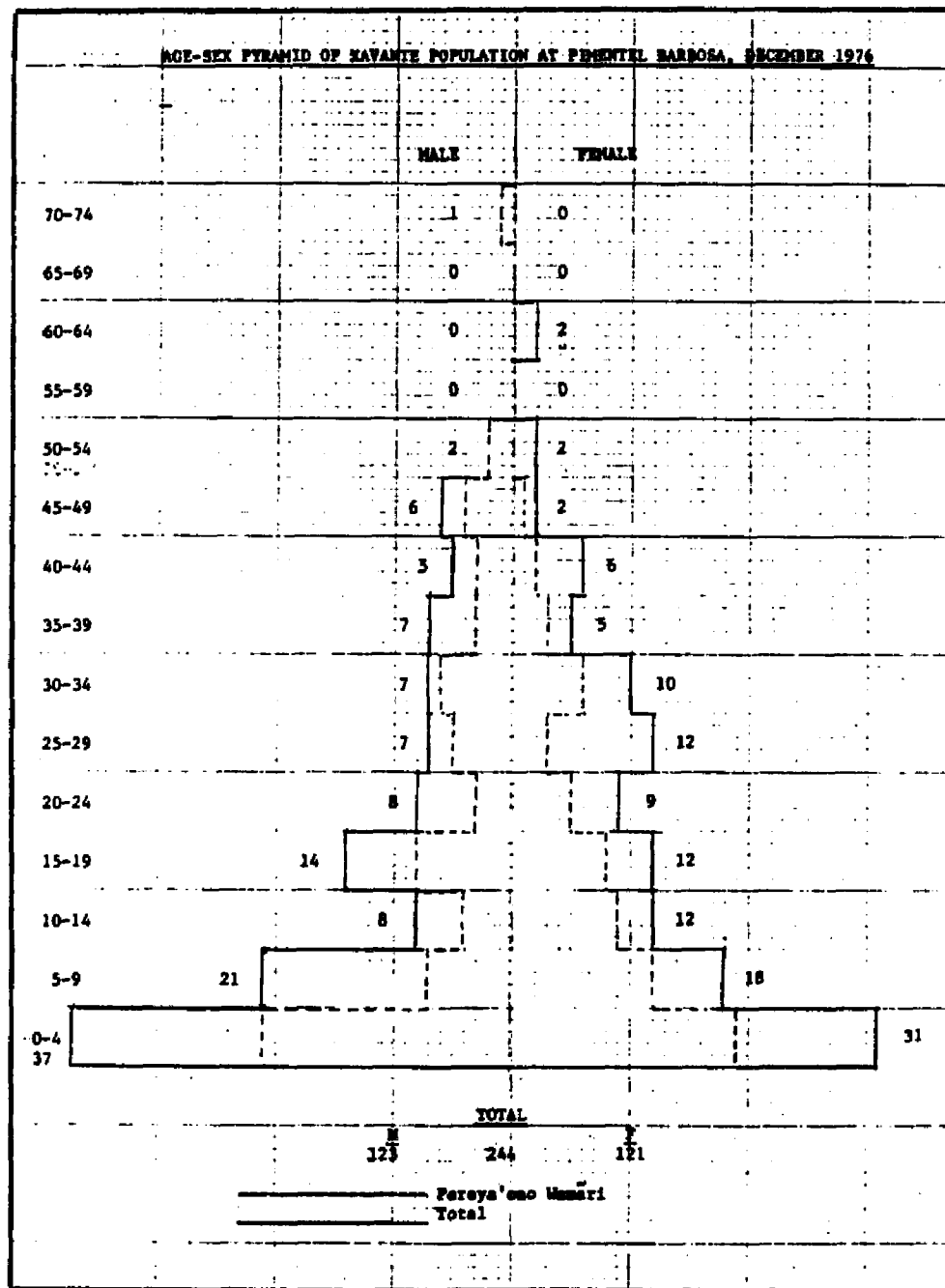
The homogeneity of the present village, however, is apparently due more to deaths than to out-migration. Most of the Wamãri who went to Ö Tõ rejoined the village. Only two Wamãri men present in 1958 are known to be living in another village (one of whom is a "converted" Topdato). Of the non-Wamãri men 14 (56%) of those who were at São Domingos in 1958 have died, while only four (17%) of the Wamari men have died. Thirty-eight percent of non-Wamãri women have died since 1958, and 30% of Wamãri women.

3.4.2.1 Dilemma of the Young Wamãri

As a result of his ruthlessness, Apowẽ succeeded in keeping most of the men of his lineage in his village. As Figure 10 shows, the population at Pimentel Barbosa in 1976 was heavily Wamãri, especially in the older age brackets. Of the 28 men over the age of 30, 19 were Wamãri.

For younger men a difficult situation was created by this imbalance between the clans (see Table 5). There were 11 young Wamãri men between the ages of 15 and 25 who were already initiated and therefore entitled to take wives which, according to Xavante rules of clan exogamy, they must find among the girls of the Ö Wawẽ clan. Only three of these young men had found wives. There were seven Ö Wawẽ girls between the ages of 10 and 20, but of these three were married to older men, one was betrothed to a young man who

Figure 10: Age Pyramid at Pimentel Barbosa in 1976,
Comparing Wamãri with Non-Wamãri



was away from the village, and only three were married to young men.

As Table 5 shows, for young men of the Ö Wawẽ clan, who according to the marriage rules take wives from the Pereya'ono clan, represented at Pimentel Barbosa by the Pereya'ono Wamãri, the situation was quite different. Of the nine young men between the ages of 15 and 25, seven were married, three of them polygynously. There were 17 Wamãri girls between the ages of 10 and 20, of whom 12 were married, eight of these as polygynous wives. Five of the young Ö Wawẽ men had moved to Pimentel Barbosa recently and married girls in the village.

The young Wamãri men were growing restive. They realized that they would have to wait a long time to marry. They were betrothed, but their future brides were still small girls. However, no young Wamãri had left the village to seek wives, and only two "incestuous" marriages (as defined by rules of clan exogamy) had taken place. Apowẽ's youngest son for a time considered marrying a Guaraní Indian girl, the daughter of the foreman on a neighboring ranch. He gave up the idea when the girl's parents said he must leave the village if he did so and be married by the Church. When the wife of another son of Apowẽ died after a log-racing accident, a young cousin of the wife of one of his brothers was brought from São Marcos to live in his brother's house. She was to marry the widower when she was old enough.

TABLE 5

Marital Status of Men and Women at Pimentel Barbosa by Age
and Lineage

MARITAL STATUS OF MEN AND WOMEN AT PIMENTEL BARBOSA IN 1976,
BY AGE AND LINEAGE

MEN (Initiated only)

	<u>N</u>	<u>M</u>	<u>P</u>	<u>T</u>	<u>F</u>	<u>W</u>	<u>D</u>	<u>Total</u>
<u>Pereya'ono Wamari</u>								
15-24	7	3	0	0	0	0	1	11
25+	0	20	4	0	0	0	0	24
<u>Other Lineages</u>								
15-24	2	4	3	0	0	0	0	9
25+	0	7	3	0	1	0	0	11

WOMEN

	<u>N</u>	<u>M</u>	<u>C</u>	<u>W</u>	<u>D</u>	<u>Total</u>
<u>Pereya'ono Wamari</u>						
10-19	5	4	8	0	0	17
20+	0	8	8	3	0	19
<u>Other Lineages</u>						
10-20	1	5	1	0	0	7
20+	0	17	7	4	1	29

CODES

N Unmarried
M Monogamously married
P Man married to two wives
T Man married to three wives
F Man married to four wives
C Woman polygynously married
W Widowed
D Divorced

The young Ō Wawē men were married to women at their fertility peak, and clearly were fathering more children than Wamāri men of their age. Thus it seemed clear that, if the exogamous moiety system did not break down, the numbers of the two clans would soon become more nearly equal.

3.4.3 Village Splits and Tribal Unity

It seems likely that the general effect of factional disputes, given an exogamous moiety system, is to increase village exogamy. When a village splits, the most numerous lineage is likely to remain, the weaker one to leave. If the men of the weaker lineage are killed, or forced to leave their daughters and sisters behind, those who are not already married will be married, often polygynously, to men of the dominant lineage. Therefore the dominant lineage will increase in numbers for a time. But, as we can see from the situation at Pimentel Barbosa this situation cannot last indefinitely. Eventually husbands must be found for the daughters, wives for the sons, and they can only be found in other villages.

It seems that the periodic imbalance between exogamous groups that results from the fission-fusion pattern of village movement must cause closer integration of villages through ties of kinship. Because the number of village splits probably increases at times of environmental stress

from resource depletion, external attacks, or epidemics, the integration of the intermarrying villages that make up a tribe may become closer at such times.

3.5 EFFECT OF CONTACT ON FERTILITY AND MORTALITY

3.5.1 Population Fluctuation in Small Groups

There has been a gradual increase in population throughout human history. This increase demonstrates the human capacity to live under many ecological conditions and to adapt to changing environments. However the greatest relative increase in human population took place after the Neolithic revolution. During the Pleistocene, prior to food production, population increase was apparently very slow (Neel 1973; Hassan 1975).

Neel (1973) suggested that, since the human species is such a successful reproducer, this slow growth rate was largely due to cultural mechanisms for controlling fertility:

I conclude, as has been suggested elsewhere, that perhaps the most significant of the many milestones in the transition from primate to man -- on a par with speech and toolmaking -- occurred when human social organization and parental care permitted the survival of a larger proportion of infants than the culture and economy could absorb in each generation and when population control, including abortion and infanticide, was therefore adopted as the only practical course available [Neel 1973:165-166].

Among cultural mechanisms for controlling fertility, preferential female infanticide has often been cited (Birdsell 1968, etc.).

However, others do not agree that, under most conditions, cultural controls on fertility would have been necessary to maintain a low growth rate in Pleistocene populations. Denham (1974), for example, pointed out that local groups might fluctuate considerably in number due to transitory conditions, and that a high rate of increase would allow them to recover rapidly from natural disasters, epidemic disease, and localized failure of food supplies:

Although the overall Pleistocene hunter-gatherer population may have been relatively stable in size and structure, it is likely that most of the small-scale semi-isolated reproductive populations (e.g. bands) which comprised the total population spent most of their time in conditions of population growth. Periodically the size of each group would be reduced sharply by some external factor and a cycle of prolonged growth and rapid decline would be repeated. Under these conditions, infanticide would not be necessary for maintaining overall population stasis even in the face of characteristically moderate to high growth rates for most bands most of the time.... [T]here is no reason to doubt that Pleistocene and modern bands, patrilineages and other small groups did die out occasionally and were replaced by parts of other groups that grew beyond their optimum size and fissioned. Infanticide would have been inappropriate in groups that were dying out, and groups that expanded sufficiently to replace the extinct bands would not have practiced infanticide or they would not have expanded so much [Denham 1974:193].

Hunting and gathering populations have been known to expand rapidly when migrating into uninhabited territory. Birdsell (1957), basing his calculations on population doubling every generation (16 years), estimated that the entire continent of Australia could have been peopled by a handful of migrants in a little over 2000 years (Birdsell 1957:65).

There seems little doubt, however, that some modern hunters and gatherers and swidden agriculturalists do employ infanticide and abortion as mechanisms of fertility control (Birdsell 1968; Balikci 1968; Chagnon et al. 1979).

Wagley (1973) suggested that when such controls are maintained inappropriately they may lead to group extinction. The Tapirapé, whom he cited as an example, had a population between 1000 and 1500 around 1900, just before they entered into intermittent contact with Brazilians. Their population decline after that was precipitous, due to introduced diseases. By 1957 only 55 Tapirapé remained. However, after that date their living conditions improved and they ceased to practice systematic infanticide. By 1976, 19 years later, the Tapirapé population had more than doubled, to 136 (Wagley 1977:45). Similarly, the Cashinahua in Peru suffered a severe influenza epidemic in 1951 which reduced their population to 96. However, between 1951 and 1966 there was a population rebound that more than doubled

their numbers in 15 years. Johnston et al. (1969) ascribe the large number of livebirths largely to a lowered abortion rate: "In recent years the Peruvian Cashinahua have come to feel that they can survive in the world, in contrast to their previous pessimistic outlook. Consequently their major medicine man has, since 1961, refused to dispense any contraceptive or abortive drugs, such as are commonly used in Amazonia and which (as we will show) have contributed to a high rate of abortion" (p.33). Howell (1979) showed that !Kung women living under hunting and gathering conditions had long intervals between pregnancies which led to low fertility. Since the !Kung did not practise infanticide, biocultural mechanisms were proposed to account for this low fertility. Howell (1979:190-211) cited Frisch's hypothesis that delay in regaining body fat during lactation could lead to a longer period of postpartum annovulation. Another hypothesis is that frequent nursing, by maintaining a high level of prolactin in the mother's bloodstream, could have a similar effect (Konner and Worthman 1980).

Biocultural mechanisms maintaining low fertility might have evolved among the !Kung population over a long period of time, but would not necessarily have done so in other hunting and gathering groups. Lee (1968) implies that the !Kung were in relatively stable balance with their food supply, perhaps because they were skillfully exploiting an environment that was so inappropriate for agriculture that,

until recently, other peoples did not compete for its resources.

Neither a slow rate of overall growth in the past nor the example of some modern hunters and gatherers should allow us to assume that a low and stable rate of population growth, however maintained, was characteristic of all hunting and gathering populations. Bates and Lees (1979) have pointed out that such measures as abortion and infanticide are under the control of individuals who are unlikely to practise them except to favor the life chances of living or anticipated offspring. The employment of such practices, therefore, is likely to vary opportunistically. The examples of the Tapirapé and the Cashinahua show that individuals can alter their reproductive strategies rapidly under changed conditions. Laughlin (1968:242) stated that Eskimo parents made deliberate reproductive choices based on the condition of the environment as they perceived it. Rose (1969:203-204) found that the Groote Eylandt Australians maintained a high birth rate except in times of drought. At these times infanticide was practiced, as the Aborigines felt that when times became better the women could bear children with better life chances.

The most frequent cause of population crashes in semi-isolated groups in more recent times, when they have come into contact and conflict with large societies, is epidemic

disease. A disease such as measles or smallpox that is highly contagious but confers immunity on those who have experienced it once, dies out in small communities until it is re-introduced (Black et al. 1974). Kunstadter (1972) suggested what the probable effect on a small semi-isolated population of introduced epidemic disease would be. Frequent epidemics would affect only the younger members of community, those who had not become immune in a previous epidemic. Infrequent epidemics, which would affect larger numbers of all age categories, would have a much more disruptive effect on the community.

Family and village structure would be disrupted, and children might die if their parents died, even though the children themselves might not be mortally infected. By contrast with the first model, some aspects of the demographic structure would be quite variable. During non-epidemic periods, the proportions of children in the population would grow rapidly. As this cohort reached reproductive years, the crude birth rate would increase and the population growth would accelerate. After the epidemic the "normal" age structure would be disrupted, the crude birth rate would drop, and the population growth would not accelerate until a new expanded cohort reached reproductive age [Kunstadter 1972:316].

The history of the Central Gê since early colonial times suggests that they must have experienced population fluctuations of this type. Epidemics of measles and smallpox were frequent in colonial Goiás, with high mortality among the settlers themselves (Cunha Mattos 1874:298-307; Paula Ribeiro 1841:311). Nomadic groups such

as the Central Gê may have survived these epidemics better than those dependent on agriculture, because when hit by an epidemic they consistently abandoned the aldeias and retreated to areas far from the whites. The apparent increase in numbers and aggressiveness of the Indians of Goiás after the abandonment of the aldeias, and the expansion of the Xavante after they migrated into Mato Grosso suggests rapid population growth during these periods. Local populations of the Central Gê have probably been fluctuating widely since the the time of first contact. Some have become extinct, or their remnants absorbed by other groups. At other times certain local groups expanded and budded off. This process would most closely resemble that which Denham (1974) hypothesized, and is probably characteristic of groups adjusting to unpredictable environmental changes.

3.5.2 Fertility and Mortality Changes in the Xavante

During my fieldwork in 1976-77 I took censuses, collected genealogies, and kept records of births and deaths. I also collected pregnancy histories from nearly all the women over the age of 10 at Pimentel Barbosa. Analysis of these data may help to indicate the direction of changes in fertility and mortality that occurred during and after contact.

The analysis is made more meaningful by comparing my data with the information provided by Maybury-Lewis's fieldwork in 1957-58, and the investigations of a team of scientists in 1962-64.

3.5.2.1 Previous Studies

In 1962 J. V. Neel, F. M. Salzano, P. C. Jungueira, F. Keiter, and D. Maybury-Lewis carried out genetic, epidemiological, and demographic studies at São Domingos. This was intended to be a pilot program "to test the methodology of such studies as well as employing the same team approach in much more extensive investigations along similar lines among these and other Gê-speaking tribes of the general area" (Neel et al. 1964). In 1963-64 further studies of the Xavante were carried out, this time in the communities at São Marcos and Simões Lopes (Salzano et al. 1967; Niswander et al. 1967; Weinstein et al 1967; Niswander 1967; Neel and Salzano 1967; Neel et al. 1968).

The intent of these Xavante studies was to investigate, while it might still be possible, a society in which the selective pressures and breeding structures were based on living in small groups and gaining subsistence largely from hunting and gathering -- conditions under which man is believed to have lived for most of his history. The investigators realized that the Xavante were already

somewhat acculturated -- otherwise it would have been impossible to work among them -- "...we do not present this group as 'untouched' but rather at about that stage of acculturation compatible with achieving our objectives" (Salzano et al. 1967:464).

In 1962-64 the investigators were impressed by the generally good physical and nutritional status of the Xavante. At the same time it was apparent that they were undergoing considerable stress from disease and cultural changes. In 1962 Maybury-Lewis (1967) remarked that a number of changes had taken place at São Domingos since his first fieldwork in 1958. In 1958 the São Domingos Xavante were "the most powerful, most numerous, and least acculturated of all the Downstream Xavante" (Maybury-Lewis 1967:27). Although they had built their village near the Indian post, the agent at that time had little control over the group. Any influence he had was through the headman Apowê, who claimed the lion's share of gifts which the agent was in charge of distributing. Most of the time the Xavante were still nomadic; when they spent a week or two at their base village it was to hold an important ceremony.

On his return to São Domingos in 1962, accompanied by the other scientists, Maybury-Lewis found that the population of São Domingos had declined, both from diseases and from a split in the group. People now wore clothing, and had

become much more dependent on the Indian post to provide them with manufactured goods which were important to their new life style. A number of the young men had visited Brazilian cities. People were planting more area in crops, including manioc which they had refused to plant before because they said that cultivating it would interfere with trekking. Perhaps most important, they had come to understand the power of the outside society: "...the Shavante had learned by now of their comparative impotence, and they were acutely conscious of their own dwindling numbers, a topic to which they returned again and again in conversation with me, who had known the village in the days when it was numerous and strong" (Maybury-Lewis 1967:29). An unusual number of deaths had occurred at São Domingos between 1958 and 1962, but it was not clear which of these could be attributed to disease and which to killings resulting from factional disputes (Maybury-Lewis 1967:175). Maybury-Lewis made the point that sorcery accusations following a death might provide the dominant faction (Apowẽ's lineage) with an excuse for eliminating members of opposing factions.

There was evidence in 1962-64, from the presence of antibodies to measles and whooping cough in all three villages studied (Neel et al. 1968), that the Xavante had already passed through epidemics of those diseases. The Indian agent at Simões Lopes kept birth and death records

from 1958 to 1963. In 1960 there was an epidemic of whooping cough followed by pneumonia, and in 1962 an epidemic of measles. According to the agent, of the 62 deaths that were recorded during the five years of record-keeping, 29 could be attributed to measles, 11 to whooping cough, and seven to pneumonia (Salzano et al. 1967).

Nevertheless, the investigators found that demographic data they had gathered indicated that the Xavante population was "replacing itself, this by virtue of an intermediate fertility and intermediate childhood mortality" (Neel et al. 1964:131). They suggested that this fertility and mortality pattern was that characteristic of nomadic hunter-gatherers, but in view of a recent rise in mortality to children of younger mothers, the death rate might be rising to the higher levels found in primitive agriculturalists in contact with western culture (Neel et al. 1964).

3.5.2.2 Age Distribution of Fertility and Mortality

A comparison of the age distribution of the communities at São Domingos, Simões Lopes, and São Marcos in 1962-64 (data from Salzano et al. 1967:471, table 2), with the age distribution at Pimentel Barbosa in 1976 (see Table 6) shows that a higher proportion of the population was in the 0-14 age bracket in 1976 than in 1962-64; while in 1976 there were relatively fewer men and women in the 15-30 age bracket

than in 1962-64. On the face of it, this might indicate that fertility and childhood mortality had risen simultaneously, so that while more children are being born, more are dying before reaching reproductive age. But this age distribution is the result of the cumulation of varying fertility and mortality rates over time. It does not tell us whether fertility and mortality changed at the same or at different times.

If we compare the number of livebirths per married woman in the villages studied in 1962-64 (data from Salzano et al. 1967:477, table 5) with livebirths per woman at Pimentel Barbosa in 1976 (see Table 7) we find that the most striking difference is in the higher number of children born at Pimentel Barbosa to women in the 20-29 age bracket as of 1976. To women of this age 4.5 children had been born per woman, as compared to an average of 2.8 children per woman in the same age bracket in 1962-64. It would appear that births to younger women have risen sharply.

By comparing the number of livebirths with surviving children at São Domingos in 1962 and at Pimentel Barbosa in 1976, a clearer pattern emerges (see Table 8). The highest rates of loss of children at Pimentel Barbosa are to women between the ages of 30 and 49 -- more than half the children born to them have died. These women were 15 years younger in 1962 -- that is they were 15 to 34 years old -- and at

TABLE 6

Age and Sex Distribution in Xavante Villages in 1962-64 and
in 1976

AGE AND SEX STRUCTURE IN XAVANTE VILLAGES IN 1962-64 AND IN 1976

	<u>0-14</u>	<u>15-30</u>	<u>31+</u>	<u>Unknown</u>	<u>Total</u>
<u>Simões Lopes</u>					
<u>1964</u>					
Male	60	41	16	7	124
Female	39	43	15	5	102
Total	99 (43.8%)	84 (37.2%)	31 (13.7%)	12 (5.3%)	226
Sex ratio	153.8	95.3	106.7	140.0	121.6
<u>São Marcos</u>					
<u>1964</u>					
Male	83	54	39	42	218
Female	61	53	42	18	174
Total	144 (36.7)	107 (27.3)	81 (20.7)	60 (15.3)	392
Sex ratio	136.1	101.9	92.9	233.2	125.3
<u>São Domingos</u>					
<u>1962</u>					
Male	29	35	3	17	84
Female	39	31	8	16	94
Total	68 (38.2%)	66 (37.1%)	11 (6.2%)	33 (18.5%)	178
Sex ratio	74.4	112.9	37.5	106.3	89.4
<u>Pimentel Barbosa</u>					
<u>1976</u>					
	<u>0-14</u>	<u>15-29</u>	<u>30+</u>		<u>Total</u>
Male	66	29	28		123
Female	61	33	27		121
Total	127 (52.1%)	62 (25.4%)	55 (22.5%)		244
Sex ratio	108.2	87.9	103.7		106.6

a. 1962-1964 data from Salzano et al. 1967:141.

TABLE 7

Livebirths per Woman, by Age of Woman, in 1962-64 and in 1976

LIVEBIRTHS PER WOMAN OVER FIFTEEN, BY AGE, IN 1962-64 AND IN 1976

	<u>15-19</u>	<u>20-29</u>	<u>30-39</u>	<u>40-49</u>	<u>50-59</u>	<u>60+</u>	<u>All ages</u>
<u>São Marcos, 1964</u>							
N of women	10	32	15	15	7	0	79
Mean N livebirths	1.1	2.2	3.3	5.2	6.3	0	3.2
<u>Simões Lopes, 1964</u>							
N of women	19	22	12	5	2	0	60
Mean N livebirths	0.9	2.9	4.6	5.8	5.0	0	2.9
<u>São Domingos, 1962</u>							
N of women	14	9	2	4	1	1	31
Mean N livebirths	1.2	2.8	8.5	7.0	8.0	1.0	3.1
<u>Pimentel Barbosa, 1976</u>							
N of women	12	20	15	8	2	2	59
Mean N livebirths	1.4	4.5	5.5	6.5	5.5	9.5	4.6

a. Data for 1962-64 from Salzano et al., 1967:477.

that time the highest rates of infant and child deaths were to women in the 15-29 age bracket. It was this observation that prompted the comment in Neel et al. (1964:95) that infant mortality rates appeared to be rising. By 1976 at Pimentel Barbosa the situation was reversed: the younger women (15 to 29) were not only giving birth to more children than were women in the same age bracket at São Domingos in 1962, a greater proportion of their children had also survived.

A breakdown of deaths of children born to mothers at Pimentel Barbosa by age of mother and age of child at death shows that the women in their middle years have lost many children that were not babies (see Table 9).

Women who are now 30 to 50 years old have lost 20 children, 27% of the total that died, between the ages of five and 14. Only 13% of the deaths of children born to younger women were over the age of five. Of course, since these younger women have younger children, some of them may yet die before reaching reproductive age. Women who are now over the age of 50, and would therefore have been over 35 in 1962 have lost relatively few children. However, the sample is very small since there are only four women in this class. Of the 30 children born to these women only one died between the ages of five and 15. It has often been pointed out that older women are likely to forget the births of children that died very small (Bogue and Bogue 1971:9-10), but since many

TABLE A

Surviving Children by Age of Woman in 1962-64 and in 1976^aSURVIVING CHILDREN BY AGE OF WOMAN IN 1962 AND IN 1976

	<u>15-19</u>	<u>20-29</u>	<u>30-39</u>	<u>40-49</u>	<u>50-59</u>	<u>60+</u>	<u>All ages</u>
<u>São Domingos, 1962</u>							
N of women	12	9	2	4	1	1	29
Average N surviving offspring	0.7	1.8	7.5	4.8	8.0	0	2.3
Decrease as % of livebirths	41.7	35.7	11.8	31.4	—	100.0	25.8
<u>Pimentel Barbosa, 1976</u>							
N of women	12	20	15	8	2	2	59
Average N surviving offspring	0.9	3.3	2.8	2.4	4.0	7.0	2.7
Decrease as % of livebirths	35.7	26.7	49.1	63.1	27.3	26.3	41.3

a. Data for 1962 from Salzano et al., 1967:481

TABLE 9

Deaths of Children Born to Women at Pimentel Barbosa by Age
Of Child at Death

**DEATHS OF CHILDREN BORN TO WOMEN AT PIMENTEL BARBOSA
BY AGE OF CHILD AT DEATH AND BY AGE OF MOTHER**

<u>Woman's Age</u>	<u>N of Women</u>	<u>N Livebirths</u>	<u>N Surviving</u>	<u>Age of Child at Death</u>				
				<u>Birth- 1 mo.</u>	<u>1-11 mo.</u>	<u>1-4 yr.</u>	<u>5-14 yr.</u>	<u>15+ yr.</u>
15-19	12	17	11	1	2	3	0	0
20-29	20	90	66	6	6	8	4	0
30-39	15	83	42	2	12	16	11	0
40-49	8	52	19	0	12	8	9	4
50-59	2	11	8	0	0	2	0	1
60+	2	19	14	0	0	1	1	3

a. As of December, 1976.

of the children of these women are living and present in the village, the survival of a larger number of their children (a mean of 7.0 per woman) than for those of younger women can be demonstrated. The information gathered at São Domingos in 1962 also indicated that fewer children of the oldest women in the village at that time had died.

There are further indications that childhood mortality among this Xavante group has declined, though not necessarily infant mortality. The Indian agent at Pimentel Barbosa began keeping systematic birth and death records in November, 1974, which I continued during my stay in the village. In the 33-month period covered by these records there were 23 deaths. Three of these were of adults, and five were of children between the ages of one and 15. Two of these deaths were the result of accidents. Sixty-two babies were born, and 15 died in the first year of life, which indicates that the infant mortality rate is relatively high at 242 per 1000. All but two of the infant deaths occurred under the age of six months, an age up to which all the babies I observed -- including those that died -- appeared to be growing and gaining weight well (see Table 10). Most of the infant deaths that I witnessed followed a short respiratory illness that culminated in pneumonia. This pattern appears to be quite different from that in many developing countries, where the death rate is highest among toddlers, and is associated with malnutrition which becomes

evident at the time of weaning (see, for example, Malcolm 1970; Eveleth and Tanner 1976:243; Jelliffe 1968; Kunstadter 1972:325).

3.5.2.3 Changes in Disease Patterns

The health picture among the Xavante has changed since 1962. The Xavante still give an impression of fine physique and muscular strength, especially the young men and women. There have apparently been no epidemics of measles or whooping cough in recent years -- at least since the village moved to its present site in 1972. There were several cases of what appeared to be mumps while I was in the village, and in two cases adult men were affected. There are two young men in the village, now about 18 years old, who have partial paralysis from polio contracted when they were young children. During the dry season, when the days are hot but the temperature at night may drop to under 40° F, people suffer constantly from colds, coughs, and fevers, which may lead to pneumonia, especially in the very young and in the elderly. There were several cases of fevers that appeared to be malarial as they improved after medication with anti-malarial drugs. One adult death was due to Brazilian pemphigus, a disease with a usually fatal outcome (Weinstein et al. 1967:538), and there were at least three other people affected.

TABLE 10

Deaths of Children 0-24 months, 1974 to 1977

Deaths of Children Age 0-24 Months, By Age at Death (November 1974-July 1977)*																								
Months																								
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Weeks																								
0	1	2	3																					
F																								
M	M	M	F												M		F							
M		M	M																					
M			M																					
F																								

* M is male; F is female.

The most serious health problem now at Pimentel Barbosa is tuberculosis, which often strikes young adults who seem to be strong and well-nourished. This disease has apparently appeared recently as there was only one positive reaction to the tuberculin tests made in Xavante villages in 1962-64 (Neel et al. 1968). Black et al. (1974:242) stated that: "Tuberculosis probably represents the most serious immediate threat to the survival of the Indian tribes. The increasing prevalence of positive tuberculin reactions and the fact that the highest rates are found in the teen-age group suggest that this is an infection which has not yet established an equilibrium with its host."

3.5.2.4 Changes in Mortality Patterns

In order to analyze fertility and mortality over the time covered by the pregnancy histories that I collected, I considered three periods separately: pre-contact, contact, and post contact. Pre-contact was defined as before 1957. Although the Xavante had already been pacified for about 10 years at that time, contacts with the outside increased after 1956. From around 1950 to 1956 Apowe's group lived at the same site that they occupy today. Then they built a village near the post at São Domingos, on the Rio das Mortes. There were a number of Brazilians working at the post, which also received frequent outside visitors, so it can be assumed that the Xavante were exposed to more

frequent contacts with potential carriers of disease. Maybury-Lewis does not mention an unusual amount of illness in 1957-58, but when he returned in 1962 he found evidence that an epidemic was partly responsible for depleting the population of Apowẽ's village (Maybury-Lewis 1967:28, 176). On the other hand it cannot be assumed that isolation had completely protected the Xavante from introduced diseases prior to this time. They were aware of the danger of contagion from Brazilians, and feared the Karajá as bearers of disease, which supports the idea that epidemics may be carried to uncontacted communities through a group that is in contact.

The next 15 years, from 1957 to 1971, I consider the period of contact, since reports of epidemic illnesses are more frequent during these years. In 1963 or 1964 Apowẽ's group moved the village to another site on the Rio das Mortes some distance from São Domingos. Some people who had gone to Ö Tõ in 1960 (Maybury-Lewis 1967:176-178) re-joined Apowẽ's village around this time. The Xavante themselves talk of the many deaths that took place both during and after this village split.

Apowẽ's group moved to its present location in 1971. I consider the five years from 1972 to 1977 as post-contact, because the diseases that now seem to be the greatest threats are pemphigus, which is endemic, and tuberculosis,

which has become endemic. These diseases mostly affect adults. Even if there were another epidemic of measles or whooping cough, the effect would probably not be as disruptive as earlier ones, since many adults are already immune, and would be able to care for the young children (see Neel et al. 1970).

Tables 11 to 13 show survival rates to age 10 of the 271 children born to the 71 women interviewed. Three periods are considered: pre-contact (before 1956), contact (1957-1971), and post-contact (1972-1976). For a detailed description of how these tables were derived, see Appendix.

For Table 11, covering the pre-contact period, only the births and deaths that occurred before 1957 are considered. The bottom line of the l_x column indicates the probability of surviving to age 10, given the mortality rate derived from the data. In the pre-contact period, 802 children out of a cohort of 1000 would be expected to survive to that age.

For the contact period we consider all the children born up to 1972 that did not die before 1957 or after 1971. Therefore this table indicates the percent of children that survived to age 10 during the years 1957 through 1971. The death of a child born in 1950 that died in 1958 at age eight would be recorded in this table. Only 597 out of 1000 children would be expected to survive to age 10 during this period.

TABLE 11
Life Table in Pre-Contact Period

LIFE TABLE (PARTIAL) IN PRE-CONTACT PERIOD: 1942-1956

Age	N of Persons		Subtotal	Deaths	Surviving	Percent Survival	Life Table Functions		
	Entering Interval	Still in Interval					q x	l x	d x
0	58	5	53	3	50	94.3	.057	1000	57
1	50	2	48	1	47	97.9	.021	943	20
2	47	5	42	2	40	95.2	.048	923	44
3	40	2	38	1	37	97.4	.026	879	23
4	37	3	34	0	34	100.0	0	856	0
5	34	2	32	2	30	93.8	.063	856	54
6	30	1	29	0	29	100.0	0	802	0
7	29	3	26	0	26	100.0	0	802	0
8	26	3	23	0	23	100.0	0	802	0
9	23	1	22	0	22	100.0	0	802	0
	22							802	

TABLE 12
Life Table in Contact Period

LIFE TABLE (PARTIAL) IN CONTACT PERIOD: 1957-1971

Age	N of Persons			Deaths	Surviving Interval	Percent Survival	Life Table Functions		
	Entering Interval	Still in Interval	Subtotal				q x	l x	d x
0	174	5	169	24	145	85.8	.142	1000	142
1	145	8	137	3	134	97.8	.022	858	19
2	134	14	120	8	112	93.3	.067	839	56
3	112	5	107	4	103	96.3	.037	783	29
4	103	8	95	4	91	95.8	.042	754	32
5	91	6	85	5	80	94.1	.059	722	43
6	80	3	77	6	71	92.2	.078	679	53
7	71	4	67	2	65	97.0	.030	626	19
8	65	5	60	1	59	98.3	.017	607	10
9	59	4	55	0	55	100.0	0	597	0
10	55							597	

In Table 13, covering the recent "post-contact" period (1972-1976), I include all the children that were born through 1976 and that did not die prior to 1972. The pattern of survival through each age looks very similar to the pre-contact period, but the percent that would survive to age 10 is somewhat higher, at 850 out of 1000.

These tables clearly indicate that childhood deaths rose sharply during the contact period, but now appear to be dropping to a level that prevailed before the epidemics of introduced diseases.

A question is often raised regarding the prevalence of infanticide in Amazonian societies. In a number of them it was apparently a not uncommon practice (Wagley 1973, 1977; Chaqnon et al. 1979; Divale and Harris 1976). According to some, preferential female infanticide can be inferred from an unusually high sex ratio in the youngest age brackets. The sex ratio of Xavante communities in the 0-14 age bracket in 1962-64 varied widely from 74.4 to 153.8 (see Table 6), so if infanticide was practiced its direction cannot be inferred. The investigators at that time found nothing else to suggest that the Xavante practiced infanticide.

Infanticide is not likely to be openly reported by Xavante women, as they are aware that it is not approved of by outsiders. One woman told me that formerly it was not customary to keep both of a pair of twins born. From 1975

TABLE 13
Life Table in Post-Contact Period

LIFE TABLE (PARTIAL) IN RECENT PERIOD: 1971-1976

Age	N of Persons		Subtotal	Deaths	Surviving Interval	Percent Survival	Life Table Functions		
	Entering Interval	Still in Interval					q x	l x	d x
0	192	19	173	7	166	95.9	.041	1000	41
1	166	18	148	3	145	98.0	.020	959	19
2	145	12	133	3	130	97.7	.023	940	22
3	130	11	119	1	118	99.2	.008	918	7
4	118	15	103	1	102	99.0	.010	911	9
5	102	5	97	0	97	100.0	0	902	0
6	97	4	93	3	90	96.8	.032	902	29
7	90	13	77	1	76	98.7	.013	873	11
8	76	4	72	1	71	98.6	.014	862	12
9	71	6	65	0	65	100.0	0	850	0
10	65							850	

to 1977 three births of twins were recorded at Pimentel Barbosa. In each of these cases the twins were raised, although in two instances one of the pair died later.

Sex-preferential infanticide might show up in pregnancy histories in several different ways (see table 14): If a markedly greater number of stillbirths were reported for one sex than for the other this could indicate that children killed at birth were reported as stillbirths. Xavante women reported seven male stillbirths, four female, and 10 of unknown sex. A greater number of livebirths reported to be of one sex might indicate that infants of the other sex were being killed at birth and not reported. For recent births the sex ratio at birth is 119, which is not particularly high considering the influence of random variation in a population of this size. For pre-contact births the sex ratio is 81. For births that took place during the contact period the sex ratio does seem unusually high, at 126. Another way in which deaths by infanticide might show up is if they were reported as deaths in the first few days of life. Seven boys and four girls have died under one month of age, but the numbers are small.

3.5.2.5 Changes in Fertility

Table 15 shows age-specific fertility rates for women ages 10 through 44 for the three time periods, and Figure 11

TABLE 1a

Deaths of Children at Different Periods by Age at Death and by Sex

DEATHS OF CHILDREN AT DIFFERENT PERIODS BY AGE AT DEATH AND BY SEX																		
DATES	WOMAN/ YEARS	STILLBIRTHS		LIVEBIRTHS		DEATHS		AGE OF CHILD AT DEATH										
		M	F	M	F	M	F	Birth- 1 mo.		1-11 mo.		1-4 yr.		5-14 yr.		15+ yr.		
Recent (1972-1977)	344	2	0	4	51	43	21	14	4	2	8	2	4	6	5	1	0	3
Contact (1957-1971)	628	5	3	4	72	57	33	34	3	2	9	10	10	10	8	11	3	1
Pre-Contact (before 1957)	298	0	1	2	26	32	6	7	0	0	1	2	3	3	1	1	1	1
Total	1270	7	4	10	149	132	60	55	7	4	18	14	17	19	14	12	4	5

DEATHS OF CHILDREN AT DIFFERENT PERIODS
BY AGE AT DEATH AND BY SEX

displays the same data graphically. Methods of calculation are derived from Bogue and Bogue (1970) (for details of methodology see Appendix). An early start to childbearing is indicated. While age at birth of the first child is difficult to estimate for older women, judging by the younger women childbearing begins at ages 14-15. Black et al. (1978) recorded births to girls in their 14th year. I extended the table only to age 44 because I found no women who had borne a child after that age. I found no primary sterility among Xavante women. Every woman over the age of 17 had had at least one child.

The age-specific pattern of fertility is markedly different for the three periods considered. During the recent period the age-specific fertility rate rises quickly to .444 for women in the 15-19 age bracket, and remains high until 30, when it drops quite abruptly. During the contact period fertility peaked at ages 15-19, but then fell off rapidly and was lower for each succeeding age bracket. Before the period of contact, fertility was lower between 15 and 19 than at later periods, but then rose slightly to age 30. The graph shows an unexpected peak at 30-35, but this is probably an artifact due to small sample size, since there are only two women in the village old enough to report on their later fertility before 1957. It does seem probable, however, that in the pre-contact period fertility was more evenly distributed over reproductive life than it was later.

TABLE 15

Age Specific Fertility Rates of Women at Pimentel Barbosa at Different Periods

	10-14		15-19		20-24		25-29		30-34		35-39		40-44		TOTALS	
	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR	W/Y	B ASFR
1977	5.5	0.0	6.5	2.308	5	1.000	5	0.0	4	1.250	5	1.200	2	0.0	33	9.273
1975-1976	25	0.0	26	14.583	17	9.529	21	9.429	21	5.238	10	4.400	11	1.091	129	42.326
1972-1974	45	1.022	28	10.357	24	9.375	34	14.412	28	5.179	11	1.091	12	4.333	182	44.262
Total for Recent 1972-1977	75.5	1.013	50.5	26.444	46	23.500	60	23.500	53	11.208	26	6.231	25	5.200	344	95.276
1967-1971	52	1.019	41	13.317	55	13.236	49	13.265	21	4.190	23	4.174	12	0.0	253	48.190
1962-1966	41	4.098	55	21.382	49	11.225	21	6.286	23	4.174	12	1.083	6	0.0	207	47.227
1957-1961	55	2.036	49	19.386	21	7.333	23	3.130	12	1.083	6	1.167	2	1.500	168	34.202
Total for Contract 1957-1971	148	7.067	145	53.366	125	31.248	93	22.237	56	9.161	41	6.146	20	1.050	628	129.205
1952-1956	49	1.020	21	7.333	23	7.304	12	2.167	6	1.167	2	0.0	8	1.125	121	19.157
1947-1951	21	1.048	23	5.217	12	3.250	6	3.500	2	2.000	8	1.125	0	0.0	72	15.208
1942-1947	23	1.044	12	4.333	6	2.333	2	1.500	8	4.500	0	0.0	0	0.0	51	12.235
Total for Pre-Contract 1942-1956	93	3.032	56	16.286	41	12.293	20	6.300	16	7.438	10	1.100	8	1.125	244	46.189
Overall Total	316.5	11.035	259.5	95.366	212	66.311	173	51.294	125	27.216	77	13.169	53	7.132	1216	270.222
															270	7.615

W/Y = Women/years

B = Babies

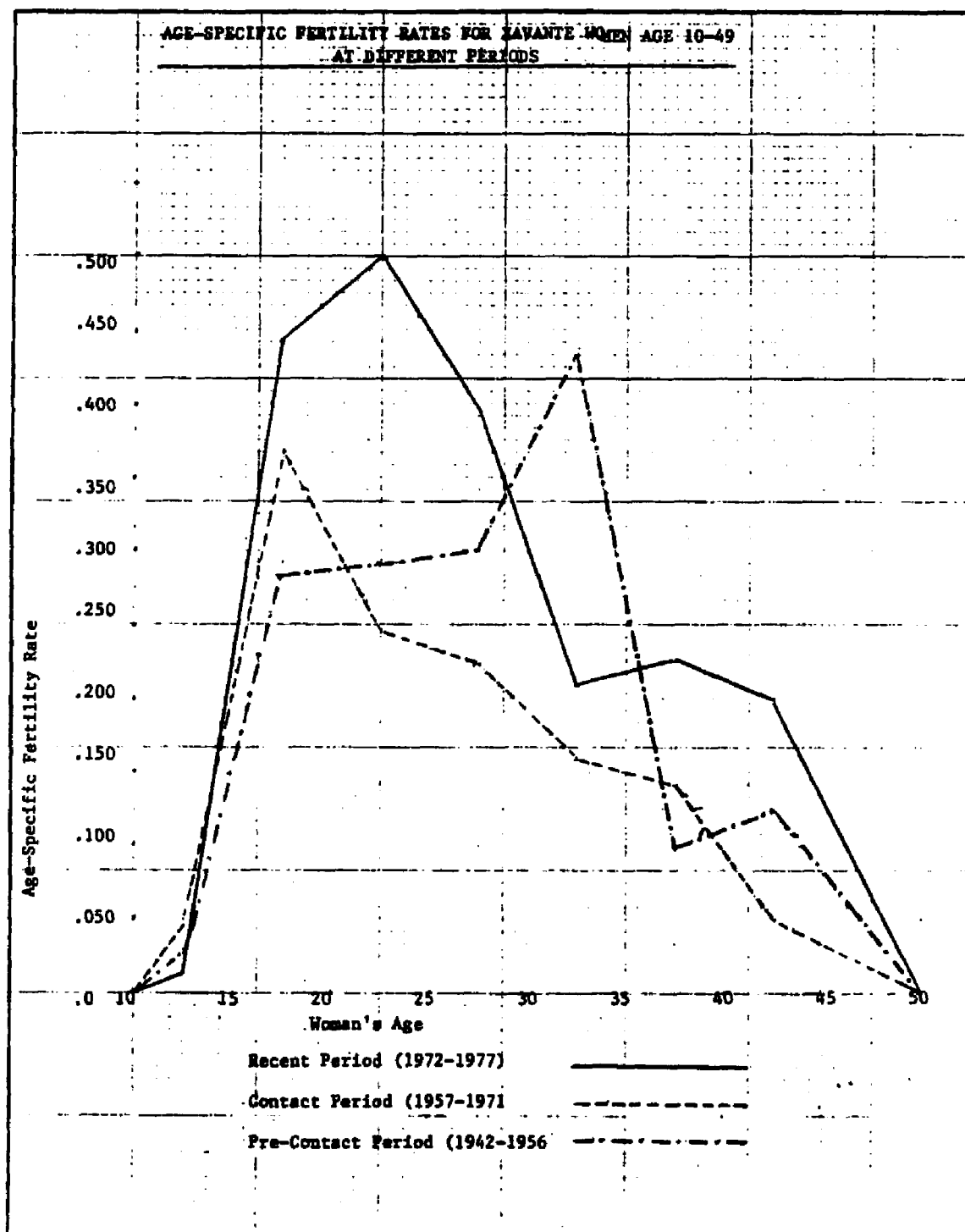
ASFR = Age Specific Fertility Rate^a

GFR = General Fertility Rate

TFR = Total Fertility Rate

^a For explanation of the above terms see appendix.AGE-SPECIFIC FERTILITY RATES FOR YOUNG WOMEN AGE 10-44
AT DIFFERENT PERIODS

Figure 11: Age Specific Fertility Rates of Xavante Women at Different Periods



It was not possible to obtain data on the rate of abortion, either induced or spontaneous, among Xavante women. Induced abortion was not admitted to by any of the women. The frequency of spontaneous early abortion could not be estimated, as it was apparently not distinguished from a menstrual period. Like Kayapó women (Black et al. 1978; Werner ms.b), Xavante women did not perceive menstruation as a normal regularly-occurring phenomenon. While they know that it occurs among women who have not had a baby for some time, they apparently consider it pathological. A FUNAI medical attendant who had had experience in several Xavante villages told me that women often came to her infirmary to ask for medicine to "stop the bleeding." Harrell (1981) has shown that menstruation may be a relatively rare occurrence among women who lactate for long periods. Xavante women lactate almost continuously throughout their reproductive lives, sometimes sharing the breast between a new baby and the previous child (see also Black et al 1978:123). Harrell has also shown that the longer lactation lasts, the longer the period of post-partum amenorrhea and anovulation is likely to be. Also, as lactation is prolonged it becomes more likely that ovulation -- and possibly pregnancy -- will precede the first menstrual period.

The Xavante have a normative post-partum sex taboo. They say that a baby should be walking before another one is

started. The interval should be longer if the baby is a girl, as girls are "softer." It is not clear, however, whether the effect of this taboo is to actually lengthen the birth interval, which is about what would be expected biologically, given extended lactation. During the 33 months of accurate record-keeping, 42 of the 65 women between the ages of 15 and 44 gave birth at least once (not counting stillbirths.) Fourteen women gave birth twice, and one woman a third time. The mean birth interval for women whose babies lived at least a year was 20.9 months, For women whose babies died it was 16.6 months.

3.6 SUMMARY AND DISCUSSION

It appears that at present the Xavante are going through a period of recovery and stabilization, following the shock and disruption of contact. During that time, death both from disease and from violence was very high, and fertility fell.

The disruption caused by contact had multiple effects: Villages were relocated as groups moved to gain the protection of Indian posts and missions following attacks by colonists (Giaccaria and Heide 1972:25-26; Maybury-Lewis 1967:19), to get nearer to the source of government and mission handouts (Maybury-Lewis 1967:15-27), or were forcibly relocated (Maybury-Lewis 1974, preface). Almost

immediately after these moves, which exposed them to outsiders, these groups became the victims of epidemic diseases. Since the new villages were not located in relation to agricultural land or wild resources, the food supply was affected, increasing their dependency. Tensions rose with the increased number of deaths and with jealousy over the distribution of food and other goods by Indian agents and missionaries.

It is not easy to sort out deaths by violence from those by disease, especially since the Xavante at Pimentel Barbosa were reluctant to talk about the former. It is clear, however, from the disappearance of so many men belonging to the smaller lineages, that some of them must have been killed by Apowẽ's faction.

Fertility dropped sharply during the period of contact, especially among older women, but it has recently risen, and is now considerably higher than it was during the pre-contact period. Whether this recent fertility increase, which is especially marked in younger women, will continue, remains to be seen. Nor is it clear how much is due to the "rebound effect" that has been noted in other groups that are recovering from decimation of their population.

Why did fertility drop so abruptly during the contact period, especially among older women? Harrell (1982) suggests that both male and female fertility may be affected

by psychological stress. There is evidence that some groups suppress increase through abortion and infanticide when they feel that the chances for survival of offspring are poor. While women at Pimentel Barbosa did not admit to practising infanticide or induced abortion, one woman told me that that after their first three children died when half grown, she and her husband decided to have no more children. She implied that they ceased to have intercourse. They reversed this decision five years later, and now have three living children. Fertility during the contact period may also have been affected by an increase in male deaths through violence, leaving women without husbands for varying lengths of time.

At the same time the imbalance between the two exogamous moieties that resulted from feuding is being compensated by in-marrying young men of the Ö Wawë clan. They are fathering more children than their age mates of the Pereya'ono, who must wait for wives because of a dearth of young Ö Wawë girls.

The recent history of contact and pacification demonstrates the resilience of Xavante society. Not long ago they seemed to be at risk of becoming extinct, as has happened to so many other Indian groups of lowland South America. Now they are growing in numbers, and are making adjustments in social relations and in subsistence practices

that seem likely to ensure their continued survival (see Gross et al. 1979).

The recent disruption is not a unique event in Central Gê history. As we have seen, since at least early colonial times they have been involved in both external and internal warfare. They were also exposed to epidemics. They responded to these and other environmental challenges by recombination and migration. It appears that Xavante social organization helped to preserve the identity of the Xavante as a whole, even when component groups fluctuated greatly in population.

Chapter IV

SUBSISTENCE, WORK, AND CHILDREN'S GROWTH

4.1 INTRODUCTION

Before the Xavante were settled on reservations, their procurement system was seasonally scheduled to include wild foods and limited crop production. This strategy was probably similar to that followed by many groups in the past, after cultivation began but before settled agriculture. At present the Xavante are at a transitional stage where the increasing labor requirements for the production of upland rice, now their major crop, conflict seasonally with the collection of wild foods, on which they are still partially dependent, especially for animal protein. I show that the allocation of labor affects their food supply as demonstrated by seasonal variation in the weight growth of young children. Similar seasonal variation is found among other subsistence agriculturalists specializing in grain crops, whereas nomadic groups in similar environments are less affected as they move about to exploit seasonally available resources. This suggests that once people are dependent on agriculture based on a staple grain crop they come under considerable pressure to

intensify production so that they have supplies to last throughout the year. Pressures associated with food production based on staple grain crops may be different from those found in systems where root crops predominate. The differing organizational requirements of these food production systems may direct cultural evolution along different channels.

4.2 RECENT CHANGES IN THE XAVANTE SUBSISTENCE SYSTEM

4.2.1 Changes Before 1958

In the late 1940's, when the pacification and settlement of the Xavante held high priority with the Brazilian government, the Indian post at São Domingos was a fairly large-scale operation, with cattle, a school for the children of the post workers, and a generator to supply electricity (Leitão 1949). Since there was no good garden land in the vicinity of São Domingos, the Brazilian workers planted rice, maize, manioc, bananas, and fruit trees at Água Preta, some 30 km distance from São Domingos, to supply the post and to provide gifts of food to attract the Indians. A service order from the president of the Indian agency to the agent, Ismael Leitão, exhorted the agent to persuade the Xavante to dedicate themselves to agriculture and gradually give up their nomadic ways. This was expected to have the result of containing them within a more limited territory.

The efforts of the Indian agent to persuade the Xavante to plant more crops began as early as 1954. In a letter Leitão (1954) reported that he had ordered the post workers to plant in the gardens of Apowẽ's village at Tentiprepá 65 liters of rice, 2154 manioc shoots, 78 sugar cane shoots, and 14 banana plants. The Indians had helped with the planting. But whatever enthusiasm the Xavante showed for these introduced crops apparently soon waned. Maybury-Lewis found in 1958 that the Xavante were again planting only maize, beans, and pumpkins.

The Shavante, however, perceived that if they followed the advice of the Indian agent they would have to modify or even give up their roving way of life. They therefore accepted the plantations but failed to keep them up. They planted only the aboriginal crops, which they had been accustomed to plant. They took endless pains to discover which Brazilians for many miles around had manioc flour, and made special efforts to beg, extort, or steal it from them; yet they obdurately refused to plant it themselves. Even the banana trees that were left to them were destroyed. They were too careless in burning off the undergrowth in the plantations and burned down the trees as well. No seed bananas were saved, so the community had no bananas in 1959 [Maybury-Lewis 1967:49].

Therefore, it seems that the Xavante subsistence system that Maybury-Lewis observed in 1958 was little altered from that the Xavante followed before pacification.

4.2.1.1 The Seasonal Round in 1958

Maybury-Lewis began his observations on his arrival at São Domingos in February 1958. In Early March the Xavante

harvested their maize crop. During March and April they remained in their base village and celebrated the first phase of the boys' initiation rites. They did not eat up their entire maize harvest at this time, however.

In April, 1958, the Shavante were saving what was left of the maize harvest for the initiation ceremonies due to take place in the middle of the dry weather. Accordingly they were no longer eating maize by the end of the rains and were relying almost entirely on roots and palmito shoots. At about this time the beans were showing green in their plantations, and I was told that this was the signal for the group to leave on trek. In this way the impatient and immature are prevented from eating the young beans and spoiling the harvest. It was not until they returned at the end of June that they ate the rest of the maize, together with the harvest of beans and pumpkins [Maybury-Lewis 1967:44].

In May the village divided into three groups which trekked in different directions (see Figure 12).

In May and June the community split into three bands. Two of these travelled west and then north-west from São Domingos and joined forces again near the upper reaches of the Rio São João. From there they trekked back again to São Domingos, thereby completing a full circle. These bands went primarily in search of buriti bast, with which to manufacture the regalia for the forthcoming initiation ceremonies, of scleria seeds for the same purpose, and of arrow canes. As they moved they lived mainly on gathered roots and nuts, though the men occasionally hunted and brought in peccary meat. The third band, which travelled north-east along the right bank of the Rio das Mortes, was also collecting buriti bast, but in that region there were no arrow canes or scleria seeds. On the other hand game, particularly deer, was more abundant and it was this that had attracted them (Maybury-Lewis 1967:55).

Maybury-Lewis (1967) accompanied one of these groups, and described the daily routine of a Xavante group on trek as he observed it:

Shavante do not move on every day even when they are on trek. At a good camping place, i.e. where there is a creek that provides water and a place to bathe, and where the surrounding country offers plenty of game or other natural resources, they may remain for up to two weeks. If they find their camp unsatisfactory, and especially if there are too many insects there, they may spend only one night in it.

The decision to move on is taken in the men's circle, which meets in the evening. Before dawn the following day the young men set out for the next site, taking nothing but their weapons with them. At sunrise the whole camp is astir and the married men are helping their women to pack all the household belongings into the large carrying baskets used to transport them. Each household moves off together. The women have the big carrying baskets slung from their foreheads and supported on their backs, and all the extras that would not fit in are either piled on top of, or hung from them. Babies and toddlers too small to walk the short distance to the next camp must also be carried in the women's carrying baskets. Babies are cradled in them but toddlers perch on top, together with any small pets, usually birds, that may be travelling with the household. Girls help their elders in carrying the household goods, and even tiny girls three or four years old bear miniature carrying baskets containing a few odds and ends. Men and boys are free to carry their weapons, though a married man may sometimes carry something for his wife. The small boys, meanwhile, skip in and out of the heavily laden procession, reveling ostentatiously in their freedom of movement.

The pace is that of the slowest and the distances between camps are never great. The Shavante try to have the shelters at their next camp built before midday, so as to give protection from the heat of the sun. This means that the distance between one camp and the next is a matter of two hours walk...

On arrival at the new site the women immediately set about building the shelters. Men help, if necessary, with the work of clearing the actual floor-space of the shelter and procuring the trees out of which its frame is constructed. If there are young trees close to the site, then they leave this work to the women and lounge by their possessions or go off to the men's circle. The young men invariably form their own circle and sit there gossiping until the shelters have been built for them. It is also the men who, at this stage, dig a water-hole if there is no natural water supply near by [Maybury-Lewis 1967:57-58].

Wild tubers, which formed the basis of the Xavante diet when on trek, were gathered mostly by the women.

Usually the loads of roots are brought in during the late afternoon or at dusk, the fires are lit (or revived), and half the tubers are put over them to boil in a pot while the other half are roasted in the embers. The roasted ones are ready first and may be eaten with their skins on (rather like potatoes in their jackets), or peeled, according to the whim of the individual... The boiled roots are similarly eaten when they are ready (Maybury-Lewis 1967:44).

It is especially interesting to note how similar is Maybury-Lewis's description of the Xavante on trek to Rabe's account of the Otshucayana, made more than 300 years earlier (see Chapter 2).

At the end of June all three groups assembled in the village, and harvested the beans and pumpkins. At this time the boys were passing through the second phase of initiation which included ceremonial races. At the end of July the entire community went out to collect food to supply the group during the final phase of initiation. The men went

together on a collective hunt which lasted 12 days. During the hunt the initiates were instructed as a group in hunting techniques by the older men. The women, accompanied by a few men, went in a different direction to collect babassu nuts (Orbignya speciosa). The return of the hunters was followed by a formal distribution of meat:

All the game was deposited in a big heap at the entrance to the village and was formally distributed. The distributors were Apewé, the chief, Waarodi, his eldest son, Pahiri'wa, his next most influential son, and Sibupá. The three younger men leaned on their bows (or guns), as influential Shavante do when they wish to emphasize their standing, and directed the division of the huge quantity of meat, while the chief himself presided over the distribution. Three outsize baskets were filled with about 200 lb. of meat each and were carried away to the households from which a boy was to be named Tebe and two others Pahiri'wa. The rest of the pile was divided among the men present. As many of them had brought back over 100 lb. in their carrying baskets and no one had returned with less than about 30 lb., there was plenty all round. The formal distribution did not, however, put an end to the meat exchanges. For the rest of the evening people were hurrying to and fro with the meat which they had either begged from or were taking to their kinsmen in other huts. (Maybury-Lewis 1967:122).

Before the collective hunt the Xavante had spent about a week clearing and burning their gardens, which were a day's journey away from their base village, in the vicinity of where the village is now located. After the hunt they went off on trek again, this time the whole community travelling together. At the time of this trek, which covered the end of the dry season and the beginning of the rains, the year-

round wild staples of roots and palmito were augmented by carob pods (St. John's bread), the fruits of the buriti palm (Mauritia sp.), and piqui (Caryocar sp.). This diet was further supplemented by mangoes, genipapo (Genipa sp.), and a number of other species that Maybury-Lewis was unable to identify (Maybury-Lewis 1967:46). In October the Xavante returned to their gardens for a week when they cleared away some of the undergrowth and planted their crops. Household members cultivated a garden jointly. Each household kept a stock of maize, beans, and pumpkin seeds stored in a gourd stoppered with beeswax until time for planting. When Maybury-Lewis left São Domingos in November, 1958, the Xavante were planning another trek to begin in December from which they would return in time for the maize harvest.

4.2.2 Subsistence Changes 1958-1976

Apowê's group moved their village to São Domingos in 1956. For several years after that they continued to plant their three crops at their old garden sites at Tentiprepá and carry harvested garden foods to their base village at São Domingos. Basílio da Silva Barros, who was a young worker at the post at that time, told me that after a few seasons of planting at Tentiprepá Apowê's group ceased to plant at all, and for about three years depended entirely on hunting, fishing, and gathering, plus handouts from the post of manioc flour and rice. While there was no good garden

land at São Domingos the fishing was excellent, and since the Xavante acquired fishhooks they took enthusiastically to fishing with hook and line (Maybury-Lewis 1967:52).

By the early 1960's a change in the relationship between the Xavante and the Indian Service had begun. As Maybury-Lewis found at his second visit in 1962, the Xavante had become diminished in numbers, and had lost much of their former independence. The government was no longer interested in courting the Xavante as they had ceased to be a threat to the settlement of the region. As time went on, the Indian Service cut back the number of workers at the post, and the constant flow of presents for Apowẽ and his people began to dry up. In 1964, after the remains of the splinter group that went to ǃ Tõ rejoined Apowẽ's village, the entire group moved upriver some 50 km to Noratsuprepá (Barreira Vermelha) where a tributary called the Rio Amarelo entered the Rio das Mortes. It was at about this time that they began to intensify the production of rice and manioc. But Basílio told me that they continued to spend much of their time on trek until around 1970. In 1972 Apowẽ's group moved back to Tentiprepá. The present village is located between the sites of two former villages, one occupied during the 30's, and the other in the early 50's. Since the move to their present village, rice has become increasingly important in Xavante subsistence, and they are producing more from year to year. Although hunting, fishing, and

gathering remain important subsistence activities, the Xavante now go on trek for only a few weeks in August. It is interesting to compare the round of seasonal activities as I followed them in 1976-77 with Maybury-Lewis's observations of 1959.

4.2.2.1 The Seasonal Round in 1976-77

I lived at Pimentel Barbosa from May, 1976 to July, 1977. There were several breaks in my fieldwork, the longest from the beginning of December, 1976 to the end of January 1977, when members of the field team met in Brasilia to compare observations and plan the rest of the research. I began time allocation observations in August, 1976 (for methods see Appendix) which allowed me to quantify seasonal variation in activities over 12 months (see Table 16). When I started these observations the dry season was ending, and when I ended them in July of the next year harvesting was finished and people were clearing new gardens for the next planting season.

In June of 1976 two Wai'a ceremonies were held, and in early July there was a naming ceremony for the young women. In August, 1976, about half the families in the village left on a trek lasting several weeks. All those who remained were clearing gardens. In September all were back in the village, and the men organized several collective game

TABLE 16
Xavante Adult Activities by Sex and by Season

*Xavante Adult Activities by Sex and by Season**

Activity	July-Sept. (garden clearing)		Oct.-Dec. (planting and weeding)		Jan.-March (harvest)		April-June (postharvest)		Annual mean		Mean (both sexes)
	M	F	M	F	M	F	M	F	M	F	
Hunting	1.67	0.0	0.50	0.0	0.95	0.0	1.12	0.0	1.06	0.0	0.53
Fishing	0.91	0.31	0.0	0.0	0.08	0.07	0.64	1.05	0.41	0.36	0.39
Gathering	0.24	1.37	0.0	0.14	0.0	0.06	0.0	0.59	0.06	0.54	0.30
Total wild food	2.82	1.68	0.50	0.14	1.03	0.13	1.76	1.64	1.53	0.90	1.22
Gardening	1.71	1.32	4.02	3.33	2.53	3.28	1.09	1.19	2.34	2.28	2.31
Domestic animal care	0.04	0.0	0.0	0.0	0.04	0.0	0.39	0.18	0.12	0.05	0.09
Market activities	0.29	0.24	0.63	0.17	1.01	0.48	1.41	0.52	0.84	0.35	0.60
Nonsubsistence work ^b	1.25	4.66	0.48	5.32	1.48	6.15	1.11	4.77	1.08	5.22	3.15
Nonwork ^c	7.88	6.08	8.36	5.03	7.92	3.96	8.22	5.70	8.10	5.19	6.65

*Number of hr/14-hr day, from 6:00 A.M. to 8:00 P.M.

^bIncludes child care, food preparation, housekeeping, manufacture of tools, gathering firewood, and business transactions within the community.

^cIncludes eating, ceremonial activities, hygiene, conversation, recreation (e.g., soccer game), sleeping, and sitting idly.

drives. One of these game drives was aborted after the men were painted up and had carried out the preliminary ceremonies in the plaza. A local landowner drove up in his truck and asked the Indians not to set fire to the cerrado, because the direction of the wind would blow the fire toward his land. He offered to pay for two steers to compensate the Indians. Tsurupredu haughtily refused this offer, but did agree to call off the hunt, though a few men went out hunting on their own. At the same time that the men went on collective game drives, the women organized several collective gathering expeditions, principally to collect palmito and palm fruits.

From the end of September until March people spent much of their work time in their gardens, preparing the soil, planting, later weeding, and finally harvesting. Maize and manioc were planted first, then rice. Families went to the fields as a group, taking the babies and children with them. Each family had a shelter at the edge of its fields where the babies and young children rested and played. Older children ranged further, but under the age of 12 they had few responsibilities beyond running errands such as fetching a few gourds of water from the stream, scaring away birds when the crops were ripening, and seeing that the younger ones did not wander far.

The harvest started in late January, when the maize crop was ripe. During the first two weeks of February, at the time of the maize harvest, there was a men's or a women's log race almost every afternoon. Harvesting rice was an activity that went on for several months, for the Xavante planted rice in different plots from early October to December so that manpower for harvesting would not be required all at once. It was mostly men who cut the rice and stacked it, with some help from the women. Then the women threshed rice and brought it to their houses little by little, as it was needed.

After the harvest men again turned their attention to hunting. But some of them, especially young unmarried men, left the village for a week or more at a time to work for wages on nearby farms. The women, still busy with threshing rice, did little gathering at the end of the rainy season.

From April through June much of the wild food effort was spent on fishing. By July some families were clearing new gardens, but until the rains began more time was spent on wild food than on garden labor. The Wai'a was again held as the dry season was beginning, in May. In July a ceremony marked the beginning of rites that would go on for most of the next year to celebrate the initiation of the S'dard' age set, the age set then in the bachelors' hut.

4.3 THE PRESENT SUBSISTENCE SYSTEM

4.3.1 Hunting

The Xavante take little interest in the care of domestic animals. Some families own a few pigs and chickens. There is a small herd of cattle on the reservation, cared for by a Brazilian employee of the government Indian post. When the community does some collective task, such as clearing the grass from the airstrip, the government agent has a steer killed, and the meat is distributed. but almost all the animal protein in the Xavante diet comes from hunting and fishing.

The Xavante use several different hunting techniques: individual hunting, collective hunting expeditions lasting several days, and game drives using fire which are held in the dry season. Time allocation observations showed that Xavante men spent an average over the year of 1.06 hours per day in hunting (see Table 16).

4.3.1.1 Individual Hunting

Individual hunting is the most common form of hunting, though not the most productive. One man, or two or three men, may decide to go out for a day's hunting. Or, if they have flashlight batteries, they may go to the gardens at night to wait for paca (a large rodent). Practically all Xavante men today own .22 rifles. I found that only about

21% of such hunts were successful (that is, some game was bagged) and the average share of dressed meat per hunter was 1.7 kg (see table 17). For the method of deriving this table see Appendix.

However, both the frequency and success rate of individual hunting may be underestimated. Men always carry their guns and are on the alert for game, whether going to their gardens or on some other errand away from the village. Several times I have seen men returning from work on neighboring farms come into the village carrying a deer or a peccary they had shot on the way.

4.3.1.2 Collective Hunting

The Xavante say that collective hunting brings better results than individual hunting, and my observations bear this out. The success rate of collective hunts (four or more hunters) was 67%, and the average share of each hunter per day (some hunts last several days) was 4.7 kg in dressed meat (see Table 17). This is probably because the most commonly bagged game animal is white-lipped peccary which runs in large herds. If he comes across a herd of white-lips a lone hunter is lucky to shoot one or two, but with a number of hunters present some can head off the herd, giving everyone a chance to shoot more. On two occasions during my stay a large herd of peccaries was spotted close to the village. When the alarm was given, every man in the village

TABLE 17
Xavante Hunts

XAVANTE HUNTS^a

Date	No. of Hunters	Duration in Days	Game Bagged	Est. ^b Share per Hunter/day in kg. Dressed Meat
8/1/76	2	1	0	0
8/16/76	12	1	0	0
9/3/76	1	night	0	0
9/10/76	10	1	1 peccary ^c	1.32
9/16/76	30	1	1 deer	0.49
10/15/76	11	6	8 peccary, 3 tapir	6.93
11/14/76	1	night	1 paca	4.40
11/18/76	1	1	0	0
11/19/76	1	1	0	0
11/19/76	1	1	0	0
11/21/76	2	night	0	0
2/4/77	30	1	0	0
2/5/77	30	1	0	0
2/7/77	10	2	4 tapir	23.46
3/5/77	1	1	0	0
3/16/77	1	1	0	0
3/27/77	1	1	0	0
3/27/77	1	1	1 deer	14.68
6/11/77	1	1	0	0
6/14/77	1	1	0	0
6/14/77	2	night	2 paca	4.40
7/23/77	20	1	3 peccary, 1 deer	2.72
7/27/77	20	1	2 deer, 1 tapir	7.33

Average yield per hunter/day for all hunts = 2.81 kg.

Average yield per hunter/hour = 0.40 kg.

- a. Hunts listed are those that showed up on randomized time allocation visits (see Notes 2 and 4). When any individual was reported to be out hunting, I returned later to ask the hunter how many other hunters were with him, how long they were out, and what game was killed. The list, therefore, represents a sample of total hunts.
- b. Estimated share per hunter in kg. dressed meat is the estimated amount of dressed meat from the total bag (as many animals were reported, rather than observed directly, average weights are used) divided by the number of hunter days. The duration of an average day of hunting was estimated to be 7 hours.
- c. All peccary on this list are white-lipped. On other occasions I saw collared peccary brought in, usually by individual hunters.

seized his gun or, if it was not at hand, bow and arrows or a club, and gave chase. On one of these occasions 22 peccaries were killed, and on the other 20. On the other hand it may happen that most of the men in the village go out to search for a herd of peccary whose location has been reported and fail to find it, returning empty-handed at the end of the day.

On hunting expeditions a number of men go out hunting for several days, and usually return with a large amount of smoked meat. "Wedding hunts" are of this kind. When a boy's age set is initiated into manhood each youth is betrothed to a girl of the proper clan affiliation, but she is often so young that he must wait for several years before he can initiate relations with her. When the girl reaches puberty another ceremony is held which indicates that the young man can now visit his bride at night. Only after the first child is born does the husband take up residence with her in her father's house. An important part of this ceremony is the "wedding hunt." The young man goes out hunting with a number of his age mates. They return only when they have accumulated an impressive amount of smoked and dried meat. On one of these hunts the reported bag was three tapirs and eight peccaries. Upon the hunters' return to the village they pile the chunks of smoke-blackened meat into one enormous basket and hoist it onto the bridegroom's back. Supported by his friends he staggers to the doorway

of his father-in-law's house where he deposits the basket. The bride's mother's brother then distributes the meat to the entire village.

Dry season collective hunts, which usually last only one day, use the technique of driving game by setting fire to the dry undergrowth. As a result, by the end of the dry season a large part of the reservation has been burned over. At night the glimmer of fires can be seen far into the distance and a pall of smoke hangs over the village.

Collective hunting may be most advantageous where there is high dependence on herd animals and in relatively open country, like the cerrado, where there is visibility over considerable distance. If collective hunting also produces large quantities of game at one time it also requires that meat should be widely shared and that there should be some way of preserving the surplus of fresh meat. The Xavante technique of smoking and drying meat keeps it in reasonably edible condition for about a week, and I have never seen any indication that meat was wasted.

Comparison of Xavante hunting yields with those obtained by other Central Brazilian groups indicates that for the Xavante hunting is still reasonably productive. The average yield per hour spent hunting was 0.40 kg dressed meat for the Xavante. The Mekranoti obtained an average of 0.69 kg, but the Bororo and the Kanela, both of whom live in degraded

habitats, obtained averages of only 0.20 and 0.11 respectively (Werner et al. 1979:207). But this situation may soon change. Tsidaizé, of the Ö Wawě Uhö (peccary) lineage, told me that his father and his elder (classificatory) brother, both now dead, were "Masters of Pigs." That is, as leading men of their lineage, they possessed magical techniques to call the peccary herds (see also Giaccaria and Heide 1972:111-112). The "Master of Pigs" was not permitted to kill peccaries himself, but stood quietly to one side stroking the back of the "Father of the Herd," the large boar that leads the herd, while the other hunters killed as many peccaries as they needed for that occasion. Tsidadzé never witnessed such a hunt, and his kinsmen died without passing their knowledge on to him, but he suspected that someone in the village had it and was using it secretly. Otherwise, he reasoned, how could you account for the fact that large herds of peccaries had appeared on two recent occasions right at the edge of the village, both times only a few days after holding the Wai'a ceremony? Unfortunately there may be another reason: the increasing occupation by ranches and farms of land around the reservation may be driving game onto the Indian land where it may soon be overhunted.

4.3.2 Fishing

The present Xavante village on Pimentel Barbosa reservation is located near a minor stream where small fish are caught. More intensive fishing involves a 20-30 km trip to a larger tributary of the Rio das Mortes or to the river itself. It appears that fishing became more important in Xavante subsistence after they acquired fishhooks from the Indian Protection Service in the 1950's (Maybury-Lewis 1967:51). Both men and women fish (see Table 16) -- women's fishing is perhaps recent, as Maybury-Lewis noted that women did not fish at the time of his research.

The Xavante fish only from March through September, when the water level in the rivers and streams is falling. It is also the season when their time is least taken up with garden work.

Local fishing was casual. A few women would go off together for a day's fishing, taking their small children with them. Fishing in local streams was also popular with boys in the 8-12 age group who would return with their catch and roast it in the ashes of the household cooking fire. All the local fishing was with hook and line.

The composition of parties that went on longer fishing trips was varied. A family, including all the children might go to one of the larger rivers and camp there for a

week or more. On one occasion a party of young men and boys went on a fishing trip while most of the other men were engaged in a game drive. Another fishing party consisted entirely of women and children. When the members of these longer fishing trips returned to the village they brought with them baskets of smoked fish, caught by using fish poison, and this fish was widely distributed in the village.

On one occasion the boys in the bachelors' hut went on a joint fishing trip and brought back a large amount of smoked fish. They then offered a ceremonial meal to the older men, during which several of the elders made speeches praising the boys for their civic endeavour. Then each man took his portion of fish, only part of which he had eaten, wrapped it in leaves, and took it back to his house.

4.3.3 Gathering

When Maybury-Lewis studied the Xavante, the staple of their subsistence was gathered wild roots (Maybury-Lewis 1967:43-44). They continue to collect these tubers occasionally, apparently for the sake of variety in their diet, for sweet manioc now provides them with a cultivated starchy staple. But they continue to collect palm nuts, other wild fruits, and palmito (hearts of palm) in large quantities. Palmito is eaten fresh, but may also be dried in the sun and pounded into flour which is boiled to make a

kind of thick soup considered a suitable food for small children, or made into loaves which are baked, like maize loaves, in an earth oven. The Xavante also collect a great variety of plants used for other purposes: medicinal, housebuilding, making artifacts such as mats and baskets, and manufacturing ceremonial regalia. George Eiten, the botanist who collaborated with the field team, made a collection of plants at the Xavante site. Informants indicated that a large number of these were used for medicinal purposes, especially for curing wounds and bruises and for "giving strength." However, informants did not identify any plant medicine that was used for contraceptive purposes.

Gathering is mainly, but not exclusively, a female activity (see Table 16). In the dry season, while the men were out on a collective hunt, the women would make up a large party to collect palmito. On one occasion I accompanied them. Although we went in a different direction from the men, as we climbed a height of land we could follow the location and activity of the hunt by the smoke of brush fires. Another time a party of more than 25 men, women, and children went on a mini-trek, lasting four days, to collect palmito and wild fruits.

4.4 AGRICULTURE

There is no doubt that at present the Xavante are highly dependent on agriculture. In terms of labor time over the year they devote nearly twice as much time to garden labor for food as they do to collecting wild food (see Table 16). Gardens are planted, weeded, and harvested by individual families, and the produce, for subsistence or sale, is regarded as belonging to the family that clears and plants the garden.

The Xavante have available to them good land in the gallery forest. The level of soil nutrients found in unused forest land adjacent to their gardens is the highest of the four groups we studied, perhaps because the Xavante annually burn over the entire area around their village, including forest as well as gardens, so that nutrients from the ash gradually accumulate in the soil. For levels of nutrients found in soil samples taken from forest land, from first year gardens, and from second year gardens, see Figure 13, and Figure 14. For the methodology used in the collection of soil samples, and further discussion of the significance of soil nutrients, see Appendix. The Xavante habitat probably favors the adoption of upland rice as the new Xavante staple, for D. R. Harris (1971:495) suggests that seed crop cultivation by swidden techniques is most efficient in regions where a long rainless season assures that the

vegetation felled when the garden is cleared will dry out thoroughly enough to burn well (conditions which are fulfilled in the cerrado region).

The Xavante plant their seed crops, maize and rice, for two years running in the same garden. All the other groups we studied planted seed crops in first-year gardens only. The Xavante maintain that the second year's crop is usually better than the first year's. This judgement was confirmed by my sampling of yields from both first and second year gardens as well as by comparison of soil samples which showed nutrients to be higher in a second year garden than in an adjacent new garden (see Figure 14).

Generally speaking, the Xavante plant their various crops in separate patches of their gardens, although they grow pumpkins between the rows of maize or rice. They weed the rice fields twice between planting and harvest. They plant beans after the maize harvest. Banana plants usually grow around the perimeter of the garden. Rice, though not maize, is sometimes planted in third year gardens, but bananas and manioc are the main crops grown in gardens after the third year.

Interviews with individual informants showed that many of them were increasing the area they cultivated -- that is they were clearing more new land than was going to fallow. The newly cleared land was progressively more distant from

Figure 13: Scales Used to Indicate Nutrient Levels in Soil Samples

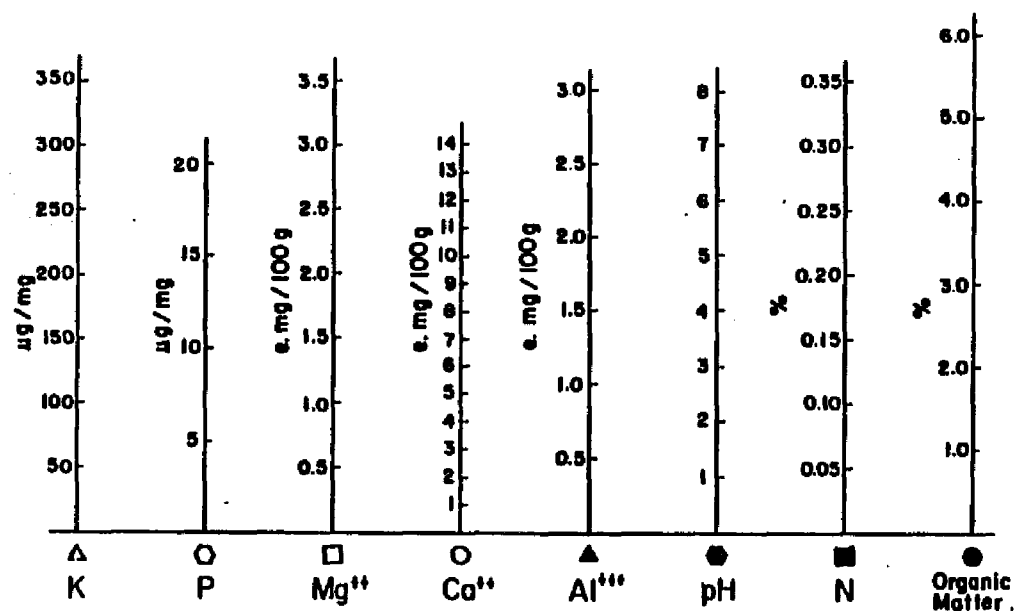
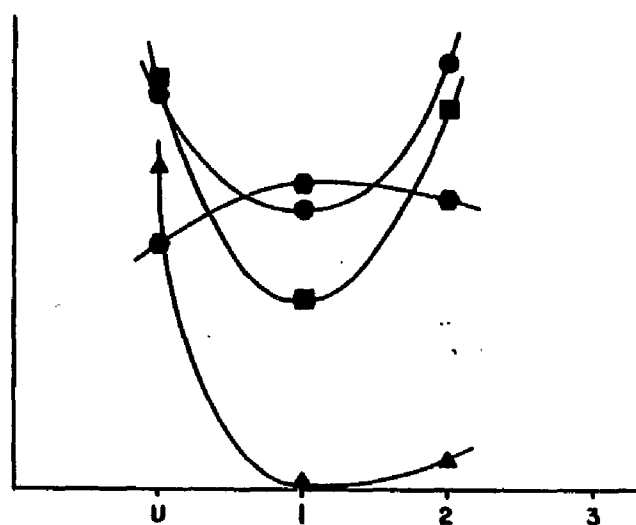
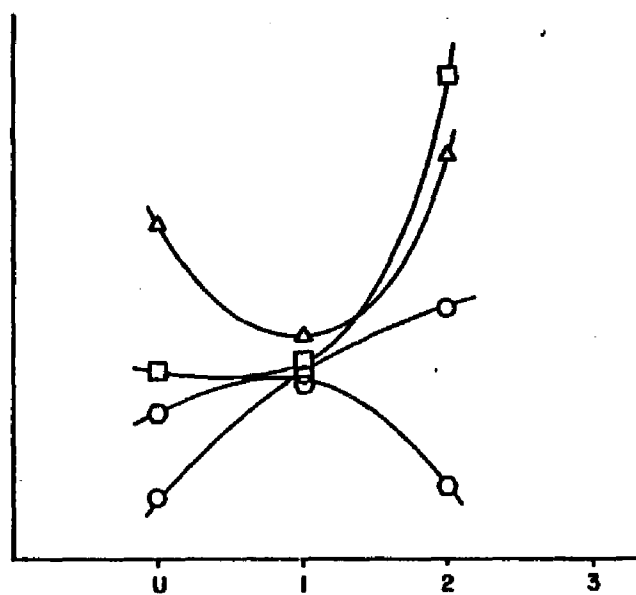


Figure 14: Levels of Nutrients in Gardens at Pimentel Barbosa



U = Unused garden land
 1 = First year gardens
 2 = Second year gardens

the village, so that some gardens were more than an hour's walk away. Several families moved to other garden sites on the reservation where they spent the planting and harvesting seasons. They indicated that the move was motivated as much by the need to prevent encroachments on the reservation as by a shortage of land near the village.

4.4.0.1 Rice

Upland rice has become the Xavante staple in the last five or six years (see Table 18). Production figures indicate that rice now provides the Xavante with about 61% of the calories they derive from garden produce. Their reasons for accepting and intensifying the cultivation of this crop may have as much to do with their need for a marketable product as it has with their food subsistence requirements (for further discussion of this see Gross et al. 1979). The Xavante now grow sufficient rice to cover their needs from one harvest to the next, though stocks may run low before the next crop is in (see Table 19, showing seasonal variation in foods consumed).

4.4.0.2 Maize

Xavante maize varies in kernel color from white and yellow to bright red and dark purple, with mixtures of these colors. The Xavante greatly esteem this variation, carefully saving a stock of seed from each color variety in

TABLE 18
Xavante Crop Production

XAVANTE CROP PRODUCTION

<u>CROP</u>	<u>HECTARES PLANTED</u>	<u>% OF TOTAL LAND PLANTED</u>	<u>YIELD IN KGS.</u>	<u>YIELD IN KCAL x 10⁶</u>
Rice	59.5	78.0	94,010	332.79
Maize	7.8	10.2	23,431	84.32
Manioc	2.9	3.8	40,806	67.4
Other (bananas, pumpkins, papayas, yams, beans)	6.1	8.0	-----	65.0 (est.)
TOTAL	76.3	100.0		549.51

TABLE 19

Daily Per Capita Consumption of Representative Foods by
Season

DAILY PER CAPITA CONSUMPTION OF REPRESENTATIVE FOODS BY SEASON

	<u>September</u>	<u>November</u>	<u>February</u>	<u>June</u>
<u>RICE</u>	209.5 gr.	179.4 gr.	296.5 gr.	246.1 gr.
<u>MANIOC</u>	153.0	54.0	0	215.0
<u>MEAT AND FISH</u>	158.9	50.2	52.5	256.4
<u>WILD VEGETABLE FOODS</u>	129.9	22.8	0	32.7

separate gourds stoppered with beeswax. As in previous times, they eat up their maize crop, saving only seed and a little more to make the maize loaves they use as ceremonial prestations. In 1958 Xavante informants gave Maybury-Lewis the names for seven different color varieties of maize (Maybury-Lewis 1967:47). They also gave me the names of seven varieties, but they said that the seed of two of them, the black and the yellow, had been lost.

The Xavante are especially fond of a variety of maize with bright red kernels. Tsidadzé, who liked to recount stories of the past, told me how the Xavante acquired the seed of the red maize. He said they got it from the "Tepe Tede'wa" -- that is the Fish People (Karajá or Canoeiro?) -- with whom they traded on the banks of the Araguaia. Tsidadzé said that when he was a small boy the Xavante would sometimes trek over towards the Araguaia. The Water People appeared suddenly in the river, holding the maize cobs out of the water. If they were startled or didn't want to trade the Water People would submerge and swim away under water. But they sometimes came out of the water and traded. Tsidadzé said the Tepe Tede'wa knew only a few words of Xavante -- just enough to say that they were friendly. The Xavante traded game for their fish, and the Tepe Tede'wa gave the Xavante seeds of their red maize. The Xavante were to plant and harvest the maize and give part of the crop back to the Tepe Tede'wa (it is not clear whether they ever

actually did this). Tsidadzé said that he remembered two occasions when the Xavante met the Tepe Tede'wa to trade, once when he was a very small boy and once when he was bigger -- perhaps 35 or 40 years ago. After that they did not appear again.

The Xavante still do not plant very much Brazilian maize, only a few rows bordering the rice fields. They say they prefer their own maize which is softer, so it is easier to grind by pounding it in their wooden mortars made by hollowing out an upended racing log.

The maize grown by the Xavante belongs to a group of varieties called by the botanist Brieger (Brieger et al. 1958) "Interlocked Soft Corn" (see Figure 15).

In our collections we found that the western and southern margin of the Amazon Basin...contains exclusively representatives of one group of races, and we call this group the "Interlocked Soft Corn", since one of their main characteristics is the interlocking of ranks, first correctly described by Cutler (1946). Cutler used the name "Coroico" for this racial group, but this name is not really correct. Coroico in eastern Bolivia is a locality at a rather high altitude, and the Interlocked Maize may be grown there, but its real habitat is at much lower altitudes [Brieger et al 1958:199].

Grobman (1961:221) called the same group of maize varieties "Pericincó", the name by which it is known in the eastern Peruvian lowlands. This maize is characterized by the interlocking of neighboring alveoli, which allows more kernels to be produced on an ear, longer than usual but

Figure 15: Prieger's Map Showing Distribution of Interlocked Soft Corn Varieties



Map from Brieger et al. 1958.

without increased diameter. Brieger felt that interlocking is not the result of recent breeding but is "a primitive character, dating from the very early days of breeding and domestication" (Brieger et al. 1958:211). Grobman et al. (1961:211) also found that "the limited degree of inbreeding depression [is] consistent with the assumption that this race originated early in the evolutionary development of corn in South America." Brieger suggested that the geographic limitation of Interlocked Soft Corn may be explained by gene linkage: "If the genes for interlocking and for climatic adaptation were correlated after a first period of domestication in the Amazon Basin, this would explain that genes neither spread outside the region nor became lost within the region." (Brieger et al 1958:211). The Xavante grew at least two varieties of Interlocked Soft Corn which Brieger called "Chavante Interlocked Soft Corn." One of these is "rather slender, with brown to orange aleurone, and the other much shorter and with black pigment in the aleurone in addition to the yellow ones" (Brieger et al. 1958:202).

These botanists suggested, then, that the maize grown by the Xavante was not recently introduced into the region, but originated there, and has been cultivated for a very long time. It is apparently of different origin from the Northern Cateto Flint corn grown farther east which is a variety of a type widespread along the Atlantic coast from

Cuba to Argentina (Cutler 1946:280; Brieger et al. 1958:222-224 and 230). There are also indications that the Gê-speaking peoples have been present in the same region for a long period (see Chapter 2). Therefore it seems likely that the cultivation of maize was not a recent borrowing by the Gê-speaking peoples but has, for a long time, been an element in their subsistence system.

4.4.1 Other Crops

Although the Xavante still grow beans and pumpkins, Basílio told me that the present Halloween-type pumpkins are not the same as those they grew in the early days of contact. The seeds of their old pumpkins, which were long and thin, have been lost, and the pumpkins they grow now are a Brazilian variety. The small brown beans they now grow are also different from those formerly grown, which were large and spotted.

The Xavante now grow a considerable amount of sweet manioc most of which they cook by roasting in the ashes of their cooking fires, though they also occasionally make manioc flour using large copper toasting pans they got from the Indian Service. Manioc makes a greater contribution to their diet during the dry season, as they start to harvest it in March (see Table 19). The Xavante at Pimentel Barbosa do not grow bitter manioc, as they say they once planted

some that the Indian Service gave them and several children were poisoned by it.

Other crops that the Xavante now grow are bananas, panayas, sugar cane, and cará, a New World yam according to C. Sauer (1963:511). At Pimentel Barbosa the Xavante do not grow sweet potatoes, which are staples for the Northern Gê. The Xavante still grow a very limited range of crops. They have nothing resembling the "home garden" of tropical forest peoples which, according to Lathrap (1977:731) might contain "50 to 100 discrete botanical entities."

4.4.2 Food Exchange

To study the distribution and consumption of food in the village I monitored two households for three-day periods each at different seasons of the year -- 24 days of observation in all (see Appendix).

4.4.2.1 Animal Foods

I found that fish and game were widely shared. The larger household of the two I studied had five resident hunters; the smaller household had only one hunter, who did not bring any meat into the household during the study periods. Therefore, 100% of the meat consumed during those periods in the smaller household was contributed from some other household. In the larger household 60% of the meat consumed

was brought in by resident hunters, with the rest coming from some other household. Yet there was little difference between the two households in mean per capita per day consumption of meat and fish. This averaged 138 g per capita per day for the smaller household, and 121 g per capita per day for the larger.

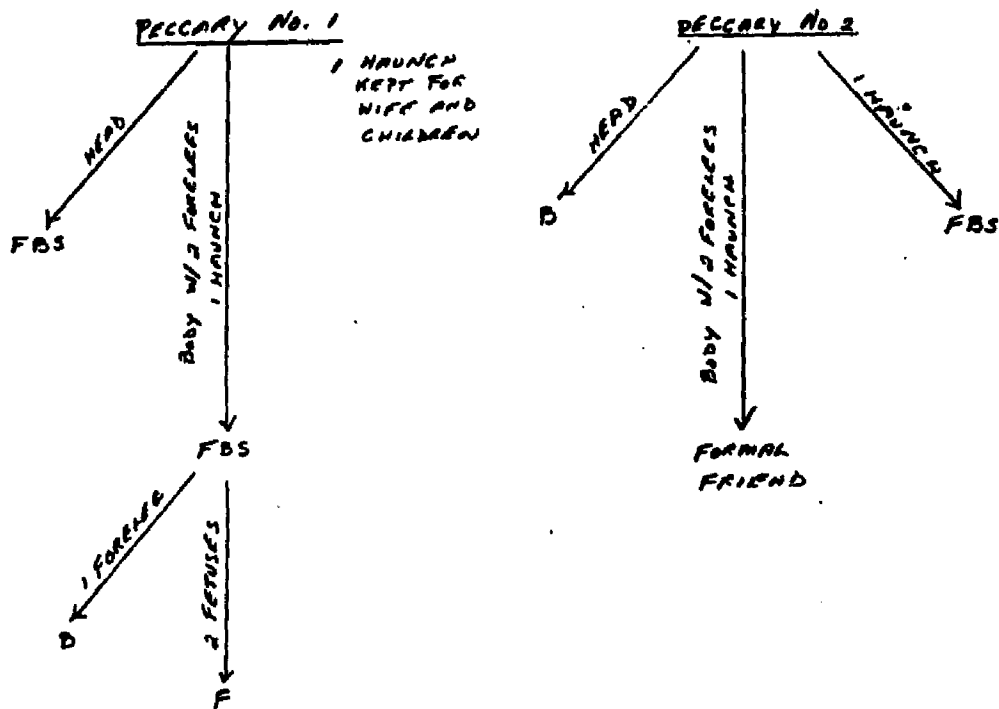
One hunter, Preoi, described to me how he distributed two collared peccaries (caititu) he had shot. For his own small family he kept only the haunch of one peccary. His wife cut up and parceled out the meat, but the distribution followed the kin connections of the hunter (see Figure 16).

4.4.2.2 Vegetable Foods

Networks for informal exchange of garden foods seem to be much more restricted than those through which game and fish are distributed throughout the village. My food consumption studies showed that members of the larger household that I monitored shared food almost exclusively among themselves. On only two occasions did a visitor eat rice, and no one brought a gift of vegetable food. For methodology of the food consumption studies, see Appendix.

On the other hand, while monitoring the smaller household I counted 47 instances of exchange with outsiders that involved vegetable food, such as cooked rice, manioc cakes, and palm nuts. On 16 of these occasions the household

Figure 16: Distribution of Meat from Two Peccaries Shot by a Hunter



gained food, as a gift of food was brought to the household, or a household member ate with another family. On 31 occasions the household gave food, since a visitor ate with the family, or a gift of food was sent to another household. However, about 85% of this frequent food exchange was with people from the two adjacent households who were close kin as well as neighbors.

While the arrival of game or fish in the village was regarded as public information, people were reluctant to reveal the amount, or even the existence, of cereal stores. I find the following comment in my field notes taken while monitoring food consumption in November (the time of lowest rice consumption) in the smaller of the two households:

I was unable to weigh rice stores, as Otomoabá insisted that there were none left in the house. However, I was in the house later when Tsipatsé (the 10-year-old son) took rice, carefully hidden under empty sacks, out of the bottom of a barrel in order to hull it. Perhaps seven or eight kilos were left. I also learned that the family had some rice stored in a shelter in their field. At this time households in the village had very unequal stores of rice. A few had a surplus stored to sell, others had eaten theirs up. So those who had rice were reluctant to admit how much for fear of claims to share it by those who had none.

Nevertheless, during this time of shortage Otomoabá gave plates of cooked rice to children from neighboring households, apparently as freely as to her own children.

4.4.3 Market Labor and Exchange

The Xavante at Pimentel Barbosa are becoming progressively more involved in the local market economy, both through labor on farms of the region and by growing rice for sale. Table 16 shows that the season when Xavante men worked most for wages outside the reservation was at the end of the rainy season. When men finished harvesting their rice and stacked it in the fields, women threshed it as it was needed for their households. A number of men then left the reservation to help with the harvest on Brazilian farms, usually staying only a week or two. Other tasks the men worked at were clearing the cerrado and fencing. A few men were beginning to take their wives and children with them to the farms and make longer stays. Rice cultivation on these farms was mechanized, and the Xavante were impressed with the labor-saving capability of farm machinery as they observed it. One or two of the younger men had already learned how to drive a tractor. The Xavante men earned the going wage for farmhands, which was 30 crz. a day (about two dollars at the 1976 exchange rate) and food. The Xavante complained about the Brazilian laborer's diet of rice and beans, as they said they were accustomed to eat more meat, and the long working hours during the harvest. As few Xavante men were able to count money, they often feared that they were being cheated in their pay. The Xavante spent most of the money that they earned on clothing, tools,

cigarettes, and such small food luxuries as coffee, sugar, and treats of candy or fruit for their children.

Xavante leaders talked a great deal about growing rice on their own land for sale on the market. The National Indian Foundation (the present title of the Brazilian government Indian agency, usually known by its acronym of FUNAI), encouraged the Xavante to grow rice as a cash crop, but during the time I was on the reservation FUNAI provided little practical support. In the season previous to my visit, according to the Indian agent, the Xavante had sold 300 sacks of rice. But in 1976 only three families grew rice for sale. The main difficulty was to get transportation to take their rice to Matinha where it could be sold, or to get a buyer to come to the reservation for a small amount of rice. In November 1976 they had still sold little rice from their last harvest. In the unused schoolhouse 138 sacks of rice were stored. Finally, in March, 1977, one man sold his 1976 surplus of 56 sacks of rice to a buyer from Matinha. In Table 16 garden labor to produce rice for sale on the market is not separated from garden labor for subsistence. If it were, this would take 0.17 hours out of gardening time and place it in the category of market labor, increasing market labor time, when averaged over the year, to 0.77 hours a day.

The Xavante see Brazilian landowners using machinery to clear the cerrado and grow rice, and they believe that they could do the same if they only had the means to do so. In fact, most of these Brazilian ranchers plant rice for only one or two years, and then sow the fields in fodder grass for cattle. Toward the end of my stay there was much talk of a development project, to be implemented by FUNAI, for the Xavante to increase rice production. Before I left the field, a shiny new tractor had arrived at the reservation, but a number of parts were missing, and in any case there was no diesel oil to run it. FUNAI was also to supply a tractor driver and mechanic, for at the time no Xavante had the training required to keep a tractor running. Nor do the Xavante have the knowledge and capital needed to use the techniques that the Brazilians have developed to farm the cerrado, since these techniques involve liming to counteract the acidity of cerrado soils, and application of chemical fertilizers to supply missing nutrients. If the Xavante use their tractor to farm in the gallery forest, as they were planning to do, they will probably increase the rate of degradation of their environment.

FUNAI had recently ceded to the Xavante some 120 head of cattle -- what remained of the herd which formerly supplied meat for the post. From years of neglect these cattle had become half wild. The Indian agent engaged Basílio da Silva Barros, the young Brazilian who grew up at the Xavante

Indian post, as cowboy to care for and rebuild the herd on the terms that are still customary in the region: instead of a salary he was to own one fourth of the increase of the herd. Basílio was attempting to train one or two young Xavante men as his assistants.

When the Xavante lost part of their reservation (see Chapter 5) several local landowners who established themselves on the ceded land attempted to secure Xavante acquiescence by promising them "in exchange" cattle, a pickup truck, and a bridge which would make a dirt track across part of the reservation passable for the truck. These promises, however, became a cause of ongoing friction between the ranchers and Xavante leaders, for the bridge was no sooner built than it washed away in the rains. The cattle were not delivered as promised; a few aging beasts at a time were sent, instead of the 100 heifers and 10 bulls they were promised. The Xavante had hoped to use the truck to take their rice to market, but they found that since it could only carry 20 to 30 sacks at a time, the truck was far too expensive in gasoline to be a practical means of transport. In any case, the truck was only in use for a short time. It soon broke down, and for some months remained at a garage at Xavantina, until the Xavante could raise the money to pay for its repair. They finally did so by selling several head of cattle, and were then rebuked by the FUNAI regional inspector for selling off their cattle.

For the Xavante, increased involvement in the regional market appears to be inevitable, as each step in that direction produces new needs which in turn result in greater dependency on the outside economy (see Gross et al. 1979). The Xavante do not necessarily regard modernization as desirable in itself, rather they see it as the only way they can defend themselves against pressure from the larger society (see Chapter 5).

4.5 ADULT SUBSISTENCE LABOR AND THE GROWTH OF YOUNG CHILDREN

Does dependence on agriculture give the Xavante an "increased and more reliable food supply" compared to their former mode of subsistence? I attempt to answer that question by observing whether, with the use of agriculture, their present food supply appears to be seasonally stable or fluctuating.

The health and growth of young children is a sensitive indicator of the nutritional status of a community (Jelliffe 1966). Growth in stature reflects the effect of long-term conditions, while growth in weight is more variable, and fluctuates in response to short-term nutritional changes (Gross and Underwood 1971). Therefore, seasonal changes in the rate of weight growth of young children should reflect seasonal fluctuations in the food supply.

If the rate of children's weight growth is even year round, this would indicate little variance in daily food intake from season to season, and would therefore suggest that increased reliance on agriculture has augmented, or at least not diminished, Xavante subsistence security. If their rate of weight growth varies considerably by season, this may suggest that the Xavante are experiencing stress as they attempt to reconcile conflicting demands on labor for maximizing crop production while still exploiting the wild food sources on which they are still partially dependent. Such stresses may well be similar to those experienced by prehistoric populations during the transition from wild food procurement to food production.

4.5.1 Comparison with Earlier Studies

The same team of physical anthropologists and geneticists who studied the health status, genetics, and demography of the Xavante in 1962-64 (see Chapter 3) also took anthropometric measurements of adult Xavante at São Domingos and at Simões Lopes (Neel et al. 1964:65; Niswander et al. 1967:492). Comparison of Xavante weight and stature with those of other Indian groups shows that the Xavante are among the tallest and heaviest South American Indians (Comas 1971, Table 12, 23). Comparison of the height and weight measurements that I made of the adult Xavante in March 1977 with the earlier ones (see Table 20) shows that they are

very similar, indicating that if subsistence changes are affecting growth, they have not had much effect on achieved stature.

TABLE 20

Mean Stature and Weight of Xavante Adults

MEAN STATURE AND WEIGHT OF XAVANTE ADULTS (ESTIMATED AGE OVER 18)

	<u>Men</u>			<u>Women</u>		
	<u>No.</u>	<u>M. Ht.</u>	<u>M. Wt.</u>	<u>No.</u>	<u>M. Ht.</u>	<u>M. Wt.</u>
São Domingos ^a 1962	24	168.1	67.2	34	154.7	54.0
Silvões Lopes ^b 1964	42	170.2	69.8	39	156.3	57.9
Pimental Barbosa 1977	40	168.9	66.0	48	153.1	57.7

a. Data from Neal et al. 1964:65.

b. Data from Niswander et al. 1967:492

4.5.2 Children's Nutrition and Growth

I weighed the children in the village who were under two years of age four times during the year of observation (for methods see Appendix). I found that from birth through the sixth months babies gained well at all seasons. While I weighed no babies immediately after birth, eight were weighed within a week after birth. The mean weight of these babies was 3.325 kg. All except two weighed more than 3.200 kg. The exception was a pair of female twins, who when first weighed were respectively 2.500 kg, and 2.700 kg. Although small for age, these twins gained weight well, and when I left the village they were thriving at 10 months of age.

It has often been observed from studies in Third World countries that babies do well during the first few months -- and in fact often grow more rapidly than in developed countries. (Eveleth and Tanner 1976:241-242; McGregor et al. 1961, 1968). But after six months they fall behind in relation to Western standards. This is probably because supplementary foods are not available or are not sufficient, and after six months of age breast milk alone is not sufficient to support rapid weight growth (Jelliffe 1968). I observed a similar effect among Xavante children. The mean weight of eight boys between the ages of three and five

TABLE 21
Children's Weight for Age at Different Seasons

Children's Weight for Age, at Different Seasons

Age group	September, 1976				November, 1976				March, 1977				July, 1977			
	N	Mean age (mo)	Mean wt (kg)	% of standard	N	Mean age (mo)	Mean wt (kg)	% of standard	N	Mean age (mo)	Mean wt (kg)	% of standard	N	Mean age (mo)	Mean wt (kg)	% of standard
0-11 mo																
Boys	6	2.6	5.75	103.3	7	3.8	6.42	101	9	6.9	7.85	97	5	4.3	5.74	94
Girls	5	3.8	4.66	85.7	5	3.2	4.92	96	5	4.5	6.06	97	8	5.8	6.29	95
Both sexes	11	3.1	5.26	95.4	12	3.5	5.79	99	14	6.1	7.21	97	13	5.2	6.08	95
12-23 mo																
Boys	6	17.0	9.37	83.2	6	19.2	9.70	83	6	21.6	10.74	89	4	16.4	9.73	88.0
Girls	9	15.9	8.80	84.8	8	17.7	8.70	81	9	20.4	10.11	90	3	21.3	10.70	94
Both sexes	15	16.4	9.00	84.1	14	18.3	9.13	82	15	20.9	10.35	89	7	18.5	10.14	90

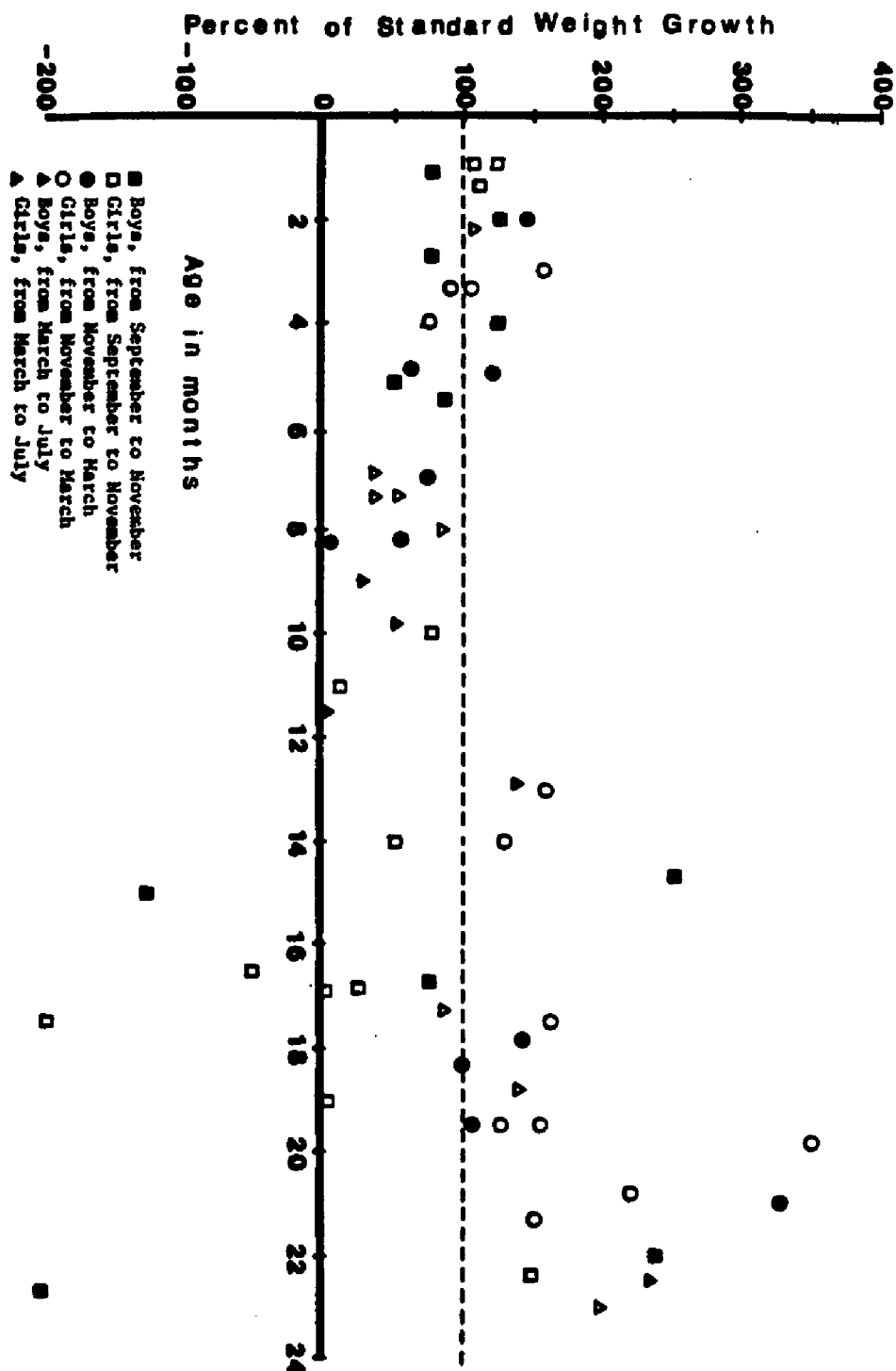
* "Standard" is weight for age according to "A Growth Chart for International Use in Maternal and Child Health Care" (WHO 1978).

months was 106% of standard (W.H.O. 1978) weight for age. The mean weight of four girls (including the twins) weighed between the same ages was 99.3% of standard. Xavante children are not fully weaned until three years or over, even if there is a younger sibling. Supplementary food is introduced after six months of age; this consists of boiled rice, mashed-up sweet manioc or bananas, and bits of meat or fish. Powdered milk and commercial baby formula are not found in the village.

Figure 17 shows the weight growth of individual children at different ages and at different seasons. The weight growth of a child during the interval between two weighings, as a percent of the standard weight change for a child of that age for the interval, is indicated on the scattergram by a different symbol for 1) the interval between the September weighing and the November weighing, 2) the interval between the November weighing and the March weighing, and 3) the interval between the March weighing and the July weighing. The age assigned to the child is that reached at the midpoint between the two weighings.

The scattergram indicates that up to six months of age there is little decline with age in rate of weight growth, and seasonal influence appears to be negligible. Sixty percent of the comparisons between weighings of babies in the 0-5 months age group showed a weight gain greater than 100% of standard.

Figure 17: Weight Growth of Xavante Babies at Different Seasons



From six through 11 months there is a gradual decline in rate of weight growth, still with little apparent seasonal effect. The mean weight of four boys weighed between the ages of nine and 11 months was 92.7% of standard. The mean weight of six girls weighed between the same ages (again including the twins) was 85.5% of standard.

Table 21 shows that the mean percent of standard weight for age of the 0-11 months age group varied little by season. The variation between a high of 99.2% of standard (in November) and a low of 94.5% (in July) seems more closely related to the average age of the sample of babies observed at each weighing. Due to small sample size the mean weight of the girls is depressed by the small-for-age twins, especially in September when they were born. For the 0-11 month age group, seasonal change in weight growth is non-significant (by Wilcoxon signed-ranks matched-pairs test) at any season. It is probable that babies up to one year of age are primarily dependent for nourishment on mother's milk, which becomes increasingly inadequate as they get older.

After 12 months, as children become more dependent on the general supply of food in the village, a pronounced seasonal effect becomes apparent. Children in the 12 to 23 months age group dropped from a mean of 84.1% of standard weight for age in September to 81.9% in November (see Table 21).

This was the season when garden labor was most intense and when rice stocks were running low. Labor time spent in wild food procurement reached its low in October (see Table 16). All but three of the 12 children in this age group showed less than 100% of standard weight gain for age during the interval between the September and November weighings (see Figure 17). Two of the children gained no weight, and four showed a weight loss. The decline in percent of standard weight for age from September to November is significant for this group (by Wilcoxon matched-pairs signed-ranks test, $p=.05$, one-tailed). It is probably not a coincidence that two of the three children who showed greater than standard weight gain for age belonged to families that had grown extra rice the previous season with the intention of selling it. Since transport problems had prevented them from selling all this rice they had a considerable amount stored at the Indian post, which they consumed as needed.

During the next interval between weighings, from November to March, weight growth for age of the children in the 12 to 23 months age group showed an almost completely opposite trend from the previous interval. All the children in this age group gained more than standard weight gain for age at this season. The increase in percent of standard weight gain for age is highly significant (by Wilcoxon matched-pairs signed ranks test $p=.001$, one-tailed). The average weight gain for the group was 175% of standard weight gain

for age, but the older children appeared to show the greatest relative weight gain (see Figure 17). By March foods from the current harvest had been eaten in the village for about two months.

The same trend continued during the period from March to July. There are only five comparisons for weight growth of children in the 12 to 23 months age group for this interval, but four of these five children showed greater than 100% of standard weight gain.

These observations indicate that among children between the ages of one and two years a lag in weight gain during the planting season was followed by a spurt after the harvest. One result of this pattern of seasonal changes in rate of weight growth would appear to be that for those children who reached their first birthday before the harvest, the deceleration in weight growth that started at about the age of six months would continue until the harvest. Those who reached 12 months of age after the harvest, when garden foods were plentiful and people had time to collect wild foods as well, would have several months of accelerated growth before the next season of shortage, at a crucial stage of development. (For seasonal variation in per capita consumption of different types of foods, see Table 19). This might mean a considerable difference in the probability of survival of children born at different seasons of the year (see McGregor et al. 1968).

Figure 18 summarizes, by month and seasonal activity, fluctuation in weight for age of children up to two years of age, variation by season in per capita consumption of wild and cultivated foods, and percent of labor time devoted by adults to food production and to wild food procurement.

Figure 18: Seasonal Variation in Children's Weight, Food Consumption, and Subsistence Labor

Percent children "normal" or "advanced" by weight for age and sex, by season.

0-11 months 12-23 months

Cultivated foods consumed per capita per day, by season, in grams of edible portion.



Rice



Manioc

Wild foods consumed per capita per day, by season, in grams of edible portion.



Meat and Fish

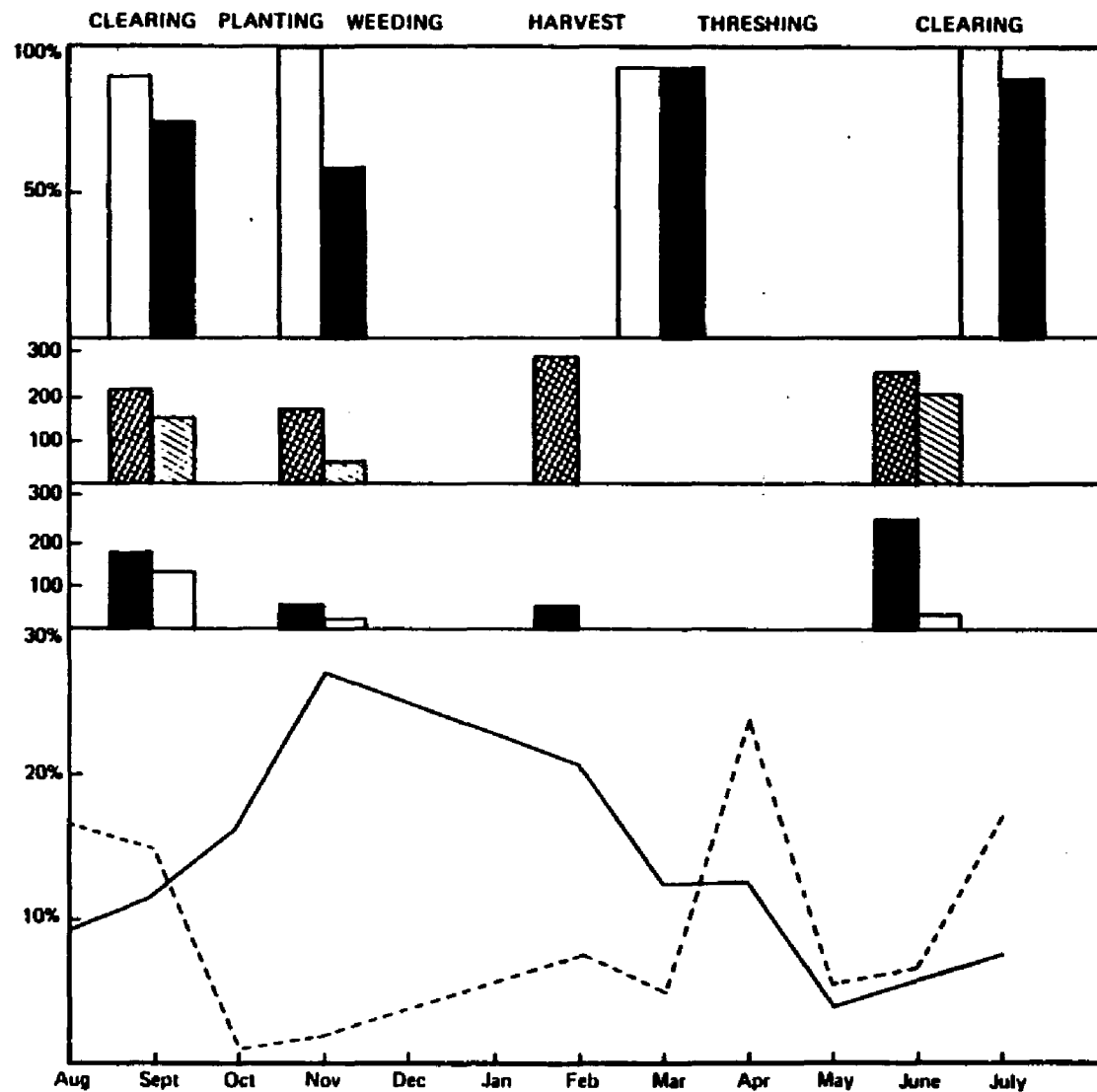


Vegetable

Garden and wild food labor as a percent of all adult activities by month and season.

Agricultural labor

Wild food labor



4.5.3 Comparison with Other Studies of Seasonal Variation in Weight

A number of studies have been done of weight fluctuation associated with seasonal variation in food supply among hunter-gatherers (Lee 1979; Truswell and Hansen 1976; Wilmsen 1978), and among subsistence agriculturalists (Hunter 1967; McGregor et al. 1961, 1968; Nurse 1975; Chen et al. 1979). These studies suggest some interesting comparisons with the Xavante experience.

4.5.3.1 Hunter-Gatherers

The !Kung San, hunter-gatherers of the Kalahari Desert, are notably small and thin, and there has been considerable discussion among investigators who have studied them as to whether or not they can be considered undernourished. Truswell and Hansen (1976:190) believe that the small stature of the !Kung is probably due to "chronic or seasonal caloric insufficiency." They found that there was an increase in skinfold thicknesses from October (the dry season) to April/May (the rainy season). For adults the change was significant. This would imply considerable fluctuation in fat stores. However, with the exception of calories the !Kung seem to have a well-balanced diet, with no evidence of qualitative nutritional deficiency (Truswell and Hansen 1976; Metz, Hart, and Harpending 1971).

Wilmsen (1978) found seasonal weight fluctuations of up to 6% in the adults of a group of !Kung foragers. This degree of variation is as high as that reported for African agriculturalists under environmental stress (Hunter 1968) and considerably greater than the seasonal variation that Wilmsen found among the Herrero pastoralists that share the !Kung territory. Wilmsen believes that much of the variation in weight among the !Kung is related to seasonal variation in the food values of the wild plants that provide the staples of the !Kung diet. He points out that nuts (including the mongongo nut) and leguminous beans, foods that are rich in proteins, fats, and calories, ripen in quantity only at certain months of the year. At other times the plant foods available may be mainly berries, fruits, and wild cucumbers which contribute mostly vitamins and fiber. Wilmsen's data also showed that there was seasonal variation in quantity of meat consumed -- from 15 g per capita per day in December to 220 g per capita per day in June. Births to !Kung women eating bush foods were more frequent in March/April. These babies would have been conceived in June/August when the calorie/protein intake was highest and weights were at their peak. Births to !Kung women who were living among the Herrero, and therefore consuming milk and maize, were more evenly distributed through the year.

Wilmsen's findings would appear to support the "notion" that, since foragers are "more intimately associated with

their environments [than cultivators] hunter-gatherer populations are, therefore thought to be more immediately affected by environmental variables and to be more sensitive to perturbations in these variables" (Wilmsen 1978:65).

Lee (1979:440-441), however, believes that Wilmsen's findings have been misinterpreted. At the time of Wilmsen's study, in 1975-76, the !Kung at the /Xai/Xai water hole, where Wilmsen did his study, had become heavily involved in manufacturing handicrafts for sale. "What were the !Kung doing when they should have been out hunting and gathering?" Lee asks. "We have to consider the possibility that they stayed at home precisely to manufacture the \$2300 worth of crafts sold to Botswana-craft, a process that would take many hundreds of hours away from subsistence... Instead of showing the range of variability in nutritional stress among foragers, the Wilmsen study shows how fragile these economies are in the face of mercantile penetration."

The success of the foraging strategy depends on scheduling activities so as to exploit each resource as it becomes available. Anything that interferes with scheduling tends to lower the efficiency of hunting and gathering. Once this occurs, foraging may not provide people with enough food, or it may become more costly in labor time; people may then turn to other strategies, for example increase their involvement in the market. In our

comparative study of four native societies in Central Brazil (Gross et al. 1979) we found that the communities where people had to work hardest to get a living from slash-and-burn agriculture, because of circumscription and environmental degradation, were those where people invested most labor in the market.

Lee (1979:292-308) also made a study, in 1968-69, of seasonal weight changes among the !Kung. The study included people living at a number of different water holes in the Dobe area. Lee found little seasonal variation in adult weights. From July, the season of plenty, to January, when weights were lowest, adults lost not more than 1% or 2% of body weight. Lee concluded: "measured objectively, the season of minimal weight among the !Kung is certainly not a hungry season by the standards of African agriculturalists."

However, the weight changes in a sample of 46 children weighed by Lee four times over the year did show a distinct pattern of seasonal changes in weight growth rate (Lee 1979:298-299). The children showed a substantial weight gain of 7.4% for boys and 8% for girls in the first six months of the year. From July to October the boys gained 0.5% and the girls 1.6%. In the final quarter of the year there was an almost complete halt to weight growth, with the girls gaining 0.9% and the boys losing 0.6%. This indicates that 84% of the weight growth of the combined samples of

boys and girls occurred during the first six months of the year. Children may be more sensitive than adults to seasonal variation in the food supply. Seasonal slow-down in weight growth, followed by catch-up, may help to explain the small adult stature of the !Kung.

We do not have evidence on seasonal changes in the diet and body weight of the Xavante during their nomadic years that would allow us to make direct comparisons with the !Kung. Certainly the Xavante are notably taller and heavier than the !Kung. A comparison of Truswell and Hansen's (1976:176) data on the growth of !Kung children with those collected by Niswander et al. (1967:494) on Xavante children when the Xavante were still living largely by hunting and gathering, shows that between the ages of four and 12 !Kung children were consistently smaller and lighter than Xavante. How much of this difference is due to genetic factors and how much to environment we do not know. The Xavante probably consumed a fairly high-calorie diet. They had maize and beans from their gardens for two or three months of the year, and their wild vegetable staple was starchy roots (Maybury-Lewis 1967:44).

The fact that Xavante mobility was not as affected by change of season as that of the !Kung may be important in comparing the two groups. In the dry season of the Kalahari desert many water holes dry up, and the !Kung congregate

around those that have permanent water. Lee (1979: 302 and 306) suggests that the greater weight loss of the people camped at the /Xai/Xai water hole in January 1968, relative to other areas, was partly due to the higher population density there. Lee notes that the people who were still at /Xai/Xai in January, and therefore weighed in the July-January weight comparison, included a disproportionate number of older and less mobile individuals who had not gone with the groups that made an early move out to the temporary water holes to exploit the new food resources that were becoming available as the wet season began. This again indicates the importance of mobility for hunter-gatherers.

In the cerrado Xavante mobility was not restricted by season. In the dry season, if the camp site chosen was not near a stream, they could obtain water by digging a water hole (Maybury-Lewis 1967:58). The time spent at one place might vary from one day to two weeks, depending on the amenities of the site and on the game or other natural resources in the surrounding country. "There was little seasonal variation in Shavante life. They were able to go hunting and collecting as well in the rains as in the dry season and by these means they were assured of a constant and abundant food supply. There was only one proviso: that they should keep on the move" (Maybury-Lewis 1967:53).

4.5.3.2 Subsistence Agriculturalists

A number of studies (Hunter 1967; Anneegers 1973; Nurse 1975; Chen et al. 1979) provide evidence of seasonal food shortages and concomittent fluctuation in weight among subsistence agriculturalists.

Hunter's (1967) study was carried out in a savanna region of West Africa characterized by low and unreliable rainfall, pockets of population density, and dependence on rainfall cultivation of cereal crops. He found that, on the average, adults lost 6% of their weight between the harvest and the peak of the hungry season, in June. The period of greatest food shortage, in the early part of the rainy season, was also the time when planting and weeding demanded maximum expenditure of calories in physical labor. "Some families, including pregnant women, nursing mothers and children, go without solid food of any sort for one or two days at a time, and men are at a loss as to how to keep up their strength for the daily round of weeding" (Hunter 1967:171). At this season people collected wild vegetable foods -- fruits, nuts and greens -- but these were not enough to make up the food deficit. The pressure on this population was also indicated by the child mortality rate. Data collected from 214 mothers of all ages indicated that 61% of their offspring had died.

Anneker (1973) points out that in West Africa seasonal food shortages are most likely to occur in the savanna regions where the agricultural season is limited by rainfall to a few months of the year. In these regions cereal crops and seasonal hunting provide people with a relatively high-protein diet. But people must depend on the grain harvested at one season to supply them with food for the entire year. The harvest may vary according to abundance of rainfall and other factors. Storage of the crop may not be effective: after the onset of the rains part may be spoiled by mould and damp, and rodents and insects may eat part of the stored grain (Nurse 1975). Since the season of food shortage falls when people work hardest in the fields, adults are favored in the distribution of the remaining food resources, so small children are the sector of the population most affected by food shortage.

By contrast, in the more humid Guinean zones of West Africa seasonal shortages are much less likely to occur, because the variety of high-energy root crops grown allows harvesting throughout most of the year. But children are more likely to suffer from severe protein-calorie malnutrition which is often considered to be a result of weaning children on a diet based on low-protein roots. Annekers (1973:256) concludes: "The ecological circumstances that create the conditions under which seasonal food shortages may occur, and those circumstances

responsible for severe endemic protein deficiency, are mutually exclusive."

A study of the growth of young children in a Gambian village (McGregor et al. 1961, 1968; Billewicz 1967; A. M. Thomson 1977) located in a region where there were pronounced wet and dry seasons, found evidence of seasonal variation in weight growth. The seasonal effect on weight growth became apparent after six months of age -- rather younger than in Xavante children -- and was most intense from six to 18 months. During the rainy season children in this age group grew very slightly or not at all, but there was rapid catch-up growth during the dry season.

Protein deficiency was not apparent in these children, who were weaned on a high-protein diet of millet, rice, and maize porridge. But the child mortality rate was high, with 43% of all children dying before the age of seven. The highest mortality was among children aged nine to 14 months. Of the children in this age group that died, a significantly larger number was born in the rainy season, and died in the rainy season of the following year. The investigators did not ascribe these deaths primarily to undernutrition, even though the rainy season was the time of poor growth, because the children who died were not observed to be significantly smaller and lighter at the weighing before their final illness than those who survived (A. M. Thomson 1977).

Clinical cases of malnutrition that were observed among these children were usually secondary to infection.

During the rainy season, insect-borne diseases such as malaria, and other infections, were most prevalent in the village. The investigators suggested that the reason for the high death rate of children born in the rainy season was that they would reach the next rainy season at an age when their passive immunity to infection was wearing off and they had not yet acquired enough active immunity to resist the increased impact of the infections present in the rainy season. However, it would seem apparent that lowered resistance due to undernutrition must have put all the children at increased risk during the rainy season, and thereby contributed to the high death rate.

The studies in Gambia indicate that the ultimate effect on children of seasonal variation in nutritional status may depend on interaction with other factors. It is probably fortunate for Xavante children that the season when illnesses -- mostly respiratory infections -- are most common is at the beginning of the dry season when both meat and garden foods are abundant.

The way in which child care is reconciled with the agricultural labor required of mothers may also be important, as the season of low food supply usually coincides with planting and weeding the new crop. A. M.

Thomson (1977) points out that in the Gambian village studied women had exclusive responsibility for planting, weeding, and harvesting the rice crop. Mothers took their small babies with them to the fields, but usually left toddlers at home in the care of older siblings. Thus when these children were most vulnerable they were receiving least maternal care. In another study, Chen et al. (1979) found that in a rice-growing region of rural Bangladesh, seasonal fluctuation in the weight growth of babies was apparent. Growth slowed in the months when there was highest demand for women's labor -- in this case for harvesting and processing rice. Observations of breastfeeding women showed that they devoted less time to suckling their babies during the periods when they participated most intensely in crop-related activities.

Xavante women take as active a part as the men in subsistence farming; garden labor time is about equal for both sexes (see Table 16). But most of the time the entire family goes to the gardens as a group, so work seldom separates the young children from their mothers. My spot checks showed that when the mothers of babies under a year old went to the gardens, they took their babies with them 87% of the time. Those who had toddlers one or two years old, and children three to five years old, had their children with them 75% and 76% of the time respectively. When children were left in the village it was almost always

in the care of the maternal grandmother, who was normally resident in the same household as the mother.

These studies indicate that for the Xavante seasonal shortages are not so severe as those reported from Africa. Nor do demands on women's labor appear to be so heavy that they affect child care to the same extent as in Bangladesh. Xavante children get a good start in life, with rapid growth during the first few months, when they rely almost exclusively on mother's milk. Infant mortality is moderately high, but does not seem to be associated with malnutrition. Among toddlers, a seasonal deficit in weight growth seems to be largely made up after the harvest. However, as the dependence of the Xavante on agriculture increases, and as their growing population puts more pressure on resources, their position becomes more vulnerable. Eventually fluctuations in their food supply could become as extreme as those experienced by African subsistence farmers who, like the Xavante, depend on rainfall cultivation of staple cereal crops.

4.6 SUMMARY AND DISCUSSION

The Xavante at Pimentel Barbosa appear to be making a rapid adjustment to subsistence changes that seem inevitable -- given that circumscription of their territory has deprived them of the mobility that made foraging, with minimal agriculture, a successful adaptation for them.

But there is little in the Xavante experience to support the hypothesis that the transition from subsistence based on wild food would necessarily produce "an increased and more reliable food supply." During this transition fluctuation in food supplies may well increase, rather than stabilize, as the group attempts to reconcile the conflicting demands on labor for the collection of wild foods and the production of cultivated foods.

Observation of the process of adjustment to subsistence changes as it affects the Xavante, and similar small groups, may help us to understand better the stresses to which populations were subjected during the prehistoric transition from wild food procurement to food production.

The Xavante experience may also have special implications for the transition to agriculture and for cultural evolution in South America, where there is a distinct dichotomy between regions where agriculture is based on seed crops, principally maize, and those where manioc and other root crop predominate. It indicates that certain pressures may have been specific to those populations that increased their reliance on seasonal grain crops. When the agricultural cycle conflicted with hunting and fishing, a high-protein grain crop would permit such populations to give priority to the requirements of agriculture, but at the risk of suffering from seasonal shortages. To prevent such

shortages it would be important to organize effective storage, and perhaps to control distribution. Populations whose primary dependence was on root crops, such as manioc, that can be stored in the ground and harvested year-round, but are low in protein, would be less subject to seasonal shortage of calories, but under more pressure to continue to hunt and fish to obtain animal protein.

Chapter V

SUMMARY AND CONCLUSIONS

5.1 SUMMARY

I have shown in previous chapters how the Xavante, like other Central Gê groups, pursued for a long time a subsistence strategy based on extensive exploitation of the cerrado environment. As I showed in Chapter 2, they maintained this mode of subsistence through years of resistance against the colonists, perhaps increasing at this time their dependence on foraging, since settlement of miners and cattlemen along rivers cut off the Indians' access to land they could use for horticulture. Mobility also allowed the Central Gê to preserve their political independence. At the same time they became more predatory, raiding the colonists' fields and cattle. When the Xavante were threatened with circumscription by the increasing Brazilian population, they withdrew, severing all contact with whites, and continued their mode of life in isolation for over 80 years. In the 1940's pacification and contact led to social disruption and their numbers were reduced by disease and feuding. Those who were left were settled on reservations which were soon surrounded by large Brazilian-

owned ranches. At present the Xavante are mainly dependent on subsistence agriculture, their population is growing, and they are becoming involved in the local market economy.

In Chapter 3 I showed some of the recent results of contact, circumscription, and sedentarization on the Xavante community at Pimentel Barbosa. For a period after contact conflicts, both within and between villages, were frequent. Feuding was common in Xavante society before contact, but probably became more intense as a result of disorientation brought about by loss of autonomy, sorcery accusations related to the increased mortality from epidemic diseases, and jealousy over "gifts" distributed by the Indian Service. By killing or driving away men of rival factions, the headman Apowê, with his lineage brothers and sons, consolidated political control over the community. I showed how, in this community, fertility and mortality patterns changed through the period of contact to the time of my fieldwork. Fertility, which dropped when child mortality from epidemic diseases was highest, has now increased. Mortality due to acute infectious diseases has dropped, but tuberculosis has become a serious health problem.

In Chapter 4, I described the present subsistence system at Pimentel Barbosa, and contrasted it with the former mixed economy of the same group. I suggested that the crops the Xavante grew before contact, by producing short-term food

surpluses that permitted seasonal aggregation, may have contributed to the effectiveness of collective hunting. By measuring the weight growth of young children over a year, I showed that weight increase fluctuated seasonally. Since the Xavante are still partly dependent on wild foods, I found that food supply was related to the scheduling of adult subsistence labor, being lowest when people were planting their crops and had little time to collect wild food. Studies of African cultivators of grain crops show that they also are affected by a seasonally fluctuating food supply, while the !Kung, as mobile hunter-gatherers, are apparently able to even out their food supply by moving around.

In the present chapter I look at the Xavante as one of the societies of Central Brazil, and suggest some similarities related to their common adaptation to the cerrado environment, and history of resistance to invasion of their territory by whites. I show how the mixed economy all these groups practised permitted relatively large communities to form and cooperate politically and economically, and also to exploit the varied resources of a large territory. I suggest that this type of economy helped these groups to cope with environmental unpredictability without social and economic breakdown. Groups that had this flexibility may have survived when others succumbed. The reason that in many places people continued to practise

mixed economies with limited crops for many centuries may be that this adaptation allowed them to adjust to many environmental changes without losing their identity.

5.2 THE CENTRAL BRAZILIANS COMPARED

5.2.1 Cultural Level of the Central Brazilians: A Problem of Definition

The mix of wild food collection and food production which constitutes the Central Brazilian subsistence strategy, may vary opportunistically, making it difficult to define the Central Brazilians neatly either as hunter-gatherers or as farmers. For this reason their classification is a topic which has long been debated by anthropologists. The early colonists characterized the Tapuya as non-agricultural even when they were observed to plant maize and other crops, agriculture being equated with the intensive manioc production of the Tupians with whom they first came in contact. Anthropologists for a long time continued the tradition of making this contrast, with the result that, until recently, the Central Brazilians were placed on the low end of the scale of cultural development in South America. In the Handbook of South American Indians edited by Steward (1963), Central Brazilian groups were nearly all described in Volume 1, devoted to "Marginal Cultures", i.e., those that did not fit into the other categories of "Tropical Forest", "Andean", or "Circum-Caribbean." Lowie

(1963c:1), for example, wrote: "The Tropical Forest Complex is marked off from the higher Andean civilizations by lacking architectural and metallurgical refinements, yet outranks cultures with the hunting-gathering economy of the Botocudo or with the moderate cultivation of the Apinayé (Gê stock)." It was principally their agricultural practices that were held to distinguish the "Marginals" from tropical forest groups. It was believed, based on the observation of such nineteenth century observers as von den Steinen (1966), that the Bororo, and some other groups did not have agriculture at all. Cultivation, when present, was not only less intensive than that of the tropical forest people, the crop complex was different: even when maize and manioc were raised they were less important than yams and sweet potatoes. Technological backwardness explained the failure of Central Brazilians to plant crops in the cerrado: "A crude dibble was the only implement; inadequate for steppe country, it restricted farming operations to the gallery forest." (Lowie 1963b:382). Even though their agricultural practices appeared to be different, the Central Brazilians were not credited with originality in developing them. Steward (1963:678-679) argued that the tribes of eastern (including Central) Brazil had acquired most of their more advanced cultural features (including farming) from their tropical forest neighbors.

Later, in a volume that summarized the Handbook, Steward (Steward and Faron 1959) reclassified the Gê-speakers and other Central Brazilian groups as "hunters and gatherers who turned farmers" (on a map [p. 12] they are called "farmers/gatherers"). Steward suggested that the Northeastern and Central Gê adopted agriculture, borrowing techniques from tropical forest agriculturalists, when they migrated in relatively recent times from arid regions to the south into areas where there were more extensive gallery forests with soils suitable for agriculture (cf. Nimuendaju 1946:1-2; Maybury-Lewis 1965b, 1979:301-303).

While the Central Brazilians who had agriculture were assumed to have acquired it recently, and therefore to have advanced to a higher level of cultural evolution, Steward and others (Steward and Faron 1959:378; Lowie 1963c:5; Martin 1969) noted that a number of horticultural groups, depopulated after contact by warfare and disease and forced into unproductive habitats, abandoned agriculture and regressed from tribal to band societies. Among these were the Siriono, the Guayaki, and the Nambicuara. Levi-Strauss (1967a:48) held that the Nambicuara, the Bororo, and the Gê-speakers formed in Central Brazil a "kernel of primitiveness" surrounded by tribes of higher cultures. He suggested that the Central Brazilians were not "truly primitive" but that they should be seen as "pseudo-archaic", having devolved under unfavorable circumstances from a "a

higher type of social and material organization." He believed that the egalitarian social forms found in many groups which had recently been described, by Nimuendaju for the Timbira and Xerente, and by Colbacchini and Albisetti for the Bororo, masked constructs which were more complex and hierarchical, and presumably were survivals from the past.

These views of cultural evolution implied a notion of "stages" correlating with agricultural commitment. More recent ideas stress adaptation to specific environments through exploitation of resources at a given technological level. For example, Gross (1979) suggests a view of Central Brazilian adaptation in which their complex but egalitarian social organizations are seen not as anomalous, but as integral factors in their adjustments to a habitat characterized by varied ecological zones and climatic unpredictability.

5.2.2 Community Size, Mobility, and Agriculture

For Central Brazilian groups agriculture seems to have been a seasonal resource, used by all of them to varying degrees, but by none to the extent that exploitation of wild resources was subordinated. Hunting was more important than fishing for most of these groups, and game is soon depleted in the vicinity of a village, as Carneiro (1970), Gross

(1975), Hames (1980), Good (1982), and others have shown. This is no less true in the cerrado than in the tropical forest; perhaps game depletion would occur even more quickly there, for in the cerrado open country and a long dry season made collective hunting an effective technique. This type of hunting has been documented for many cerrado groups: for the Xavante (Maybury-Lewis 1967:42; Pohl 1951; Giaccaria and Haide 1972:59-61), the Apinayé (Nimuendaju 1967:91), the Tapirapé (Wagley 1977:60), the Timbira (Nimuendaju 1946::65), and the Bororo (Steinen 1966:220). As I showed in Chapter 4, for the Xavante collective hunting produces a greater yield of meat per capita than does individual hunting.

Advantage in hunting implies mobility to exploit fresh game areas, while crops are a fixed resource which requires movement only to the extent that soil exhaustion, weed invasion, and other factors lead people to open new garden land. Carneiro (1973) suggested that for the Kuikuru, manioc cultivators of the Upper Xingu region, there was so much land available for planting that village moves for that reason were unnecessary (but cf. Roosevelt 1980:34-35; D. Harris 1972a). In the cerrado, land suitable for farming is restricted to strips of gallery forest along streams, therefore as new gardens became progressively more distant, people might move their village to avoid the long walk to their gardens. Carneiro showed that the Amahuaca community

of the Peruvian montana that he studied moved every year or two, building a new village a few miles away from the old one. They made these frequent moves, he found, not because they needed fresh garden land, but because game in the vicinity of the village was soon hunted out, and unlike the Kuikuru, who were fishers, the Amahuaca depended on game. Amahuaca communities were small, with an average of 15 inhabitants. The village, which consisted of only a few houses, was easily moved, and the distance of each move was short. Carneiro (1970) showed that degree of sedentism is not only a matter of frequency of village movement, but also of community size, and the distance of each move. That is, "the larger a village is, and the longer it remains in one spot, the more sedentary it is, while the greater the distance it is moved, when movement occurs, the less sedentary it is."

All the Central Brazilians maintained large base villages, which remained in the same place for several years. There is evidence that the present Xavante village site was occupied at least three times, once in the 1930's, again in the 1950's and in the 1970's, each time for about five years. During the 1950's occupation Apowẽ's group was joined by another which brought the population to at least 400 for a short time. Between occupations about 15 years elapsed, a long enough fallow period for the garden land to regenerate.

By Carneiro's index of sedentism the Xavante village, because of its large population and relatively infrequent moves, would be considered highly sedentary, if it were not for trekking. In fact, such a large population would soon have exhausted the game and wild food resources in the vicinity of the village if they had resided there all the time. But they were away from the village on trek much of the time. Trekking allowed Central Brazilian peoples to maintain relatively large and permanent villages while depending on hunting for food.

Why did Central Brazilian groups follow this strategy instead of breaking up into small dispersed communities, as many tropical forest hunters, like the Amahuaca, did? Gross's (1979) suggestion that large villages favored defense by providing large numbers of warriors that could be mobilized is borne out by the historical evidence I described in Chapter 2. In Chapter 1, I suggested that village size might also be related to the advantage of group hunting. This strategy, of maintaining large base villages from which long distance treks were made, implied that each Central Brazilian community would require a wide territory for its support.

Apparently many cerrado groups when on trek lived entirely on wild foods, as the Xavante do even today on their relatively short trips away from the village. The

Pororo (Steinen (1966), the Apinayé (Nimuendaju 1967) and the Timbira (Nimuendaju 1946) were also reported to have done so. Foraging while on trek allowed them to range over great distances. Some groups that trek at present take garden foods with them or plant outlying gardens especially for the purpose of supplying themselves when traveling. The Nambicuara do this (Aspelin 1975) and so do the Mekranoti Kayapó (Werner 1978, 1983; Flowers et al. 1982). Werner showed that the Mekranoti, former cerrado dwellers who now live in the tropical forest, spent about 22% of their time on trek, carrying with them large amounts of garden produce. The Mekranoti gathered few wild plants, but according to Werner's time allocation data the men spent more than three times as much time hunting when on trek as they did when in the village. Werner showed that, when in the village, people spent 15 out of 40 sampled days without eating meat or fish, but on trek only on three days out of 41 days observed was there no meat or fish. Daily per capita meat consumption, which averaged 320 g when in the village, rose to 920 g when on trek. Werner ascribes the increased meat consumption on trek to the time that men spend hunting -- over three times as much time when on trek as when they are in the village. Good (1982) recently showed that some Yanomamö communities undertake long treks, carrying plantains from the gardens with them, and may spend as much as four to six months out of the year away from

their villages. I suggested in Chapter 4 that before the Yavante were circumscribed their maize harvest, by providing a large quantity of food at one time, allowed people to remain assembled in the village during the dry season, when collective hunting with fire surround was practised. We can see that Amazonian peoples may actually use garden foods to facilitate trekking or collective hunting: that is, their three food sources, hunting, gathering, and horticulture, are integrated and co-dependent elements of their total subsistence strategies.

Another interesting aspect of the mixed economy is that there is no clearly defined boundary between gathering plant foods and cultivating them (see Levi-Strauss 1963:465). As Giaccaria and Heide (1972) showed, the Xavante sometimes saved some of the wild tubers that they collected for later planting. Posey (1982) found that the Gorotire Kayapó, among whom he did fieldwork, practised "nomadic agriculture."

While routinely scavenging about the forest, the Indians gather dozens of plants, carry them back to their forest camp sites or trails, and replant them in natural forest clearings. The plants include several types of wild manioc, three varieties of wild yams, a type of bush bean, and three or more wild varieties of kupá [Cissus sp.] [Posey 1982:23].

Friel (1978) found when traveling with several different Indian groups that they collected fruit in extensive groves of trees that they said their fathers and grandfathers had

planted long ago. They told Frikel that planting palms and other fruit-bearing trees was customary in "the old days" when their people were more nomadic, and they added that the descendants of those who planted the trees had the prior right to harvest from them. Stands of useful trees, whether planted or not, were resources that apparently were sometimes disputed by neighboring groups. Nimuendaju (1946) reported that the Kanela fought with the Krahó over stands of babassu palms (Orbignya sp.) A group of young Bororo clashed with the Xavante when the Bororo entered Xavante territory to collect urucu (Bixa sp.) pods used to manufacture body paint (Colbacchini and Albisetti 1942).

Whether certain plants are regarded as cultivated or wild may be a matter of how intensively they are exploited. For example the Xavante harvest piqui (Cayocar brasiliensis) fruit from trees whose location they are familiar with. When the fruit was ripe, I saw several parties of men, women, and older children, go to collect piqui and bring back basketfuls of the fruit to the village. They consumed it all within the next few days. Maybury-Lewis (1967) reported that in 1958 piqui made a contribution to the Xavante diet during four months of the rainy season. The Xavante apparently exploited piqui trees as a wild resource; as far as I know they did not plant the trees and they used no special techniques of preparing the fruit for storage. In contrast, the Kalapalo of the Upper Xingu, who depend on

fishing and have large gardens of bitter manioc, plant piqui trees near their village -- trees that will not bear fruit for at least a generation (Basso 1973:35). After they harvest the fruit, the Kalapalo eat some of it raw or cooked, but most of it is grated and put through a fermentation process which allows the fruit to be preserved for nearly a year. It seems that the way both wild plant foods and cultivated crops are used is not rigidly fixed, but varies from group to group and from time to time, depending on degree of sedentism.

5.2.3 Warfare, Mobility, and Social Organization

While all Central Brazilian groups practised agriculture, there is good evidence that they were able to support themselves, at least for a time, without planting crops. When they did this, it was usually because they had recently been attacked, had made a raid, or had suffered some other disturbance such as an epidemic. For example, informants told me that after men from Apowé's group killed several members of the first Indian Service team sent to pacify them, they abandoned their village and spent two years on trek without planting crops for fear of reprisals from the whites. Giaccaria and Heide (1972) collected from informants several accounts which indicate more or less extended periods of nomadism following epidemics and intervillage attacks. Werner's (ms.b:50-51) informants told

him of a village split after which the splinter group did not build a new village, but wandered in the forest, living off wild fruits and the bananas and manioc they found in abandoned gardens, augmented by some food they stole from settlers; eventually they joined another Kayapó community and began to plant crops again. These wandering periods were undoubtedly times of stress and considerable hardship, but the tactic must often have allowed groups to survive catastrophic events, which became more frequent after the invasion of their territory by white colonists. Since the very fact of contact with whites was disruptive, it is not surprising that Western observers who met such groups often believed them to be completely nomadic foragers.

We know that historically Central Brazilian communities linked by language and genetic affinity were spread over vast areas (see Chapter 2). In the mid-18th century, groups speaking Central Gê dialects had villages from the Gurgueia river to the Araguaia, a distance of about 800 miles. Writing in 1723, Antonio Pires de Campos (Taunay 1954:181-192), the bandeirante who fought the Southern Kayapó with the aid of Bororo warriors, described the Southern Kayapó as a very numerous people who subsisted on their large gardens where they grew sweet potatoes, maize, and other crops. They raided from the Tieté river westward as far as the Pardo river and Camapoã -- a distance of over 400 miles -- where they attacked flotillas of canoes bound

for the gold mines of Mato Grosso. Later, after the gold strikes in south Goiás, the Southern Kayapó became the scourge of the mule trains that traversed the road between Goiás and Cuiabá. As time went on they were increasingly described as treacherous and elusive. In 1760 Governor Mello (RIHGB 1918:61) wrote: "[The Kayapó] have no fixed dwellings, but wander continuously around the cerrado, living on game and wild fruits" They may indeed have become more nomadic, or merely have appeared so because they had moved their villages westward, as the Xavante did a century later, and were raiding far from them.

Central Brazilian social organization, with kin and nonkin sodalities and dyadic ties that extended throughout the tribe, tended to maintain relations among distant villages, even though these relations were often hostile. They formed the basis for political alliances between communities that were economically autonomous, and wove a social network around each individual that linked him to distant villages (see Deetz 1968:284). Maybury-Lewis noted that the Xavante were keenly interested in news from other villages: "They felt that what happened in other Shavante communities, however remote, politically affected them, especially since they might want to transfer to them at any time" (Maybury-Lewis 1967:205). If the balance of power shifted in any community, the weaker faction might have to flee or be killed. Maybury-Lewis noted that right of asylum

was universally granted as a matter of reciprocity, for those who granted it might need it themselves at some future time. Newcomers were accepted into the community on equal terms with those already there, and aligned themselves politically as they saw fit. I showed in Chapter 3 that, as long as the Xavante maintained their exogamous clan system, feuding might have the effect, not of separating communities, but of linking them more closely; for when a village split left a village demographically dominated by one lineage, young men would have to leave their home village to find wives, in accordance with the matrilocal residence rule. For example, a group of classificatory brothers came from Marawatsde in the early 1950's and married five of Apowẽ's daughters. Other Central Brazilian societies put greater stress on nonkin relationships. According to Werner (1980) the Mekranoti could define factions in several different ways: with relatives, through membership in men's societies or, in one documented case, by age grade affiliation. On one occasion, a Mekranoti community accepted a previously hostile group into the village because the newcomers shouted "ceremonial friend" to one of the Mekranoti men. These mechanisms, by allowing the survivors of any disaster to be incorporated into an unaffected group, undoubtedly mitigated the effect of the depopulation that followed contact. Gross (1979:390-392) argued that ceremonialism, as the expression of social

forms, probably increased after contact, Ceremonies that appeared to have died out were revived when small groups joined together, providing enough people to carry them out.

Social ties with their unpacified kin probably helped some Indians to survive the periodic attempts at settlement in aldeias during the 18th century. As long as these ties were maintained, settled Indians could rebel and leave when ill-treated, often taking with them the firearms they had learned to use, and resume hostilities. As Governor Mello (R.I.H.G.B. 1918:59) commented sourly in a letter to Lisbon: "These [Akroá] are astute and inconstant heathen. They came to the aldeias to see what advantage they could gain; they stayed there only as long as Your Majesty supported them at the cost of the Royal Treasury, none of them cared to learn a trade or to cultivate the soil."

In spite of numerous attempts to make cerrado Indians economically useful, economic ties failed to develop between Central Brazilian native groups and the settlers. In the mines Black slaves were employed, for the Indians were not only unwilling workers, they quickly died from diseases; nor did cerrado Indians make good boatmen, for they did not build or use canoes. Unlike the tropical forest, the cerrado had few commercialized wild products, such as valuable hardwoods, spices and cacau, and later rubber, that Indians could gather for their masters (see Boxer 1964:278).

As we showed (Gross et al. 1979) it is only recently, with increased circumscription and degradation of their habitat, that some Central Brazilian groups have entered the regional market economy. Many other lowland South American native societies became fragmented as individuals were economically tied to white traders. Murphy (Murphy and Steward 1956) showed how the collective bonds that held together Mundurucu society were eroded when men began working as rubber collectors. Families abandoned the large villages and settled near rubber trails, or formed loosely-knit communities of nuclear families. Some Central Brazilian societies, even after they had been settled for decades, retained, like the Kanela of Maranhão, a rich ceremonial life, and to a great extent were economically self-sufficient. Relations between the Kanela and the settlers were mutually hostile and suspicious; the settlers coveted the Indians' land, and the Indians struggled to keep the little land they had left. As Nimuendaju wrote, "The Indian still considers his hereditary territory as his own, irrespective of whether the settlers have duped a chief into permitting them to reside there. The native treats it as foregone conclusion that he may, from time to time, appropriate a head of livestock from the herds kept on Indian land -- all the more so as hunting always decreases as the cattle increase" (Nimuendaju 1946:5).

As I show in the next section, the Xavante determination to defend their lands by presenting a united front has caused former hostilities to be put aside; Xavante who as young men may have raided one another's villages are at present, as community leaders cooperating in forming political pressure groups that go to Brasilia to lobby, with considerable political acumen and sophistication, for the recognition of their rights.

5.3 THE FUTURE OF THE XAVANTE

As Apowê's health deteriorated in the last months of my stay, speculation arose as to who would succeed him. The apparent candidates were Waroîi, Apowê's oldest son, who was known to be a traditionalist, and Tsuruprédu, the son of Apowê's brother Pratsé, the most fluent Portuguese speaker of the leading men, who tended to make something of a show of his contacts with Brazilians.

Tsuruprédu had taken a leading role in convincing the other men to accept a deal by which the Pimentel Barbosa Xavante accepted the cession of a portion of their reservation to a group of local landowners. The ranchers had promised the Xavante 110 head of cattle, a new pickup truck, and to build a bridge which would make a dirt road across the reservation passable for the truck. But the deal soon soured for the Xavante. Most of the cattle were never

delivered, and both the truck and the bridge soon broke down. When I left the village the Xavante were on the point of repudiating the whole deal and claiming their land back.

Relations between the Xavante and the landowners whose farms bordered on the reservation were characterized by mutual suspicion and "negative reciprocity." Some landowners tried to conciliate the Xavante who bitterly resented the loss of their lands, with small gifts and favors: truck rides to a fishing site, the loan of a tractor for a day, a gift of manioc flour. On other occasions a party of young hunters might stop by a farm and adopt a threatening posture, sometimes helping themselves to food and other supplies. On such occasions the farmer would complain to the Indian agent who could do little except remonstrate with the Indians. The agent assigned to the post is supposed to mediate relations between Indians and outsiders, but this is often a thankless task, for he seldom has much influence with either.

In Brazil, the National Indian Foundation (FUNAI), has responsibility for the tutelage of native groups and the protection of their territories. This agency is always under pressure from, and sometimes is controlled by, policymakers whose priority is national economic expansion (Davis 1977; Gross 1982). Indian reservations are federal land, and each Indian group is theoretically settled on the

land it occupied at the time it was pacified. However, the area finally designated is the result of many political pressures and compromises, and usually has little relationship to the territory the Indians would require to continue traditional subsistence practices.

Indian lands are almost always under dispute because they are not held by title. Titles are held under state law, while the territory of an Indian reservation is designated by federal decree. For an account of contradictory actions by the federal and Mato Grosso state governments in the 1950's which led to the break-up of Xavante territory see Maybury-Lewis 1967:7-9.

To obtain a loan for agricultural development from the Fanco do Brasil the landholder must obtain a certificate from the Indian Agency to the effect that there are no Indians residing on the land. Venal FUNAI agents have alienated Indian territory by issuing such certificates, sometimes for land that includes the actual site of an Indian village. Examination of a land title map at the municipal seat of Barra do Garças showed that many "owners" held title to land within the Pimentel Barbosa reservation. These claims have not been occupied, but only because of the determined attitude of the Indians themselves. The situation is complicated by the fact that reservation boundaries have been shifted in response to political

pressure. In 1977 the Pimentel Barbosa Xavante were pressing for the return of their land area to that designated in 1972.

In 1972 the Pimentel Barbosa reservation was marked out by FUNAI with the western boundary at the highway to São Felix. But it was found that the lands on the eastern side of the highway were already occupied by claimants whose titles were supported by FUNAI certificates of "no Indians present" (Estado de São Paulo 1979). Rather than expropriate these lands, whose owners could claim indemnization for improvements they had made, it was decided to re-draw the boundaries of the reservation, placing the occupied tracts outside Indian land. But in this process the Xavante lost land to the south as well, for the FUNAI cartographer who made the survey and drew the new reservation map switched the names of two rivers at the southern end of the reservation, so that a stream known to both Indians and whites as "Dirty Water Creek" appeared on the map some 30 km north of its true location. This man subsequently left FUNAI and became a prominent landowner in the district.

The Xavante were not interested in the map. For them, the southern boundary of their land was Dirty Water Creek. In 1977 they were asserting their right to the land as far as this stream by opening a trail across it, alarming the

owners of the farms, who had taken title and had already cleared and built on the land. Leading men of the village were also traveling to Brasilia to demand that FUNAI expel the titleholders and return their land.

In April of 1978 Apowẽ died. His son Warodi, who succeeded him as headman, encouraged a more militant stance, as he had already told me he would after his father's death, accusing FUNAI of making promises to the Xavante that were never carried out. In December 1978, a party of men from Pimentel Barbosa attacked the four farms on the disputed land to the south, burned and looted farm buildings, and forced the ranchers to remove their cattle and farm machinery. While the Indians harmed nobody, they made it abundantly clear to the frightened farm workers that they were to get out. One of Apowẽ's sons declared to a reporter from a São Paulo newspaper (Estado de São Paulo 1979) that they were carrying out the wish expressed by Apowẽ before he died that they should throw the whites off Xavante land.

The Xavante were aware that they would have no security on their land until FUNAI surveyed and legalized the boundaries that they claimed. Some of the local landowners were threatening reprisals: "As soon as ten Xavantes die, this whole nonsense will stop. The Indians are brave only so long as nobody stands up to them. If they attack and the first ones fall, the others will run away. Haven't you seen that in Western movies?" (Estado de São Paulo 1979).

Again, in May 1980, the Pimentel Barbosa Xavante went to Brasilia, but this time accompanied by leaders from other Xavante villages. Symbolically armed with bows and arrows and ceremonial staffs, the 30 Xavante leaders arrived in Brasilia and demanded to be heard by the new President of FUNAI, Nobre da Veiga. When Nobre da Veiga said that he would speak "only with the chiefs," the Xavante replied, "We are all chiefs," and pushed their way into the President's office, accompanied by several federal deputies and by journalists whose presence they insisted on. They also demanded that the police vehicles that had surrounded the FUNAI building be withdrawn before they would talk. In the President's speech to the Xavante, which was widely reported in the Brazilian press, it was clear that they had succeeded in putting him on the defensive, for he admitted previous corruption in the agency, and promised that restoration of Pimentel Barbosa land "would be studied."

As the Xavante see it, their relationship with FUNAI has been characterized by a long series of "broken promises." In the early days of pacification the government's goal was to attract nomadic groups to the Indian posts and encourage them to settle there by distributing "gifts." Indian Agency reports from the 50's contain pages of lists of knives, fishhooks, machetes, axeheads, cooking pots, and blankets, of which Apowẽ's group got the lion's share. These articles were welcome because they made it easier for the Xavante to

carry out their customary subsistence tasks. However, the Xavante responded with indifference to the Indian agent's efforts to encourage them to plant more crops, including manioc (Maybury-Lewis 1967:48-49). By the time the Xavante were no longer able to support themselves most of the year by hunting and gathering, they had ceased to be an impediment to the development of the region. Efforts to help the Xavante improve their subsistence base under the new conditions were occasionally made, but without continuity. In the meantime the Xavante saw the newly-arrived ranchers growing large quantities of rice, using tractors, trucks, and airplanes and began to accept this as the model they expected to follow in their own development. In 1977 the Xavante welcomed a FUNAI development plan which was to lead to large-scale land clearance, rice growing and cattle raising on Xavante reservations, and were becoming angry when the promised tractors did not arrive.

Recently, the land disputes at Pimentel Barbosa appear to be settled, temporarily at least, in favor of the Indians (Queiroz 1980). According to the same writer, the development plan for mechanized rice production on Xavante reservations was again in progress.

Because of their proximity to Brasilia, the Xavante have acquired more skills in dealing with the bureaucracy than other Indian groups, and therefore have secured more

attention from FUNAI. Their style includes dramatization of their warlike past, appeals to justice, willingness to negotiate, insistence on dealing with high officials, and awareness of the power of publicity. The Xavante leader who has carried this farthest is Mário Juruna, from São Marcos, who became famous for taping the statements of FUNAI officials and playing the tapes for the benefit of the press. Juruna, who recently ran for the National Congress as a candidate of the opposition party, and was elected, claims that he intends to represent the aspirations of all Brazilian Indians, not just the Xavante. Juruna sees Indian goals as running parallel with, but not as identical to, Brazilian national goals. When a New York Times correspondent asked him what he would try to obtain for his people if elected, Juruna replied:

The most important thing is the demarcation of our lands. Beside that, we want farm implements and plows for our land, health assistance and ambulances to take care of the sick and education to give Indians a chance to get degrees (New York Times 1981).

Modernization is apparently seen by the Xavante more as a means of defending themselves against Brazilian society than as a way of integrating. Integration is the official goal of the Brazilian government for Indians and discussion is mostly limited to the pace at which it should proceed. But the experience of the Xavante, and other Indian groups with Brazilian society has given them few motives to identify with it (see Gross 1982).

The Xavante believe that their isolation has disappeared forever and that in the future they are going to have to deal with outsiders. The older men at Pimentel Barbosa, for example, when they discussed education, stressed the immediate need for their children to learn arithmetic, as they felt that whenever Xavante dealt with money they were being cheated. They knew that Brazilians often called Indian reservations an economic waste of land, and that they used this argument as an excuse to take it away. The Xavante were aware of class differences between the wealthy landowners of the region and the poor squatters, who were often forced off their subsistence farms when the land they occupied was bought. The Xavante attitude toward poor farmers was patronizing rather than hostile, for they saw that these people had no power.

Probably Juruna's statement of goals for Indians is one with which most other Xavante would agree. In this respect there is little difference between "cultural traditionalists" and "modernizers." Both seem to support what might be called "defensive development."

5.4 SOME HISTORICAL IMPLICATIONS

5.4.1 General Characteristics of Central Brazilian Adaptation

I have shown in this and preceding chapters that native groups of the cerrado region of Central Brazil shared subsistence practices and social systems related to both their physical and socio-political environments. Some of these common characteristics are:

1. The exploitation of seasonally and geographically varied resources, including cultivated crops.
2. A settlement pattern that was alternately nucleated and dispersed, and the exploitation of a large territory by each group.
3. A regional rather than localized view, demonstrated by social interaction among geographically scattered groups.
4. Persistence of regional populations over time, in spite of unpredictable disturbances that led to the extinction of local groups.

Some of the words that come to mind, in considering the overall characteristics of this strategy are "flexibility", "persistence", and "resilience." Holling (1973) defined "resilience" as the property of systems that persist by changing; that is, they have the flexibility to withstand the buffeting of relatively severe and unexpected perturbations by alterations in the variables that comprise

them. In spite of variation, basic relationships among variables are maintained, and thus the integrity of the system itself. The contrasting type of system is "stable"; that is, in a constant and predictable environment it returns quickly to equilibrium after minor disturbances. Under favorable conditions, stable systems produce maximum sustained yield but, being less flexible, under severe pressure they are more likely to break down than resilient systems.

In ecological terms, stable systems are found in constant environments associated with narrow biological niches, while resilient systems are characteristic of variable environments. "Elements, or species, in resilient systems persist, although their numbers and distributions may alter dramatically over time. Their more finely-tuned, stable counterparts are inherently more fragile and less tenacious" (Yellen 1977b:264). As Slobodkin (1968) pointed out, the only real measure of evolutionary success is survival.

Yellen (1977b) applied this concept to human ecology in analyzing the long-term adaptation of hunter-gatherers to desert environments. He found that desert adaptations were characterized by behavioral flexibility, a broad resource base, and social ties maintained among scattered social groups. One would expect that adaptations to savanna environments should share some of these characteristics,

although savannas are generally more favorable human habitats than deserts because their mosaic environments of grassland, woodland, and gallery forest provide varied resources. Humans are probably physically well adapted to living in savannas because they resemble the habitat in which the hominid line differentiated from the pongids. Savannas, by definition, have more rainfall than do deserts, but interannual variation in rainfall, which, in humid savannas like the cerrado varies on the average 15-20% from the annual norm, makes savannas, like deserts, unpredictable environments (D. Harris 1980b). In the cerrado, short dry spells within the rainy season further increase unpredictability. Therefore, while savannas are able to support greater overall population density, and the aggregation of larger human groups for longer periods, survival in savannas, as in deserts, may depend on maintaining the flexibility to respond to unpredictable variation. I would also suggest that in Central Brazil, after the initial contact between Indians and whites, the frequency of unpredictable disturbances increased. Resources might disappear, as game was driven away, or access to gallery forests along rivers was blocked by cattle raisers and mining settlements. The entire population of a village attacked by a bandeira might be killed or enslaved, or a local population might be practically wiped out by an epidemic. Under these conditions, the flexibility to act

opportunistically might mean the difference between survival and extinction.

We would expect that native groups in the cerrado would resist sedentarization and dependence on agriculture -- as they did -- because specialization would compromise the resilience of their adaptive system. Even though they had potentially high-yielding crops, they did not concentrate on cultivation to the exclusion of other resources. Mobility was essential to their political and military strategy as well as to their subsistence strategy. As Irons (1974) showed for pastoral nomads, when mobility allows people to defend themselves effectively against external threats it is valued as a means of maintaining their political independence.

5.4.2 The Agricultural Transition

The evolution of agriculture is often described as a gradual change from a broad-spectrum food procurement system to a more specialized one, with increasing concentration on a few of the available plants and animals, usually those that have the greatest potential for high yields under human protection. These domesticates eventually come to provide the bulk of the diet. With increased specialization on a few fixed resources, sedentism also increases. This implies a change from a "resilient" to a "stable" system. Instead

of making opportunistic choices among a variety of seasonally available resources, people alter their local environment to increase its productive capacity. Some of the ways they do this are by investing more labor in preparing and weeding gardens, by selecting cultigens with maximum yield to produce surpluses, by combatting other predators, such as birds and insects, that compete for the harvest, and by defending their croplands against other human groups.

It often seems to be assumed that once people started tending plants, the progression to effective agriculture was an ongoing, gradual, but inevitable process. However, cultivation probably began, not as a means of specializing but, on the contrary as a way for further increasing the range of resources in a broad-based economy. As we have seen, there is no fixed line between the use of wild plants and their cultivation. Once manipulation of plants began, however, it tended to increase for, as Rindos (1980) showed, it established a symbiotic relationship between predator and prey -- humans made certain plants dependent on their protection by providing environments that favored their increase, and in turn humans became more dependent on those plants.

Christenson (1980a:36-37) suggests that the change in food niche breadth for a growing human population over time

is curvilinear, going from narrow to broad and to narrow again. At low densities people will specialize in procuring a few low-cost resources. As population grows, the use of these resources will be intensified, and new resources (which may include cultigens) will be added, making the food niche more diverse. Cultigens will contribute increasingly to the diet, but diversity will not decline until resources that do not respond to intensification are overexploited, or until scheduling conflicts appear. The Xavante at present are at this stage. As I showed in Chapter 4, difficulty in reconciling the need to intensify labor to increase crop production with the procurement of wild foods may result in a seasonally fluctuating food supply. In the presence of pressures, such as population growth, to increase crop production, people will probably be forced to abandon the procurement of wild resources which require their absence from the village for long periods. Ross (1978:6) argued that this conflict might be one reason that certain tropical forest groups taboo the consumption of large game animals.

Because of these pressures, the stage of transition into agricultural dependence may be brief, compared with the long period during which crops were incorporated into a broad-spectrum resource base. For example, in the Tehuacan Valley in Mexico, the period during which people scheduled subsistence activities in terms of particular seasons and micro-environments, with gradually increasing use of

cultigens, lasted for over 5000 years. But once settled village life and subsistence food production began it was accompanied by rapid population growth. This phase lasted about 700 years, and was followed by the rise of templated villages, the beginning of irrigation, and many other cultural innovations (MacNeish 1971:315). Similar rapid changes, once a commitment to food production was made, took place in many other parts of the world. When applied to this final transition, the term "Neolithic Revolution", is probably not a misnomer, given the rapidity with which it has been observed to take place in many different regions, and the profound systemic changes that resulted from it. Agricultural dependency however, did not always develop as a result of population pressure. In some places, sedentism was made easy, and might occur before agriculture became important, because people were able to exploit certain wild resources, such as fish, from a fixed location (Lathrap 1977:735; Carneiro 1970). Also, as we have seen, some people, like the Mekranoti, seem to be able to integrate fairly intensive production of crops -- in the Mekranoti case primarily root crops -- with extended periods of trekking. Agricultural labor is less seasonal in the tropical forest than it is in the cerrado, and manioc is often harvested year-round, so scheduling conflicts are probably less severe.

In many instances, it seems that the agricultural transition was costly in terms of human health and well-being. Environmental perturbations did not cease, and while agriculture, as a stable system, had high potential for production under constant conditions, conditions were not necessarily constant. People with a broad-based economy might survive crop failure with relatively little hardship by exploiting alternative resources, while a similar event might be disastrous for an early agricultural population.

5.4.3 Physical Effects of Agricultural Dependence

Physical examinations of the Xavante soon after they were pacified, and before they had adopted rice as a staple (Neel et al 1964, 1968; Niswander 1967; Niswander et al. 1968; Weinstein et al. 1967) showed that they were in good general physical condition, even though they were beginning to suffer from acute epidemic diseases. The investigators were particularly impressed by the excellent condition of their teeth, with little caries and few malocclusions. In 1976-77 I found that there were still few Xavante with visibly missing teeth, and although people came to me with many minor health problems, I remember no complaints of toothache. This contrasts with the poor teeth I observed among the Bororo, who have been in contact with Brazilian society for a much longer time. When I compared the measurements of weight and stature of adult Xavante that I

made in 1976 with those taken 16 years earlier (see Table 20) I found little change; however, only the younger adults at Pimentel Barbosa spent their years of growth after the change in subsistence.

The seasonal fluctuation in rate of weight growth that I observed in Xavante children under two years of age I interpreted as a probable indication of conflict between the labor demands on adults of cultivating crops and procuring wild foods. Of course, there is no way of knowing to what extent food supplies fluctuated under their former subsistence regime. My study does indicate, however, that this population, as it shifts from emphasis on foraging to greater dependence on crops, appears to experience conflicts in scheduling subsistence activities that may affect nutrition, and which may become a pressure, as wild foods become more difficult to obtain because of increasing scarcity, or circumscription of the group, to abandon the exploitation of wild foods and invest more heavily in crop production.

Studies of past populations that made the transition to agriculture tend to show, through skeletal evidence, that dependence on agricultural was often costly in terms of individual health and well-being. For example, a study by Scott and DeWalt (1980) of tooth pathology in a series of populations in coastal Peru shows that the teeth of early

hunter-gatherers had a high level of attrition, with numerous abcesses, but less tooth loss from caries than a later population dependent on maize agriculture. Extensive tooth loss from caries is so common in early agricultral populations that some physical anthropologists assume that its appearance is in itself sufficient indication, in the absence of other evidence, that the population depended on a high-carbohydrate crop (C. Turner 1979).

Most of the skeletal and dental research comparing pre-agricultural with agricultural populations has been done in the eastern and midwestern United States. Almost all find evidence of greater physical stress as populations became more dependent on agriculture. Demographic studies based on burials show that life expectancy dropped after agriculture was adopted, and infant mortality rose (Lallo and Rose, 1979; Cassidy 1980). Dental pathology of various kinds (Cook 1979; Larsen 1982; Lallo and Rose 1979) and skeletal lesions (Lallo and Rose 1979; Cassidy 1980; Larsen 1982; Cook 1979; Robbins 1977) indicate both acute and chronic nutritional stress. An increase in infections, perhaps related to crowding, is sometimes revealed by skeletal changes (Lallo and Rose 1979; Cassidy 1980; Larsen 1982). The average stature of some populations decreased relative to the stature of earlier populations (Larsen 1982; Cook 1979). Researchers are thus almost unanimous in concluding that aoriculture in the eastern United States was

deleterious to the health of those who practised it (but cf. Perzic 1977). We should probably remember that all these populations were highly dependent on the same staple crop, maize, and that therefore we are looking at the effect of agriculture based on this crop. As Harner (1977:127) noted, while a combination of beans and maize provides relative balanced vegetable protein, they must be eaten together in large quantities, or the protein will be used up as energy. Therefore, in an agricultural economy based on maize even partial crop failure could have serious effects.

5.5 CONCLUSIONS

One of the objectives of this study was to identify some of the pressures that directed and accompanied the transition of past populations to dependence on agriculture. I suggested that, since the Xavante recently changed from a mixed foraging-farming economy to primary dependence on cultivated crops, examination of this shift might disclose effects that were probably experienced in the past, as well as in the present. I also suggested that we might gain some insight into why, in the past, some people increased their commitment to agriculture to the point of dependency, while others, though they cultivated crops, retained a broad-based mode of subsistence. But how does the Xavante case relate to conditions that affected early populations, since their recent commitment to agriculture is primarily the result of acculturation and domination by a modern state society?

The "evolution of agriculture" is often discussed in terms of progressive long-term changes, often assumed to result from the interaction over time of a population with its local environment. Examples of the changes that are often considered to lead to agricultural commitment are genetic alteration in plants through cultivation, population pressure (often seen as the result of natural increase under given conditions such as sedentism or a new resource base), technological innovation, and change in climate (Christenson 1980b). It is true that the history, as we know it, of the Xavante and other Gê groups, can inform us very little about most of these aspects. However, we should probably look beyond the relationship of a population to its local environment, even when considering a "pristine" transition to dependence on crop production. If subsistence changes leading to agriculture often occurred, as many believe (for example Cohen 1977; Harner 1970, etc.), in the context of increased population pressure, inter-group competition for control of resources was undoubtedly an important factor. Selective pressures on a local group may derive not only from "non-equilibrium conditions in the local ecosystem" (Binford 1971:34) but also from non-equilibrium conditions in the local ecosystem of a neighboring population. The Xavante experience may serve to illustrate how this competition may be played out, and the mechanisms by which one group may change through interaction with another.

When the Xavante and other Gê groups appeared in the historical record they were cultivating a range of crops, including a variety of maize probably developed within the region (Briegleb et al. 1958). The earliest accounts that we have of a Gê or related group (Barleus 1940; Marcgrave 1942) date from the mid-17th century. These accounts indicate that the group practised both cultivation and foraging, exploiting wild foods while on trek. At this time there were other similar groups in the same general region, probably varying considerably in the relative importance to their economies of foraging versus cultivation. There were also sedentary groups, mainly Tupian, depending heavily on manioc which they grew on a large scale. All these groups were already struggling to maintain their resource base and their independence against the advance of the colonial frontier. The historical evidence indicates that, at least for a time, the partially-nomadic groups appear to have had an advantage over the sedentary ones in this struggle. The flexibility of their economies and social structures allowed them to resist by abandoning some resources, from which they were cut off by colonial settlement, and adopting others, including, in the early period, predation on the settlers crops and cattle. In effect, they reacted to "population pressure" even as their population was declining in numbers due to warfare and introduced diseases. Recently, after years of resistance to domination, the Xavante became

dependent on agriculture when their mobility was restricted by surrounding ranches and farms, so that the wide territory over which they formerly exploited varied resources was no longer available to them.

Examination of this struggle and its outcome sheds some light on mechanisms through which people altered their economies -- not because circumstances were necessarily identical, but because on many occasions in human history, peoples exploiting the resources of a region through different technologies have competed for the resources of that region.

Shrire (1980) warns us against assuming that any modern group can be regarded as "living representatives of early hunter-gatherers" (see also Ember 1978).

An analysis of one hunter-gatherer group, the Bushmen or San people of southern Africa, shows that they are not as isolated as they sometimes seem, nor have they stayed locked into hunting and gathering until quite recently. Instead, their behavior and concerns are part of a wide system in that a range of environmental factors -- climatic changes, political alliances, differential inheritance of goods, and relationships with other groups in a wide area -- appear to have affected their socioeconomic status over time. Historical investigation reveals that the Bushmen sometimes kept stock, and sometimes lost it, their subsistence depending on changing historical and environmental circumstances. They acted in a way that underscores the opportunism and plasticity of their socioeconomic behavior, rather than confirming the social evolutionist's view of its fixed nature over time [Shrire 1980:10].

I believe we can learn more about cultural evolution by looking at groups like the San and the Xavante in the way Shrire suggests -- as people adapting to changing conditions -- than by typologizing them as examples of an "evolutionary stage" in human development. I also believe that this viewpoint need not prevent us from using ethnographic descriptions and historical information to identify general processes that may help to explain, by retrodiction, events more distant in time, such as the increasing commitment to agriculture of prehistoric populations.

Christenson (1980a) suggested that as population increases, and preferred food sources become scarcer, animal (including the human) species tend to widen their food niche to include a greater diversity of resources. In the human case the subsistence base may be broadened by including cultigens as well as more varied wild foods in the diet. As population continues to grow, more intensive exploitation puts greater pressure on wild food resources, and to procure these resources people may exploit a larger territory, bringing them into competition with other groups. Harner (1970:68-69) suggested that competition for resources may be particularly intense at this point, as groups approach the limit of population that can be supported by a pre-agricultural economy. If population growth continues, some wild resources may disappear due to over-exploitation.

People may then invest more time in the cultivation of crops, which respond to labor invested in them by producing more food. At this time scheduling conflicts may appear between agricultural work and the procurement of wild resources. The habitat may be altered by human activities associated with agriculture, such as forest clearing, so that more wild food resources are reduced or disappear. If population growth continues, people will come to depend more and more on domesticated plants and animals. From this point on food niche breadth declines, "The result is a specialized but fairly diverse economy with a low efficiency of labor" (Christenson 1980a:37).

Harner (1970) points out that competition for resources may diminish for a time after people become fully agricultural, until the capacity of the new means of production is absorbed by continued population growth. When population catches up to the new resource base, competition will resume, this time focusing on land suitable for agriculture or stock raising. However, among groups in actual or potential competition for the resources of a region, some may resort to agricultural intensification, while others may seek to maintain a broad-based economy.

"Romer's Rule" (Hockett and Ascher 1964) indicates that evolution is conservative in the sense that it proceeds through small adjustments to maintain equilibrium, thus

stasis may be maintained for some time; but the accumulation of these adjustments may lead to great diversity, since each change directs further changes. The direction of change of different local populations seeking to maintain their nutritional level by making adjustments to increasing food scarcity depends on local ecological and social opportunities and pressures. Flannery (1971) showed that some habitats favor rapid increase in agricultural investment, while others discourage it. Strategies of change, as we pointed out (Gross et al. 1979) may be influenced not only by scarcity in an absolute sense, but also by perception of increased labor cost to maintain a given subsistence economy. Therefore some may increase the labor they devote to crops, others may seek to control more wild food resources by exploiting a larger territory, while others may limit the number of consumers by various mechanisms (see Dumond 1971). When populations that have adopted these varied strategies come into contact, conflicts are likely to result that lead to further changes in each of them. One may absorb, drive away, or wipe out the other, or they eventually may co-exist and engage in trade if they specialize in exploiting different resources.

The history of Xavante adaptation to their environment and to surrounding groups did not come to an end when they adopted the cultivation of an introduced crop, and entered the regional market through wage labor and the sale of rice;

rather it entered a new phase. As the Xavante interact increasingly with the regional and national economies and political structures, their communities are beginning to support one another in their struggle to retain control over the land which they see as their economic base. This is demonstrated by the recent confrontation in Brasilia, when leaders from other Xavante village joined those from Pimentel Barbosa to support their demands for restoration of Pimentel Barbosa land. Since his election to the National Congress, Mário Juruna, probably the most acculturated Xavante, has stressed his Xavante identity by growing his hair long and cutting it in the distinctive Xavante style, and by announcing that he intends to give some of his speeches in the Xavante language (Isto É 1982). Juruna has also stated that he intends to be a representative not only of the Xavante but of all Brazilian Indians. I believe that the emerging Xavante definition of broad goals can be explained not only in terms of their present situation, but also by the history of their relationship with their physical and human environment which, as I have shown, was characterized by opportunistic exploitation of a varied range of resources, and by social interaction among geographically dispersed groups. In the course of doing fieldwork for this study I gained great respect and admiration for the Xavante. I believe they have the potential, under the new conditions that they face, for

continuing to be a proud and vital people, and I wish them all success.

Appendix A

FIELD DATA COLLECTED AND METHODS OF ANALYSIS

During the 14 months of my fieldwork with the Xavante I collected the following types of data:

A.1 TIME ALLOCATION OBSERVATIONS

For the time allocation studies I used the technique devised by A. Johnson (1975). I made 12 visits each week to as many households chosen at random, at randomly selected hours between 6 a.m. and 8 p.m. Upon entering the household I took note of the activity in which each household member or visitor was engaged. Then I asked where each absent household member was and what he was doing. Spot-checking with people on their return showed that these reports were generally accurate. The activity of each person was briefly described and coded. Provision was made for alternative analyses of simultaneous activities (such as cooking and conversation). For purposes of this study, a village population of 198 was used because several families had their gardens so far from the village that they stayed there for weeks at a time. Their activities when they were in the village were not representative, as they were there on holiday, so to speak.

By the end of the year, about 5000 observations of individuals had been coded. The analysis of this data is based on the assumption that the proportion of observations of a given activity is the same as the proportion of time actually spent on that activity during the 14-hour day used. When people were absent from the village for several days, and were reported to be away, for example, hunting or working on a farm, the code for "away" was entered, and the assumption was made that 9 of the 14 hours were spent on the activity reported, and the rest on "nonwork" (see Table 16). This procedure for time allocation study provides a more representative and reliable picture of time allocation than do studies of a few people over short periods.

A.2 AGRICULTURAL PRODUCTIVITY

To assess garden productivity I took samples of the main food crops. I measured off plots of 100 sq m from first and second year gardens at or near the time of harvest, and weighed or counted the food harvested from each plot. By measuring, counting, and observing gardens, I calculated the yield and the average area devoted to each food crop.

A.3 ESTIMATES OF HUNTING AND FISHING YIELDS

To get a representative sample of hunting and fishing yields, I used the random spot-check observations designed for measuring time allocation. Whenever an individual was reported to be out hunting or fishing during a spot-check, I returned later in the day to see what was killed or brought back. In some cases, especially when a hunt lasted more than one day, I depended on the hunters' reports of what animals and how many were killed since the meat was brought back already butchered and smoked for preservation.

A.4 SOIL SAMPLES AND BOTANICAL OBSERVATIONS

These were collected by D. Gross and G. Eiten during a visit to the site in December, 1976. Eiten also observed and provided a technical description of the vegetation at the site and made a plant collection. Soil for analysis was collected from adjacent patches of forest, recently burned-over swiddens, and second-year gardens. Each sample was made up by collecting approximately 1 liter of soil from each of 10 spots scattered over a 0.1 ha plot. These were mixed together, and approximately 1 kg was dried, tagged and sent to various laboratories for analysis. The results reported are from the Instituto Agronómico de Campinas through the courtesy of Dr. Alcyr Nascimento (see Figure 13 and Figure 14).

It is generally considered that clearing and burning felled vegetation raises the fertility of tropical soils by increasing available calcium (Ca^{++}) magnesium (Mg^{++}) potassium (K), and phosphorus (P). Soil acidity also tends to be neutralized by the release of Ca^{++} and Mg^{++} from the ashes of burned litter. The same elements are probably also responsible for lowering available aluminum (Al^{+++}) which is toxic to cultivated plants (Gross 1983).

In contrast to the other garden sites sampled at the Mekranoti, Kanela, and Bororo villages (see Gross 1983), where levels of nutrients and organic matter generally rose from forest land to recently burned-over gardens, and then fell by the second year of cultivation, in Xavante gardens these levels generally fell from forest to first year gardens, and then rose in the second year (see Figure 14). The Xavante themselves say that second-year gardens often grow better crops than first-year gardens, and of the four groups surveyed only the Xavante grow seed crops in second-year gardens (see Flowers et al. 1982). Unfortunately we did not collect soil samples from Xavante third year gardens, so we cannot say whether nutrient levels drop off after the second year. We found generally higher levels of nutrients in the forest land adjacent to Xavante gardens than in that of the other three groups. We suspected that this might be due to the Xavante custom of annually burning over wide stretches of land (including the sites of future

gardens) during their game drives. Ashes from this burning might be absorbed by the soil, so that nutrients had already been released into the soil before the forest was cleared and burned for gardens.

A.5 DIETARY STUDIES

Two households were used for dietary studies: a small one consisting of one hunter, his wife, and three children, and a large extended family household which varied at the different study periods from 10 to 18 people and from one to five hunters. I monitored each of these households for three days at four seasons of the year: in September, November, February, and June, giving 24 days of study in all. I remained in the household through the day, and weighed food as it was prepared.

Per capita estimates are based on the total consumption of each food in the household for the day, divided by the number of household members over the age of one year present on that day. As there are no set mealtimes, and food is constantly shared, there is no other way to arrive at individual consumption figures. The per capita consumption for each season was arrived at by averaging those recorded on each of the six days of observation (see Table 19). Food weights are given in edible portion (e.g. hulled rice, peeled manioc root, dressed meat). With the exception of

salt, which is now generally used in cooking rice, few purchased foods are consumed. When men earn cash by occasional labor on neighboring ranches they may buy and bring back to their household a little coffee, manioc flour, sugar, or candy for the children.

A.6 GROWTH AND WEIGHT OF CHILDREN UNDER TWO YEARS

I weighed the children under the age of two in September, November, March, and July. Two anticipated weighings, in January and May, were missed because of my unforeseen absence from the village. I weighed the children on a standard baby scale, removing outer garments (usually the only clothing worn), measured supine length, and the circumference of head, thorax, and upper arm. I had accurate birthdates for almost all the children in this group, as the agent at the Indian post had started keeping birth and death records some 18 months before my arrival. Approximately 80% of the children falling within the age group were recorded at each weighing. A few could not be reached because their families were absent from the village or for some other reason. The total sample was 41 children, of whom 10 were weighed four times, 12 three times, seven twice, and 11 once.

The reference values for age and sex used in comparisons are from A Growth Chart for International Use in Maternal

and Child Health Care (W.H.O. 1978). The expected weight gain for age and sex used is that of the 50th percentile (see Figure 17). Children considered below normal weight are those below the 3rd percentile for age and sex. Children considered advanced are those above the 50th percentile for age and sex (see Figure 18). My purpose in using standard tables was to provide me with a measure for comparisons between age groups and to show seasonal variation. This is not meant to imply that the 50th percentile of a standard table is necessarily a universally "ideal" weight for age.

A.7 CENSUSES AND GENEALOGIES

I censused the village at the beginning of my stay, and kept records of the births, marriages, and deaths that occurred subsequently. I also collected genealogies by interview with all adults, and compared them with those collected 20 years earlier by Maybury-Lewis (1967). I made efforts to ascertain the place, age, and cause of death of dead relatives.

A.8 PREGNANCY HISTORIES

In May and June of 1977 I collected, with the help of a translator, the pregnancy histories of all the women at Pimentel Parbosa over the estimated age of 10, with the single exception of a woman who was away from the village during that time. This gave me information on the outcome of 302 pregnancies, of which 281 were livebirths. I assigned an i.d. number to each child born living, also sex, year of birth, place of birth, and order of birth (parity). For those that died, I also collected year and place of death, and cause of death when the mother was able to give it.

Collecting accurate dates of birth and death has obvious difficulties in a society, like the Xavante, without written records. These were available only from 1974, when the Indian agent started keeping records of all births and deaths in the community. To get the best information possible, I used various techniques in interviewing the women. I used a calendar of events that the women would be likely to remember, and for which I had a date. For example: "Was the baby born before (after) Meireles came?...Before (after) the Tirowa were initiated?...Before (after) David (Maybury-Lewis) was at São Domingos?" Another method was to compare the child being discussed with siblings. For example, "How big was Tsipatsé when Riridu

(the next child) was born? Was he so big... or so big? Was he running around?" Xavante use number words only to a limited extent, but they deal easily with successive events; the mothers remembered without apparent difficulty the order in which their children were born. This is facilitated by Xavante kinship terminology, according to which ego addresses older siblings by a different term from that used to younger siblings. The age set system was also helpful, since age sets are initiated at roughly 5-year intervals, and recent initiations could be correlated with other known events. Some of the older women in the village had living daughters and granddaughters, also interviewed, which provided a further means of estimating birthdates.

It has been noted that older women in non-literate societies tend to forget their children that died very small a long time ago (Bogue and Bogue 1971:9-10). Others may be reluctant to talk about their dead children. Xavante women seemed to be able to recall their children that died long ago, and apparently did not mind discussing their death, although they were seldom able to specify the cause. They also described stillbirths. But I could not collect reliable information on menstruation (age of menarche or menopause), or on early miscarriages, because Xavante women apparently do not recognize menstruation as a normal physiological function. Black et al. (1978:99) and Werner (ms.b) found this to be also true of Kayapó women.

After I returned to New York I coded the pregnancy data and entered it into a computer file (for the codebook and a sample of the file see Figure 19). I used data from the pregnancy histories to construct Tables 7, 8, 9, 11, 12, 13, 14, 15, and Figure 11. Tables 7, 8, 9, and 14 were made up by grouping data, but the life tables for different periods and the table and figure showing age-specific fertility rates at different periods were more complex to construct.

Figure 19: Codebook for Xavante Pregnancy Histories and Sample of File

Xavante Pregnancy Histories as of June 1977 CODEBOOK FOR XAVANTE PREGNANCY HISTORIES			
VARIABLE NO.	VARIABLE DESCRIPTION	COLUMN NO. 1, 2, 3, 4.	
1	Child's i.d. number (ZZZZ for stillbirths).		
2	Sex of child (1 for boy, 2 for girl). Z for stillbirth, sex unknown.	5	
3	Year of birth (last 2 digits).	6, 7	
4	Place of birth (letter code, B for unknown). A = Tserere (Cabeciras do Corichao) B = Arakenhipara or U're (Corichao) C = Tserere (Ribeirao Turvo) D = Marawatsede (Cabeciras do Rio Sao Joso) E = Tentirera (Rancador) -- 1950's occupation. F = Mededze (Sao Domingos) G = O To (Lazo) H = Arabore (Rio Cristalino) I = Barreira Pre (Barreira Vermelha) J = Tentirera -- present occupation K = Burura (near Sao Felix) L = Norwadera (Arcoos) M = Edzutscheri (Sta. Teresinha) N = Capitariguara O = Couto Maranhao P = Sao Marcos Q = Senaradouro R = Tera'ura (Cabeciras do Rio Isamuol) S = Barreira Amarela T = Noratsupera (Rio Corua) U = Burura (Lama) V = Barawade (Barreira do Piqui) W = Anua Preta Y = On trak Z = "Civilized" town	8, 9	
5	Parity (2 digits). Stillbirths don't count. (00 for women who have not borne a child).	8, 10	
6	Presently living? (0 for dead, 1 for living).	11	
7	Year of death (last 2 digits).	12, 13	
8	Cause of death (letter code, B for unknown). K = killed by Xavante M = killed by whites E = died in epidemic (unspecified disease) N = pneumonia T = tuberculosis P = penfimo C = childbirth M = measles D = dysentery A = accidental death S = suspected sorcery X = other	14	
	Age at death (2 digits). NN for died under 1 month of age.	15, 16	
	Place of death (same letter code as birthplace)	17	
	Mother's i.d. number	18, 19, 20, 21	
	Year of mother's birth (last 2 digits).	22, 23	
	Mother's clan (letter code, B for unknown).	24	
	F = Perera'one O = O Name T = Tapate		
	Mother's lineage (letter code, B for unknown).	25	
	N = Namari U = Uhotedewa D = Dzutsima H = Mahi T = Tebe		
	A = Aiute'manhari		
	Father's i.d. number	26, 27, 28, 29.	
	Year of father's birth	30, 31	
	Father's clan (same letter code as for mother).	32	
	Father's lineage (same letter code as for mother)	33	
	1808125C011 0103120D010205PW 1301128E021 0103120D010205PW 0302136B031 0103120D010205PW 0106238B041 0103120D010205PW 0202142B051 0103120D010205PW 2108146B061 0103120D010205PW 0612252B071 0103120D010205PW 0101157E081 0103120D010205PW 8501253F010548018010638PW8001270U 8502154F020818078010638PW8001270U 8503157Y030858082010638PW8001270U 8504258Y0405880910638PW8001270U 0510158Y051 010638PW8001270U 0104161Y061 010638PW8001270U 0107167Y071 010638PW8001270U 0105168Y081 010638PW8003270U		

A.8.1 Comparative Life Tables

To construct the life tables showing the probability of surviving to age 10 in the precontact, contact and "recent" periods (Tables 11, 12, and 13), I used the methods described in Howell (1979), with modifications suggested by Werner (personal communication), and the file derived from the pregnancy histories (figure 19).

For the precontact period, I wanted to look only at deaths that occurred before the cutoff date of 1957, therefore I used the data as if it were from a census taken at the end of 1956 (see Table 11). After deleting stillbirths from the pregnancy history file, I took out all individuals born after 1956. There were 58 babies born before 1957, so I entered this number on the first line of the table under the heading "Entering Interval" (that is, the interval between birth and one year of age). Then I deleted from the file those babies who were born in 1956, and therefore at the end of the year were still within the 0-1 age interval. These are excluded because there would be no way of knowing (at the end of 1956) how many of them would complete the interval (see Howell 1979:82). After taking out the five babies born during 1956, there remained 53, so I entered that number under the heading "Subtotal." Among the 53 there were three babies that had died under one

year of age; these were entered under the column heading "Deaths." Subtracting the deaths, 50 remained, so this number was entered under the heading "Surviving Interval." The same number was entered on the second line of the table under "Entering Interval." To get the "Subtotal" for the second line I subtracted births that took place in 1955. Deaths entered on the second line were those that occurred between one and two years, and so on. On the bottom line of the table the number 22 under "Entering Interval" indicates that, of the children born before 1957, 22 are known to have survived to the age of 10 years.

The last three columns of the table are life table functions, and are calculations of the survival of an artificial cohort of 1000, given the mortality found in the real populations (see Howell 1979, table p. 81). The l_x column on the first line is the cohort that enters the interval. The probability of dying in the first year of life is $q_x = 3/53 = .057$. In this way, by dividing the deaths at each interval by the number of individuals entering the interval less those still in the interval, we get the probability of dying for each year up to age 10. The dx column for the first line is $1000 \times .057 = 57$, and indicates the number of individuals of the artificial cohort who would have died under the age of one year, according to the q_x probability factor. These deaths are subtracted from 1000 to get the l_x (943) for the next line, and so on.

Therefore, lx indicates, for each line of the table, the number out of the artificial cohort that would be expected to survive to that age. For the pre-contact period the number that would be expected to survive to age 10 is 802.

To calculate the table for the contact period (Table 12), I used the same method, but only children were included who were born before 1972, and had not died before 1957. This shows survival from 1957 through 1971 for each year of life up to 10. Mortality was much higher than during the previous period. The third table, for the "recent" period (Table 13), includes all children born before 1977 who had not died before 1972. Child mortality appears to have dropped to a level similar to that of the pre-contact period.

In these cases we are dealing with very small numbers compared to the large populations on which demographic statistics are usually based, so that differences observed may well be affected by random fluctuation. This is especially true of the pre-contact period, for the population is only 58 individuals -- those whose mothers survived up to 1977 to report on them. For the "recent" period the problem is rather different: there are many more individuals reported on, but the time period is very short -- only five years -- while 15 years were included in the pre-contact and contact periods. In spite of these

difficulties, comparison of the three tables does seem to indicate that sickness and death among children was much higher during the years after contact than it was earlier or later, especially for those who had passed the first few years of life.

A.8.2 Fertility Rates

To estimate fertility rates at different periods (Table 15 and Figure 11) I used the file derived from the pregnancy histories (see Figure 19). I deleted all stillbirths and 11 births which occurred before 1942, which left 270 births reported from 1942 to mid-1977. To analyse the data I used the methods described in Bogue and Bogue (1971). I constructed a matrix (see Bogue and Bogue 1971:5-9) showing for each year from 1977 (one-half year) back to 1942 the number of babies born in each year to women of each year of age from 10 to 44. I used a 10-14 age interval because childbearing among the Xavante appears to start early. During my fieldwork five young girls in the village were married, at an estimated age of 12-14. Two of these girls were clearly pregnant before I left the village. Black et al (1978) reported that among the women of the Indian groups in Pará that they studied they recorded births to girls of 14. They have no record of birth to a woman over 44 years of age, nor did I find that any Xavante woman over that age had borne a child.

To calculate the age-specific fertility (ASFR) for women of a given age during a specified year, the number of babies born to women of that age is divided by the number of women. However, we usually want to group data, for example to find the ASFR for women in the 15-19 age bracket from 1967 to 1971. Looking at Table 15 we find that during the period 1967-1971 there were 41 woman/years in the 15-19 age bracket, and 13 children were born. This information comes from the year-by-year matrix, according to which in 1967 there were 10 women 15-19 years of age in the population, in 1968 there were six, in 1969 there were eight, in 1970 there were eight, and in 1971 there were nine. The number of women in a given age bracket changes each year, as some enter and others leave it. In 1967, four babies were born to women in the 15-19 age bracket, in 1968, three; in 1969, four; in 1970, one; and in 1971, one, totaling 13. The ASFR for women 15-19 during the period 1967-1971 is therefore $13/41 = .317$.

The general fertility rate (GFR) for a given period represents the probability that a woman of childbearing age (10-44) selected at random from the population will bear a child during any year of the period (Bogue and Bogue 1971:2). To calculate the GFR for a given period the number of babies born during that period is divided by the total woman/years for the period. For 1967-1971 the GFR for the Xavante population is $48/253 = .190$.

The total fertility rate (TFR) is the sum of ASFR's for each year of reproductive life, and gives an estimate of average expected completed fertility. For example, to get the TFR for the Xavante population for the period 1957-1971 we sum the ASFR's for each age bracket: $.047 + .366 + .248 + .237 + .161 + .146 + .050 = 1.255$. We multiply this by 5 because each woman spends five years in each age bracket. $1.255 \times 5 = 6.275$. The TFR therefore represents the average size of completed family (at the end of childbearing) that would result if a particular schedule of ASFR were to be in effect for the complete duration of a woman's reproductive span (Bogue and Bogue 1971:3).

Just as in the case of the comparative mortality tables, the reliability of these figures is affected by the small population size, especially for the pre-contact period. Only two women, estimated to be in their mid-sixties, were old enough to have spent their later reproductive years in this period. Four more women, whose estimated ages were 45-54, passed their earlier reproductive years during the period. Therefore, the apparent jump in fertility for the 30-35 age bracket in the pre-contact period (see Figure 11) is probably an artifact of this small sample size. The data for the contact period are probably more reliable, since all the women interviewed except the youngest spent at least part of their reproductive years in this period. What seems unusual about this period is that the highest ASFR is for

women in the 15-19 age bracket, and after this age fertility drops off rapidly, being lower for each successive age group. Black et al. (1978, table p. 113), combining fertility data from surveys of a number of Indian villages, found that fertility was highest in the 20-24 age group and declined gradually after that. I speculated in Chapter 3 that one reason for the relatively low fertility of older women during the contact years might have been stress from deaths of children in epidemics, increase in violence, and the general disruption of social life. The "recent" period is short, only five years, but there appears to be a trend for high fertility to be maintained through the thirties. This fertility pattern, if it continues, will result in very rapid population growth at Pimentel Barbosa.

A.9 HISTORICAL INFORMATION

I interviewed, working through an interpreter, several older members of the group, including the headman Apowẽ. I attempted to identify village splits and movements, the geographical location of previous villages, contacts and hostilities with other Indian groups and with Brazilians. The Indian agent at the post, Ismael Leitão, who had worked with the groups since they were pacified, was also interviewed and allowed me to copy some of his records.

A.10 GENERAL PARTICIPANT OBSERVATION

I kept a journal noting weather, events, ceremonies, and so on. I lived in a house built for me in the village, and participated by socializing, exchange, dispensing medicine and medical advice, giving lessons in reading and writing Portuguese, and providing material for "reverse anthropology."

A.11 PHOTOGRAPHIC RECORDS

I used black and white and color film to record subsistence activities, material culture, and ceremonials. I also made a systematic photographic census by family.

REFERENCES CITED

- Albisetti, Cesar and A. J. Venturelli. 1962. *Enciclopedia Bororo*, vol. 1. Publicação No. 1 do Museu Regional Dom Bosco. Campo Grande: Mato Grosso.
- Alden, Dauril. 1963. The Population of Brazil in the Late Eighteenth Century: A Preliminary Study. *Hispanic-American Historical Review* 43:173-205.
- Alden, Dauril. 1968. *Royal Government in Colonial Brazil*. Berkley: University of California Press.
- Alden, Dauril. 1969. Economic Aspects of the Expulsion of the Jesuits from Brazil: Preliminary Report. In *Conflict and Continuity in Brazilian Society*. H. H. Keith and S. F. Edwards, eds. pp. 25-65. Columbia, S. C.: University of South Carolina Press.
- Alden, Dauril. 1973. *Colonial Roots of Modern Brazil*. Berkley: University of California Press.
- Alencastre, José Martins Pereira d'. 1857. *Memória chronológica, histórica e geográfica da Provincia de Piahy*. *Revista do Instituto Histórico e Geográfico Brasileiro*, Vol 20, pp. 5-58.
- Alencastre, Jose Martins Pereira d'. 1864-65. *Annaes da Provincia de Goyaz*. *Revista do Instituto Histórico e Geográfico Brasileiro*, Vol. 27 (part 2), pp. 5-186, and 229-349 (1864). Vol. 28 (part 2), pp. 5-168 (1865).
- Anneqers, John F. 1973. Seasonal Food Shortages in West Africa. *Ecology of Food and Nutrition* 2:251-257.
- Anuario Estatístico do Brasil. 1939-1940.
- Aspelin, Paul L. 1975. *External Articulation and Domestic Production: The Artifact Trade of the Maimandé of Northwestern Mato Grosso, Brazil*. Ithaca, New York: Cornell University Latin American Studies Program.
- Aspelin, Paul L. 1979. *The Ethnography of Nambicuará Agriculture*. *Bijdragen tot de Taal-, Land- en Volkenkunde* 135:18-58.

- Baldus, Herbert. 1948. Tribus da Bacia do Araguaia e o Serviço de Proteção aos Índios. *Revista do Museu Paulista* (n.s.) 2:137-168.
- Balikci, Asen. 1968. The Netsilik Eskimos: Adaptive Processes. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 78-82. Chicago: Aldine.
- Bambrugger, Joan. 1967. Environment and Cultural Classification: A Study of the Northern Kayapó. Ph. D. dissertation, Harvard University.
- Bambrugger, Joan. 1974. Naming and the Transmission of Status in a Central Brazilian Society. *Ethnology* 13:363-379.
- Bambrugger, Joan. 1979. Exit and Voice in Central Brazil: The Politics of Flight in Kayapó Society. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. pp. 130-146. Cambridge, Mass.: Harvard University Press.
- Parata, F. J. R. 1848. Memoria em que se mostram algumas providencias tendentes ao melhoramento da agricultura e comércio da Capitania de Goyaz. *Revista do Instituto Histórico e Geográfico Brasileiro* 11:336-365.
- Barbosa Lima Sobrinho. 1946. O Devassamento do Piauí. São Paulo: Companhia Editora Nacional.
- Barleus, Caspar. 140. História dos Feitos Recentemente Praticados Durante Oito Anos no Brasil e Noutras Partes. Transl. Cláudio Brandão. (Original *Rerum per octennium in Brasilia et alibi nuper gestarum*. Amsterdam 1647). Rio de Janeiro: Serviço Gráfico do Ministério de Educação.
- Basso, Ellen B. 1973. The Kalapalo Indians of Central Brazil. New York: Holt, Rinehart and Winston.
- Bates, Daniel G. and S. H. Lees. 1979. The Myth of Population Regulation. In *Evolutionary Biology and Human Social Behavior: An Anthropological Perspective*. N. A. Chagnon and W. Irons, eds. pp. 273-289. North Scituate, Mass: Duxbury.
- Beadle, George W. 1977. The Origin of Zea mays. In *Origins of Agriculture*. C. A. Reed, ed. pp. 615-635. The Hague: Mouton.
- Beckerman, Stephen. 1979. The Abundance of Protein in Amazonia: A Reply to Gross. *American Anthropologist* 81:533-560.

- Beckerman, Stephen. 1980. Fishing and Hunting by the Bari of Colombia. In *Studies in Hunting and Fishing in the Neotropics*. R. B. Hames, ed. pp. 67-109. Working Papers on South American Indians No. 2. Bennington, Vt.: Bennington College.
- Bender, Barbara. 1978. Gatherer-Hunter to Farmer: A Social Perspective. *World Archaeology* 10 (2):204-222.
- Pillewicz, W. Z. 1967. A Note on Body Weight Measurements and Seasonal Variation. *Human Biology* 39:241-250.
- Binford, Lewis R. 1971. Post-Pleistocene Adaptations. In *Prehistoric Agriculture*. S. Streuver, ed. Garden City, N. Y.: Natural History Press. (Original 1968).
- Birdsell, Joseph R. 1957. Some Population Problems Involving Pleistocene Man. *Cold Spring Harbor Symposia on Quantitative Biology* 22:47-69.
- Birdsell, Joseph R. 1968. Some Predictions for the Pleistocene Based on Equilibrium Systems Among Recent Hunter-Gatherers. In *Man the Hunter*, R. B. Lee and I DeVore, eds. pp. 229-240. Chicago: Aldine.
- Black, Francis L., W. J. Hierzholzer, F. de P. Pinheiro, A. S. Evans, J. P. Woodall, E. M. Opton, J. E. Simmons, B. S. West, G. Edsall, W. G. Downs, and G. D. Wallace. 1974. Evidence for Persistence of Infectious Agents in Isolated Populations. *American Journal of Epidemiology* 100:230-250.
- Black, Francis L., F. De P. Pinheiro, O. Oliva, W. J. Hierzholzer, R. V. Lee, J. E. Briller, and V. A. Richards. 1978. Birth and Survival Patterns in Numerically Unstable Proto-Agricultural Societies in the Brazilian Amazon. *Medical Anthropology* 2(3):95-127.
- Bogue, Donald J. and E. J. Bogue. 1971. Techniques of Pregnancy History Analysis. *Family Planning Research and Evaluation Manual* No. 4. Chicago: University of Chicago Community and Family Planning Center.
- Boserup, Ester. 1965. *The Conditions of Agricultural Growth*. Chicago: Aldine.
- Boxer, Charles R. 1964. *The Golden Age of Brazil: 1695-1750*. Berkley: University of California Press.
- Praidwood, Robert J. 1963. *Prehistoric Men*, 6th edition. Chicago Natural History Museum. Popular Series, No. 37. Chicago.

- Bray, Warwick 1976. From Predation to Production: The Nature of Agricultural Evolution in Mexico and Peru. In Problems in Economic and Social Archaeology. G. de Sieveking, T. H. Longworth, and K. E. Wilson, eds. pp. 73-95. London: Duckworth.
- Brieger, F. G., J. T. A. Sargel, E. Paterniani, A. Plumenschein, and M. R. Alleoni. 1958. Races of Maize in Brazil and Other Eastern South American Countries. National Science Foundation -- National Research Council Publication No. 593.
- Bronson, Bennet. 1975. The Earliest Farming: Demography as Cause and Consequence. In Population, Ecology and Social Evolution. S. Polgar, ed. pp. 53-78. The Hague: Mouton.
- Putzer, Karl W. 1971. The Significance of Agricultural Dispersal into Europe and Northern Africa. In Prehistoric Agriculture. S. Streuver, ed. pp. 313-334. Garden City, Natural History Press. (Original 1964).
- Caldwell, J. R. 1962. Eastern North America. In Courses Toward Urban Life. R. J. Braidwood and G. R. Willey, eds. Chicago: Aldine.
- Campbell, Alastair H. 1965. Elementary Food Production by the Australian Aborigines. *Mankind* 6(5):206-211.
- Cancian, Francesca. 1968. Functional Analysis of Change. In Theory in Anthropology: A Sourcebook. R. A. Manners and D. Kaplan, eds. pp. 204-212. Chicago: Aldine. (Original 1960).
- Carneiro, Robert L. 1970a. The Transition from Hunting to Horticulture in the Amazon Basin. In Eighth Congress of Anthropological and Ethnological Sciences pp. 244-248. Tokyo: Science Council of Japan.
- Carneiro, Robert L. 1970b. A Theory of the Origin of the State. *Science* 169:733-738.
- Carneiro, Robert L. 1973. Slash-and-Burn Cultivation Among the Kuikuru and Its Implications for Cultural Development in the Amazon Basin. In Peoples and Cultures of Native South America. D. R. Gross ed. pp. 98-123. Garden City, N. Y.: The Natural History Press. (Original 1961).
- Casal, Manoel Ayres de. 1945. *Corographia Brasileira*. (Facsimile of 1817 edition). Rio de Janeiro: Imprensa Nacional.

- Cassidy, C. M. 1980. Nutrition and Health in Agriculturalists and Hunter-Gatherers: A Case Study of Two Prehistoric Populations. In *Nutritional Anthropology*. N. W. Jerome, R. F. Kandel, and G. H. Peltó, eds. pp. 117-145. Pleasantville, N. Y. : Redgrave.
- Castelnau, Francis de. 1850-51. Expedition dans les parties centrales de l'Amerique du sud, de Rio de Janeiro a Lima, et de Lima au Para. Part 1: Histoire du Voyage, 6 vols. Paris: P. Bertrand.
- Chagnon, Napoleon A. 1973. The Culture-Ecology of Shifting (Pioneering) Cultivation Among the Yanomamö Indians. In *Peoples and Cultures of Native South America*. D. R. Gross, ed. pp. 126-142. Garden City, N. Y.: The Natural History Press.
- Chagnon, Napoleon A. 1980. Highland New Guinea Models in the South American Lowlands. In *Studies in Hunting and Fishing in the Neotropics*. R. B. Hames, ed. pp. 111-130. Working Papers on South American Indians. No. 2. Bennington Vt.: Bennington College.
- Chagnon, Napoleon A., M. V. Flinn, and T. F. Melancon. 1979. Sex-Ratio Variation Among the Yanomamö Indians. In *Evolutionary Biology and Human Social Behavior: An Anthropological Perspective*, N. A. Chagnon and W. Irons, eds. pp 290-320. North Scituate, Mass.: Duxbury.
- Chagnon, Napoleon A. and R. B. Hames. 1979. Protein Deficiency and Tribal Warfare in Amazonia: New Data. *Science* 203:910-913.
- Chaim, Marivone Matos. 1974 Os Aldeamentos Indígenas na Capitania de Goiás: Sua Importância na Política de Povramento (1749-1811). Goiânia: Oriente.
- Chen, Lincoln C., A. K. M. Chowdhury and S. L. Hoffman. 1979. Seasonal Dimensions of Energy-Protein Malnutrition in Rural Bangladesh: The Role of Agriculture, Dietary Practices, and Infection. *Ecology of Food and Nutrition* 8:175-87.
- Childe, V. Gordon. 1967. What Happened in History. Baltimore: Penguin Books. (Original 1942).
- Christenson, Andrew L. 1980a. Change in the Human Food Niche in Response to Population Growth. In *Modeling Change in Prehistoric Subsistence Economies*. T. K. Earle and A. L. Christenson eds. pp. 31-72. New York: Academic Press.

- Christenson, Andrew L. 1980b. Subsistence Change: Bibliographic Overview. In *Modeling Change in Prehistoric Subsistence Economies*. T. K. Earle and A. L. Christenson eds. pp. 31-72. New York: Academic Press.
- Clark, J. Desmond. 1976. Prehistoric Populations and Pressures Favoring Plant Domestication in Africa. In *Origins of African Plant Domestication*. J. R. Harlan, J. M. J. De Wet and A. B. L. Stemler, eds. pp. 67-105. The Hague: Mouton.
- Coe, Michael D. and K. V. Flannery. 1971. Microenvironments and Mesoamerican Prehistory. In *Prehistoric Agriculture*. S. Streuver, ed. pp. 131-142. Garden City, N. Y.: The Natural History Press. (Original 1964).
- Cohen, Mark N. 1975. Population Pressure and the Origins of Agriculture: An Archaeological Example from the Coast of Peru. In *Population, Ecology, and Social Evolution*. S. Polgar, ed. pp. 79-121. The Hague: Mouton.
- Cohen, Mark N. 1977. *The Food Crisis in Prehistory: Overpopulation and the Origins of Agriculture*. New Haven: Yale University Press.
- Colbacchini, Antonio, and Cesar Albisetti. 1942. Os Bororos Orientais Dramodigodogue do Planalto Oriental de Mato Grosso. São Paulo.
- Comas, Juan 1971. Anthropometric Studies in Latin American Indian Populations. In *The Ongoing Evolution of Latin American Populations*. F. M. Salzano, ed. pp. 333-404. Springfield: C. C. Thomas.
- Cook, Della C. 1979. Subsistence Base and Health in Prehistoric Illinois Valley: Evidence from the Human Skeleton. *Medical Anthropology* 3(1):109-124.
- Cowgill, J. F. 1975. On Causes and Consequences of Ancient and Modern Population Changes. *American Anthropologist* 77:505-525.
- Crocker, J. Christopher. 1967. *Social Organization of the Eastern Bororo*. Ph. D. dissertation, Harvard University.
- Crocker, J. Christopher. 1969a. Reciprocity and Hierarchy Among the Eastern Bororo. *Southwestern Journal of Anthropology* 25:236-260.
- Crocker, J. Christopher. 1969b. Men's House Associates Among the Eastern Bororo. *Man* 4:44-48.

- Crocker, J. Christopher. 1979. Selves and Alters among the Eastern Bororo. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. pp. 249-300. Cambridge, Mass.: Harvard University Press.
- Crocker, William. 1961. The Canela Since Nimuendaju. *Anthropological Quarterly* 34:69-84.
- Crocker, William. 1967. The Canela Messianic Movement: An Introduction. *Atas do Simpósio sobre a Biota Amazônica Vol. 2 (Antropologia)* pp. 69-83.
- Cunha Mattos, Raymundo José da. 1874-75. Chorographia Histórica da Província de Goyaz. *Revista do Instituto Histórico e Geográfico Brasileiro* 37 (part 1):213-398 (1874); and 38 (part 1):5-150 (1875).
- Cutler, Hugh C. 1946. Races of Maize in South America. *Harvard University Botanical Museum Leaflets* 12(8):257-291.
- Da Matta, Roberto. 1970. Apinayé Social Structure. Ph. D. dissertation, Harvard University.
- Da Matta, Roberto. 1973. A Reconsideration of Apinayé Social Morphology. In *Peoples and Cultures of Native South America*. D. Gross, ed. pp. 277-291. Garden City, N. Y.: The Natural History Press.
- Da Matta, Roberto. 1979. The Apinayé Relationship System: Terminology and Ideology. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. pp. 83-127. Cambridge, Mass.: Harvard University Press.
- Davidson, David M. 1973. How the Brazilian West Was Won: Freelance and State on the Mato Grosso Frontier, 1737-1752. In *Colonial Roots of Modern Brazil*. D. Alden ed. pp. 61-106. Berkley: University of California Press.
- Davis, Shelton H. 1977. Victims of the Miracle: Development and the Indians of Brazil. Cambridge: Cambridge University Press.
- Deetz, James. 1968. Hunters in Archaeological Perspective. In *Man the Hunter*. R. B. Lee and I. De Vore, eds. pp. 281-285. Chicago: Aldine.
- Deevey, Edward S., Jr. 1960. The Human Population. *Scientific American* 203(3):194-204.
- Denham, Woodrow W. 1974. Population Structure, Infant Transport, and Infanticide Among Pleistocene and Modern Hunter-Gatherers. *Journal of Anthropological Research* 30:191-199.

Diamond, Jared. 1977. Colonization Cycles in Man and Beast. *World Archaeology* 8(3):249-261.

Divale, William T. and M. Harris. 1976. Population, Warfare, and the Male Supremacist Complex. *American Anthropologist* 78:521-538.

Dumond, Don E. 1972. Population Growth and Political Centralization. In *Population Growth: Anthropological Implications*. B. Spooner, ed. pp. 286-310. Cambridge, Mass.: MIT Press.

Dyson-Hudson, Rada, and E. A. Smith. 1978. Human Territoriality: An Ecological Reassessment. *American Anthropologist* 80(1):21-41.

Ehrenreich, Paul. 1891. Die Einteilung und Verbreitung der Volkstämme Brasiliens nach dem gegenwertigen Stande unser Kenntnisse. Dr. A. Petermanns Mitteilungen aus Justus Perthes Geographischer Anstalt 37:81-89 and 114-124.

Ehrenreich, Paul. 1894. Über einige ältere Bildnisse sudamerikanischer Indianer. *Globus* 66:81-90.

Eiten, George. 1972. The Cerrado Vegetation of Brazil. *The Botanical Review* 38:201-341.

Ember, Carol R. 1978. Myths About Hunter-Gatherers. *Ethnology* 17:439-448.

Eschwege, Ludwig Wilhelm. 1830. Brasilien: Die Neue Welt. Braunschweig: Friedrich Bieweg.

Estado de São Paulo. 1979. January 7.

Eveleth, Phyllis B. and J. M. Tanner. 1976. Worldwide Variation in Human Growth. *International Biological Programme* 8. Cambridge: Cambridge University Press.

Faris, James C. 1975. Social Evolution, Population, and Production. In *Population, Ecology, and Social Evolution*. S. Polgar, ed. pp. 235-271. The Hague: Mouton.

Flannery, Kent V. 1971. Archaeological Systems Theory and Early Mesoamerica. In *Prehistoric Agriculture*. S. Struever, ed. pp. 80-100. Garden City, N. Y.: The Natural History Press. (Original 1968).

Fleming, Peter. 1934. Brazilian Adventure. New York: Charles Scribner's Sons.

- Flowers, Nancy M. 1983. Seasonal Factors in Subsistence, Nutrition and Child Growth in a Central Brazilian Indian Community. In *Adaptive Responses of Native Amazonians*, R. B. Hames and W. T. Vickers, eds., pp. 357-390. New York: Academic Press.
- Flowers, Nancy M., D. R. Gross, M. L. Ritter, and D. W. Werner. 1982. Variation in Swidden Practices in Four Central Brazilian Indian Societies. *Human Ecology* 10 (2):203-217.
- Fonseca, Sylvio da. 1947. *Frente a Frente com os Xavante*. Rio de Janeiro: Irmãos Pongetti.
- Ford, Richard I. 1977. Evolutionary Ecology and the Evolution of Human Ecosystems: A Case Study from the Midwestern U. S. A. In *Explanation of Prehistoric Change*. J. N. Hill, ed. pp. 154-184. Albuquerque: University of New Mexico Press.
- Freeman, L. G. Jr. 1968. A Theoretical Framework for Interpreting Archaeological Materials. In *Man the Hunter*. R. B. Lee and I. DeVore, eds., pp. 262-267. Chicago: Aldine.
- Frikel, Protásio. 1978. Áreas de Arboricultura Pre-Agrícola na Amazônia. *Revista de Antropologia* 21 (1):45-52.
- Gardner, George. 1970 (Facsimile of 1846 edition). *Travels in the Interior of Brazil, Principally through the Northern Provinces, and the Gold and Diamond Districts during the Years 1836-41*. New York: AMS Press. (Original London, 1846).
- Giaccaria, R. and A. Heide. 1972. *Xavante (Auwẽ Uptabi: Povo Autêntico)*. São Paulo: Editorial Dom Bosco.
- Goqin, John M. and W. C. Sturtevant. 1964. The Calusa: A Stratified Nonagricultural Society (with Notes on Sibling Marriage). In *Explorations in Cultural Anthropology: Essays in Honor of George Peter Murdock*. W. H. Goodenough, ed. pp. 179-219. New York: McGraw-Hill.
- Good, Kenneth R. 1982. Hunting and Meat Distribution in Yanomami Society. Paper Read at 81st Annual Meeting of the American Anthropological Association, Washington D. C., December 3-7, 1982.
- Gorman, Chester 1972. The Hoabinhian and After: Subsistence Patterns in Southeast Asia During the Late Pleistocene and Early Recent Periods. *World Archaeology* 2 (3):300-320.

- Gould, Richard A. 1977. Journey to Polykara. In *Man's Many Ways*. R. A. Gould, ed. pp. 155-165. New York: Harper and Row. (Original 1970).
- Greenberg, Joseph H. 1956. The General Classification of Central and South American Indian Languages. In *Men and Cultures*. A. F. C. Wallace, ed. pp. 791-794. Philadelphia: University of Pennsylvania Press.
- Grobman, A., W. Salhuana and R. Neville, in collaboration with P. C. Mangelsdorf. 1961. *Races of Maize in Peru*. National Academy of Sciences -- National Research Council Publications, No. 915.
- Gross, Daniel R. 1975. Protein Capture and Cultural Development in the Amazon Basin. *American Anthropologist* 77:526-549.
- Gross, Daniel R. 1979. A New Approach to Central Brazilian Social Organization. In *Anthropological Perspectives: Essays in Honor of Charles Wagley*. M. L. Margolis and W. E. Carter, eds. pp. 321-342. New York: Columbia University Press.
- Gross, Daniel R. 1981. Proteína y Cultura en Amazonia: Una Segunda Revision. *Amazonia Peruana* 3(6).
- Gross, Daniel R. 1982. The Indians and the Brazilian Frontier. *Journal of International Affairs* 36(1):1-14.
- Gross, Daniel R. 1983. Village Movement in Relation to Resources in Amazonia. In *Adaptive Responses of Native Amazonians*. R. B. Hames and W. T. Vickers, eds. New York: Academic Press.
- Gross, Daniel R. and B. A. Underwood. 1971. Technological Change and Caloric Costs: Sisal Agriculture in Northeastern Brazil. *American Anthropologist* 73(3):725-740.
- Gross, Daniel R., G. Eiten, N. M. Flowers, M. F. Leoi, M. L. Ritter, and D. W. Werner. 1979. Ecology and Acculturation Among Native Peoples of Central Brazil. *Science* 206:1043-1050.
- Hames, Raymond B. 1979. A Comparison of the Efficiencies of the Shotgun and the Bow in Neotropical Forest Hunting. *Human Ecology* 7:219-252.

- Hames, Raymond B. 1980. Game Depletion and Hunting Zone Rotation Among the Ye'kwana and Yanomamö of Amazonas, Venezuela. In *Studies in Hunting and Fishing in the Neotropics*. R. B. Hames, ed. pp. 31-66. Working Papers on South American Indians No. 2. Bennington, Vt.: Bennington College.
- Hames, Raymond B. and W. T. Vickers. 1982. Optimal Diet Breadth Theory as a Model to Explain Variability in Amazonian Hunting. *American Ethnologist* 9(2):358-378.
- Hardesty, Donald L. 1980. The Use of General Ecological Principles in Archaeology. *Advances in Archaeological Method and Theory*, Vol. 3, pp. 157-189.
- Harlan, Jack R., J. M. J. De Wet and A. B. L. Stemler. 1976. Plant Domestication and Indigenous African Agriculture. In *Origins of African Plant Domestication*. J. R. Harlan, J. M. J. de Wet, and A. Stemler, eds. pp. 3-19. The Hague: Mouton.
- Harner, Michael. 1970. Population Pressure and the Social Evolution of Agriculturalists. *Southwestern Journal of Anthropology* 26:67-86.
- Harner, Michael. 1977. The Ecological Basis for Aztec Sacrifice. *American Ethnologist* 4(1):117-135.
- Harrel, Barbara B. 1981. Lactation and Menstruation in Cultural Perspective. *American Anthropologist* 83(4):796-823.
- Harris, David R. 1971. The Ecology of Swidden Cultivation in the Upper Orinoco Rain Forest, Venezuela. *The Geographical Review* 61(4):475-495.
- Harris, David R. 1972a. Swidden Systems and Settlement. In *Man, Settlement, and Urbanism*. P. J. Ucko et al. eds. pp., 245-262. London: Duckworth.
- Harris, David R. 1972b. The Origins of Agriculture in the Tropics. *American Scientist* 60(180-193).
- Harris, David R. 1976. Traditional Systems of Plant Food Production and the Origins of Agriculture in West Africa. In *Origins of African Plant Domestication*. J. R. Harlan et al., eds. pp. 311-356. The Hague: Mouton.
- Harris, David R. 1977a. Alternative Pathways Toward Agriculture. In *Origins of Agriculture*. C. A. Reed ed. pp 179-243. The Hague: Mouton.

- Harris, David R. 1977b. Subsistence Strategies Across Torres Strait. In *Sunda and Sahul: Prehistoric Studies in Southeast Asia, Melanesia, and Australia*. J. Allen et al., eds. pp. 421-463. London: Academic Press.
- Harris, David R. 1980a. Tropical Savanna Environments: Definition, Distribution, Diversity, and Development. In *Human Ecology in Savanna Environments*, D. R. Harris, ed., pp. 3-27. New York: Academic Press.
- Harris, David R. 1980b. Commentary: Human Occupation and Exploitation of Savanna Environments. In *Human Ecology in Savanna Environments*. D. R. Harris, ed. pp 31-39. New York: Academic Press.
- Harris, Marvin. 1975. *Culture, People, Nature*. New York: Thomas Crowell.
- Hassan, Fakri A. 1975. Determination of the Size, Density, and Growth Rate of Hunting-Gathering Populations. In *Population, Ecology, and Social Evolution*. S. Polgar, ed. pp 27-52. The Hague: Mouton.
- Helm, June. 1968. The Nature of Dogrib Socioterritorial Groups. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 118-125. Chicago: Aldine.
- Hemming, John. 1978. *Red Gold: The Conquest of the Brazilian Indians*. Cambridge, Mass.: Harvard University Press.
- Hershkovitz, Philip. 1972. The Recent Mammals of the Neotropical Region. In *Evolution, Mammals, and Southern Continents*. A. Keast et al., eds. pp. 311-431. Albany: SUNY Press.
- Higgs, E. S. and M. R. Jarman. 1972. The Origins of Animal and Plant Husbandry. In *Papers in Economic Prehistory*. E. S. Higgs, ed. pp. 3-13. Cambridge: University of Cambridge Press.
- Hockett, Charles F., and R. Ascher. 1964. The Human Revolution. *Current Anthropology* 5(3):135-168.
- Holling, C. S. 1973. Resilience and Stability of Ecological Systems. *Annual Review of Ecology and Systematics* 4:1-23.
- Howell, Nancy. 1979. *Demography of the Dobe !Kung*. New York: Academic Press.

- Hunter, J. M. 1967. Seasonal Hunger in a Part of the West African Savanna: A Survey of Bodyweights in Nangodi, North-East Ghana. *Transactions of the Institute of British Geographers* 41:167-185.
- Instituto Brasileiro de Geografia e Estatística. 1977. *Geografia do Brasil, Vol. 4. Região Centro-Oeste*. Rio de Janeiro: Serviços Gráficos.
- Irons, William 1974. Nomadism as a Political Adaptation: The Case of the Yomut Turkmen. *American Ethnologist* 1(4):635-658.
- Irvine, F. R. 1970. Evidence of Change in the Vegetable Diet of Australian Aborigines. In *From Diprotodon to Detribalization: Studies of Change Among Australian Aborigines*, A. R. Pilling and R. A. Watson, eds. pp. 278-284. East Lansing, Mich.: Michigan State Press.
- Isto f. 1982. *Taquígrafo Xavante*. December 15, 1982, p. 13.
- Jelliffe, D. B. 1968. *Infant Nutrition in the Sub-Tropics and the Tropics*. W.H.O. Monograph Series 29. Geneva: World Health Organization.
- Johnson, Allen. 1975. Time Allocation in a Machiguenga Community. *Ethnology* 14:301-310.
- Johnston, Francis E., K. M. Kensinger, R. L. Jantz, and G. F. Walker. 1969. The Population Structure of the Peruvian Cashinahua: Demographic, Genetic, and Cultural Interrelationships. *Human Biology* 41(1):29-41.
- Kiltie, Richard A. 1980. More on Amazonian Cultural Ecology. *Current Anthropology* 21:541-544.
- King, Thomas F. 1978. Don't That Beat the Band? Nonegalitarian Political Organization in Prehistoric Central California. In *Social Archaeology: Beyond Subsistence and Dating*. C. L. Redman et al., eds. pp. 225-248. New York: Academic Press.
- Kirch, Patrick V. 1980. The Archaeological Study of Adaptation: Theoretical and Methodological Issues. *Advances in Archaeological Theory and Methods*, Vol. 3, pp. 101-155.
- Konner, Melvin and C. Worthman. 1980. Nursing Frequency, Gonadal Function, and Birth Spacing Among !Kung Hunter-Gatherers. *Science* 207:788-791.

- Kunstadter, Peter. 1972. Demography, Ecology, Social Structure, and Settlement Pattern. In *The Structure of Human Populations*. G. A. Harrison and A. J. Boyce, eds. pp 313-351. Oxford: Clarendon.
- Laet, Joannes de. 1916. *História ou Annais dos Feitos da Companhia Privilegiada das Índias Occidentais*, 2 vols. Rio de Janeiro: Oficinas Gráficas da Biblioteca Nacional. (Original Leyden 1644).
- Lallo, John W. and J. Rose. 1979. Patterns of Stress, Disease, and Mortality in Two Prehistoric Populations from North America. *Journal of Human Evolution* 8:323-335.
- Larsen, Clark S. 1982. The Anthropology of St. Catherine's Island: 3. Prehistoric Human Biological Adaptation. *Anthropological Papers of the American Museum of Natural History*, vol. 57, part 3.
- Lathrap, Donald W. 1970. *The Upper Amazon*. New York: Praeger.
- Lathrap, Donald W. 1977. Our Father the Cayman, Our Mother the Gourd: Spinden Revisited, or a Unitary Model for the Emergence of Agriculture in the New World. In *Origins of Agriculture*. C. A. Reed, ed. pp. 713-751. The Hague: Mouton.
- Laughlin, William S. 1968. The Demography of Hunters: An Eskimo Example. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 241-243. Chicago: Aldine.
- Lave, Jean. 1967. *Social Taxonomy Among the Kri'kati (Gê) of Central Brazil*. Ph. D. dissertation, Harvard University.
- Lave Jean 1979. Cycles and Trends in Kri'kati Naming Practices. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. Cambridge, Mass.: Harvard University Press.
- Lee, Richard B. 1968. What Hunters Do for a Living, or, How to Make Out on Scarce Resources. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 30-48. Chicago: Aldine.
- Lee, Richard B. 1972a. !Kung Spatial Organization: An Ecological and Historical Perspective. *Human Ecology* 1:125-147.

- Lee, Richard B. 1972b. Work Effort, Group Structure and Land Use in Contemporary Hunter-Gatherers. In *Man, Settlement and Urbanism*. P. J. Ucko et al. eds. pp. 176-185. London: Duckworth.
- Lee, Richard B. 1979. *The !Kung San: Men, Women, and Work in a Foraging Society*. Cambridge: Cambridge University Press.
- Leitão, Ismael. 1949. Report to the Indian Service.
- Leitão, Ismael. 1954. Report to the Indian Service.
- Leitão, Ismael. n.d. Personal communication.
- Levi-Strauss, Claude. 1963. The Use of Wild Plants in Tropical South America. In *Handbook of South American Indians*, Vol. 6. J. Steward, ed. New York: Cooper Square Publishers. (Original 1950. Washington D. C.: Smithsonian Institution).
- Levi-Strauss, Claude 1964. *Tristes Tropiques*. Transl. John Russell. New York: Atheneum. (Original 1954. Paris: Plon.)
- Levi-Strauss, Claude. 1967a. The Social and Psychological Aspects of Chieftainship in a Primitive Tribe: The Nambikuara of Mato Grosso. In *Comparative Political Systems*. R. Cohen and J. Middleton, eds. pp. 45-62. New York: Natural History Press. (Original 1944.)
- Levi-Strauss, Claude. 1967b. Social Structure of Central and Eastern Brazil. Chapter 7 in *Structural Anthropology*, pp. 116-127. Garden City, New York: Anchor Books. (Original 1952).
- Levi-Strauss, Claude. 1967c. Do Dual Organizations Exist? Chapter 8 in *Structural Anthropology*, pp. 128-160. Garden City, New York: Anchor Books. (Original 1956).
- Lizot, Jacques. 1978. Population, Resources, and Warfare Among the Yanomami. *Man* 12:497-517.
- Lowie, Robert H. 1963a. The "Tapuya". In *Handbook of South American Indians*, Vol 1. J. Steward, ed. pp. 553-556. New York: Cooper Square Publishers. (Original 1945. Washington D. C.: Smithsonian Institution.)
- Lowie, Robert H. 1963b. Eastern Brazil: An Introduction. In *Handbook of South American Indians*, Vol. 1. J. Steward, ed. New York: Cooper Square Publishers. (Original 1946. Washington D. C.: Smithsonian Institution.)

- Lowie, Robert H. 1963c. The Tropical Forests: An Introduction. In Handbook of South American Indians, Vol. 3. J. Steward, ed. New York: Cooper Square Publishers. (Original 1948, Washington D. C.: Smithsonian Institution.)
- Lukesch, Anton. 1976. Mito e Vida dos Índios Caiapós. São Paulo: Livraria Pioneira Editora.
- MacArthur, R. H. and E. R. Pianka 1966. On Optimal Use of a Patchy Environment. *American Naturalist* 100:603-609.
- McGregor, Ian A., W. Z. Billewicz, and A. M. Thomson. 1961. Growth and Mortality in an African Village. *British Medical Journal*, December 23, 1961, pp. 1661-1666.
- McGregor, Ian A., A. K. Rahman, B. Thompson, W. Z. Billewicz, and A. M. Thomson. 1968. The Growth of Young Children in a Gambian Village. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 62(3):341-352.
- MacLachlan, Colin M. 1973. The Indian Labor Structure in the Portuguese Amazon, 1700-1800. In *Colonial Roots of Modern Brazil*. D. Alden ed. pp. 199-230. Berkeley: University of California Press.
- MacNeish, Richard S. 1971. Speculation About How and Why Food Production and Village Life Developed in the Tehuacan Valley, Mexico. *Archaeology* 24:307-315.
- MacNeish, Richard S. 1972. The Evolution of Community Patterns in the Tehuacan Valley of Mexico and Speculation about the Cultural Process. In *Man, Settlement, and Urbanism*. P. J. Ucko et al., eds. pp 67-93. London: Duckworth.
- Magalhães, Basílio de. 1927. Algumas notas sobre os Cherentes. *Revista do Instituto Histórico e Geográfico Brasileiro* (Tomo 101 or Vol. 105).
- Magalhães, Couto de. 1938. Viagem ao Araguaya. São Paulo. (Original Goiás 1863).
- Malcolm, L. A. 1970. Growth, Malnutrition, and Mortality of the Infant and Toddler in the Asai Valley of the New Guinea Highlands. *The American Journal of Clinical Nutrition* 23(8):1090-1095.
- Marcgrave, Jorge. 1942. *Historia Natural do Brasil*. Transl. Jose Procópio de Magalhães. (Original *Historia Naturalis Brasiliae*. Amsterdam/ Leyden 1648).

- Marchant, Alexander. 1966. *From Barter to Slavery: The Economic Relations of Portuguese and Indians in the Settlement of Brazil, 1500-1580*. Gloucester, Mass.: Peter Smith.
- Martin, M. Kay. 1969. *South American Foragers: A Case Study in Cultural Devolution*. *American Anthropologist* 71:243-260.
- Martius, Carl Friedrich P. von. 1867. *Beitrage zur Ethnographie und Sprachenkunde Amerika's zumal Brasiliens*. 2 vols. Leipzig: Friedrich Fleischer.
- Maruyama, Maqorah 1963. *The Second Cybernetics: Deviation-Amplifying Mutual Causal Processes*. *American Scientist* 51:164-179.
- Mason, J. Alden. 1963. *The Languages of South American Indians*. In *Handbook of South American Indians*, Vol. 6. J. Steward, ed. New York: Cooper Square Publishers. (Original 1950. Washington D.C.: Smithsonian Institution).
- Maxwell, Kenneth R. 1973. *Conflicts and Conspiracies: Prazil and Portugal 1750-1808*. Cambridge: Cambridge University Press.
- Maybury-Lewis, David. 1965a. *Some Crucial Distinctions in Central Gê Ethnology*. *Anthropos* 60:340-358.
- Maybury-Lewis, David. 1965b. *The Savage and the Innocent*. London: Evans Brothers.
- Maybury-Lewis, David. 1956. *On Martius' Distinction between Shavante and Sherente*. *Revista do Museu Paulista* 16:263-288.
- Maybury-Lewis, David. 1967. *Akwẽ-Shavante Society*. Oxford: Clarendon Press.
- Maybury-Lewis, David. 1974. *Preface to the Paperback Edition*. Akwẽ-Shavante Society. New York: Oxford University Press.
- Maybury-Lewis, David. 1979. *Conclusion: Kinship, Ideology, and Structure*. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. pp. 301-312. Cambridge, Mass.: Harvard University Press.
- Medina, Ernesto 1980. *Ecology of Tropical American Savannas: An Ecophysiological Approach*. In *Human Ecology in Savanna Environments*. D. R. Harris, ed. pp 297-319. New York: Academic Press.

- Meegders, Betty J. 1954. Environmental Limitations on the Development of Culture. *American Anthropologist* 56:801-824.
- Meegders, Betty J. 1971. *Amazonia: Man and Culture in a Counterfeit Paradise*. Chicago: Aldine-Atherton.
- Melatti, J. 1970. *O Sistema Social Krahó*. Ph. D. dissertation, Universidade de São Paulo.
- Melatti, J. 1979. The Relationship System of the Krahó. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis, ed. pp. 46-82. Cambridge, Mass.: Harvard University Press.
- Metz, M. D., D. Hart, and H. C. Harpending 1971. Iron, Folate, and Vitamin B12 Nutrition in a Hunter-Gatherer People: A Study of the !Kung Bushmen. *American Journal of Clinical Nutrition* 24:229-242.
- Morey, Nancy C. and R. V. Morey. 1973. Foragers and Farmers: Differential Consequences of Spanish Contact. *Ethnohistory* 20:229-246.
- Morgan, Lewis H. 1973. Ancient Society. In *High Points in Anthropology*. P. Bohannan and M. Glazer, eds. pp. 32-60. (Original 1877).
- Murphy, Robert F. and J. Steward. 1956. Tappers and Trappers: Parallel Process in Acculturation. *Economic Development and Cultural Change* 4:335-355.
- Neel, James V. 1973. Lessons from a "Primitive" People. In *Peoples and Cultures of Native South America*. D. R. Gross ed., pp 159-182. Garden City, New York: Doubleday/The Natural History Press. (Original 1970).
- Neel, James V., F. M. Salzano, P. C. Junqueira, F. Keiter, and D. Maybury-Lewis. 1964. Studies on the Xavante Indians of the Brazilian Mato Grosso. *American Journal of Human Genetics* 19(4):463-489.
- Neel, James V. and F. M. Salzano. 1967. Further Studies on the Xavante Indians. X. Some Hypotheses-Generalizations Resulting from These Studies. *American Journal of Human Genetics* 19(4):554-575.
- Neel, James V., A. H. P. Andrade, G. E. Brown, W. E. Eveland, J. Goodbar, W. A. Godeman, Jr., G. E. Stollerman, E. D. Weinstein, and A. H. Wheeler. 1968. Further Studies on the Xavante Indians. IX. Immunologic Traits with Respect to Various Diseases and Organisms. *The American Journal of Tropical Medicine and Hygiene* 17:484-498.

- Neel, James V., W. R. Centerwall, N. A. Chagnon, and H. L. Carey. 1970. Notes on the Effect of Measles and Measles Vaccine in a Virgin Soil Population of South American Indians. *American Journal of Epidemiology* 91(4):418-429.
- Netting, Robert McC. 1971. The Ecological Approach in Cultural Study. McCaleb Module in Anthropology No. 6. Addison Wesley Module Publications.
- New York Times 1981. An Indian Chief Goes to Rio to Battle for His People. October 13, 1981, p. A2.
- Nimuendaju, Curt. 1942. The Šerente. Los Angeles: Publications of the Frederick Webb Hodge Fund, Vol. 4.
- Nimuendaju, Curt 1946. The Eastern Timbira. University of California Publications in American Archaeology and Ethnography No. 41. Berkley: University of California Press.
- Nimuendaju, Curt 1967. The Apinayé. Oosterhout, The Netherlands: Anthropological Publications. (orig. 1939. Washington D. C.: University of America Press).
- Niswander, Jerry D. 1967. Further Studies on the Xavante Indians. VII. The Oral Status of the Xavantes of Simões Lopes. *American Journal of Human Genetics* 19(4):554-574.
- Niswander, J. D., F. Keiter, and J. V. Neel. 1967. Further Studies on the Xavante Indians. II. Some Anthropometric, Dermatoglyphic, and Nonquantitative Morphological Traits of the Xavantes of Simões Lopes. *American Journal of Human Genetics* 19(4):490-501.
- Nurse, G. I. 1975. Seasonal Hunger Among the Ngoni and Ntumba of Central Melawi. *Africa* 45(1):1-11.
- Parsons, James J. 1980. Europeanization of the Savanna Lands of Northern South America. In *Human Ecology in Savanna Environments*. D. R. Harris, ed. pp. 267-289. New York: Academic Press.
- Patterson, Thomas C. 1971. The Emergence of Food Production in Central Peru. In *Preshistoric Agriculture*. S. Struever, ed. pp. 181-207. Garden City, N. Y.: The Natural History Press.
- Perziquian, Anthony J. 1977. Teeth as Tools for Prehistoric Studies. In *Biological Adaptation in Prehistoric America*, R. E. Blakely, ed., pp. 101-114. Athens, Georgia: University of Georgia Press.
- Pfeiffer, John E. 1977. *The Emergence of Society: A Prehistory of the Establishment*. New York: McGraw-Hill.

- Plog, Fred 1977. Explaining Change. In *Explanation of Prehistoric Change*, J. N. Hill, ed., pp. 17-57. Albuquerque: University of New Mexico Press.
- Pohl, Johann E. 1951. Viagem no Interior do Brasil. 2 vols. Rio de Janeiro: Instituto Nacional do Livro, Ministério da Educação. (Original Reise im Innern von Brasilien. 2 vols., 1832-1837, Vienna).
- Porto, Carlos Eugenio. n.d. Roteiro do Piauí, Ministério de Educação e Cultura, Serviço de Documentação.
- Posev, Darrell A. 1982. The Keepers of the Forest. *Garden Jan./Feb.* 1982, pp. 18-24.
- Prado, Caio Junior. 1963. Formação do Brasil Contemporâneo: Colônia. São Paulo: Editora Brasiliense.
- PRONAPA. 1970. Brazilian Archaeology in 1968: An Interim Report on the National Program of Archaeological Research. *American Antiquity* 35(1):1-23.
- Queiroz, Jeová F. de. 1990. Xavante: Como Manter o Orgulho de Ser Índio na Trilha do Trator. *Interior*, Ano VII, No. 35, pp. 20-31.
- Reed, Charles A. 1977. Origins of Agriculture: Discussion and Some Conclusions. In *Origins of Agriculture*. C. A. Reed, ed. pp. 879-953. The Hague: Mouton.
- Revista do Instituto Histórico e Geográfico Brasileiro. 1846. Cópia da carta que o alferes José Pinto da Fonseca escreveu ao Exmo. General de Goyazes, dando-lhe conta de duas nações de índios, dirigida do sítio onde portou. Vol. 8, pp. 376-390.
- Revista do Instituto Histórico e Geográfico Brasileiro. 1918. Subsídios para a História da Capitania de Goyaz (1756-1806), Vol. 84, pp. 41-294.
- Ribeiro, Darcy. 1956. Convívio e Contaminação: Efeitos Dissociativos da Depopulação Provocada por Epidemias em Grupos Indígenas. *Sociologia* 18(1):3-50.
- Ribeiro, Francisco da Paula. 1841. Memória sobre as nações gentias que habitam o Continente do Maranhão -- escripta em 1819. *Revista do Instituto Histórico e Geográfico Brasileiro*, Vol. 3.
- Ribeiro, Francisco da Paula. 1849. Descrição do território de Pastos Bons, nos sertões do Maranhão, pelo Major Francisco de Paula Ribeiro. *Revista do Instituto Histórico e Geográfico Brasileiro* 12:41-86.

- Ribeiro, Francisco da Paula. 1870. Roteiro da Viagem que fez o Capitão Francisco da Paula Ribeiro às Fronteiras da Capitania do Maranhão e de Goyaz em 1815 em Serviço da S. M. Fidelíssima. *Revista do Instituto Histórico e Geográfico Brasileiro* 10(1):5-80.
- Rindos, David. 1990. Symbiosis, Instability, and the Origins and Spread of Agriculture: A New Model. *Current Anthropology* 2(6):751-772.
- Ritter, Madeline L. 1974. The Conditions Favoring Age-Set Organization. M. A. thesis Hunter College.
- Robbins, Louise M. 1977. The Story of Life Revealed by the Dead. In *Biocultural Adaptations in Prehistoric America*. R. L. Blakely, ed. pp. 105-26. Athens: University of Georgia Press.
- Rodgers, David J. 1963. Studies of *Manihot esculenta* Crantz and Related Species. *Bulletin of the Torrey Botanical Club* 90:43-54.
- Roosevelt, Anna C. 1980. *Parmana: Prehistoric Maize and Manioc Subsistence Along the Amazon and Orinoco*. New York: Academic Press.
- Pose, Frederick G. S. 1968. Sahlins' Original Affluent Society: A Comment. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 203-204 Chicago: Aldine.
- Ross, Eric B. 1978. Food Taboos, Diet, and Hunting Strategy: The Adaptation to Animals in Amazon Cultural Ecology. *Current Anthropology* 19(1):1-36.
- Sahlins, Marshall D. 1960. Evolution: Specific and General. In *Evolution and Culture*. M. D. Sahlins and E. P. Service, eds. pp. 12-44. Ann Arbor: University of Michigan Press.
- Sahlins, Marshall D. 1964. Culture and Environment: The Study of Cultural Ecology. In *Horizons of Anthropology*. Sol Tax, ed. pp. 132-147. Chicago: Aldine.
- Sahlins, Marshall D. 1972. *Stone Age Economics*. Chicago: Aldine.
- Saint-Hilaire, August de. 1848. *Voyage aux Sources du Rio de São Francisco et dans la Province de Goyaz*, vol. 2. Paris: Artus Bertrand.
- Salzano, Francisco M. 1972. Genetic Aspects of the Demography of American Indians and Eskimos. In *The Structure of Human Populations*. G. A. Harrison and A. J. Royce, eds. pp. 234-252. Oxford: Clarendon.

- Salzano, Francisco M., J. V. Neel, and D. Maybury-Lewis. 1967. Further Studies on the Xavante Indians. I. Demographic Data on Two Additional Villages: Genetic Structure of the Tribe. *American Journal of Human Genetics* 19(4):463-489.
- Salzano, Francisco M., J. V. Neel, H. Gershowitz, and E. C. Megliazza. 1977. Intra and Intertribal Genetic Variation within a Linguistic Group: The Gê-Speaking Indians of Brazil. *American Journal of Physical Anthropology* 47:337-348.
- Sauer, Carl O. 1952. *Agricultural Origins and Dispersals*. New York: American Geographical Society.
- Sauer, Carl O. 1963. Cultivated Plants of South and Central America. In *Handbook of South American Indians*, Vol. 6, pp. 319-345. J. Steward, ed. New York: Cooper Square Publishers. (Original 1950. Washington D. C.: Smithsonian Institution).
- Sauer, Jonathan D. 1977. Biogeographical Theory and Cultural Analogies. *World Archaeology* 8:320-331
- Sbardellotto, Pedro. n.d. Personal communication.
- Schoener, Thomas W. 1971. Theory of Feeding Strategies. *Annual Review of Ecology and Systematics* 2:369-404.
- Schrire, Carmel 1980. An Inquiry into the Evolutionary Status and Apparent Identity of San Hunter-Gatherers. *Human Ecology* 8(1):9-32.
- Schuller, Rudolf R. 1913. Zur Affinität de Tapuya-Indianer de Teatrum Rerum Naturalium Brasiliae. *Internationales Archiv fur Ethnographie* 21:79-98.
- Scott, Eugenie, and B. R. DeWalt 1980. Subsistence and Dental Pathology Etiologies from Coastal Peru. *Medical Anthropology* 4(2):263-290.
- Scudder, Thayer. 1975. *The Ecology of the Gwembe Tonga*. Kariba Studies, Vol. 2. Manchester: Manchester University Press.
- Seeger, Anthony. 1974. Nature and Culture and Their Transformations in the Cosmology and Social Organization of the Suyá. Ph. D. dissertation, University of Chicago.
- Seeger, Anthony. 1980. *Os Índios e Nós: Estudos sobre Sociedades Tribais Brasileiros*. Rio de Janeiro: Editora Campos.

- Silberbauer, George B. 1972. The G/wi Bushmen. In *Hunters and Gatherers Today*. M. G. Bicchieri, ed. pp. 271-236. New York: Holt, Rinehart and Winston.
- Silva, Hermanno Ribeiro da. 1935. *Nos Sertões do Araguaia*. São Paulo: Edições Cultura Brasileira.
- Simonsen, Roberto F. 1967. *História Económica do Brasil*. São Paulo.
- Siskind, Janet. 1973. Tropical Forest Hunters and the Economy of Sex. In *Peoples and Cultures of Native South America*. D. R. Gross, ed. pp. 226-240. Garden City, N. Y.: The Natural History Press.
- Slobodkin, L. B. 1968. Toward a Predictive Theory of Evolution. In *Population, Biology, and Evolution*. R. C. Lowontin, ed. pp. 187-205. Syracuse: Syracuse University Press.
- Smith, Philip E. L. 1976. *Food Production and Its Consequences*. Menlo Park, Calif.: Cummings.
- Smith, Philip E. L. and T. C. Young. 1972. The Evolution of Early Agriculture and Culture in Greater Mesopotamia: A Trial Model. In *Population Growth: Anthropological Implications*. B. Spooner, ed. pp. 1-59. Cambridge, Mass.: MIT Press.
- Southey, Robert. 1970. *History of Brazil*. Vol. 3. New York: Burt Franklin. (original 1822).
- Souza, Lincoln de. 1953a. *Os Xavantes e a Civilização*. São Paulo.
- Souza, Lincoln de. 1953b. *Entre os Xavantes do Roncador*. Rio de Janeiro: Ministerio da Educação e Saúde, Serviço de Documentação.
- Souza, Luiz Antonio da Silva e. 1849. Memória sobre o descobrimento, governo, população e coisas mais notáveis da Capitania de Goyaz, pelo Padre Luiz Antonio de Silva e Sousa, natural do Serro Frio, Capitania de Minas Gerais. *Revista do Instituto Histórico e Geográfico Brasileiro* 12:429-510.
- Spix, J. B. von, and C. F. von Martius. 1824. *Travels in Brazil in the Years 1817-1829*. London. (Original *Reise in Brasilien*.)
- Steinen, Karl von den 1966. Among the Primitive Peoples of Central Brazil: A Travel Account and the Results of the Second Xingu Expedition, 1877-1888. New Haven: Human Relations Area Files. (Original 1894. Berlin.)

- Steward, Julian. 1938. *Basin-Plateau Aboriginal Sociopolitical Groups*. Washington D.C.: Government Printing Office.
- Steward, Julian, ed. 1963a. *Handbook of South American Indians*, 7 vols. New York: Cooper Square Publishers. (Original 1944-1950 Washington D. C.: Smithsonian Institution.)
- Steward, Julian. 1963b. *The Marginal Tribes*. In *Handbook of South American Indians*, vol. 5. J. Steward, ed. pp. 678-697. New York: Cooper Square Publishers. (Original 1949. Washington D. C. Smithsonian Institution.)
- Steward, Julian. 1976. *Theory of Culture Change*. Urbana: University of Illinois Press. (Original 1955).
- Steward, Julian H. and L. C. Faron. 1959. *Native Peoples of South America*. New York: McGraw Hill.
- Stuart, David E. 1977. *Seasonal Phases in Ona Subsistence, Territorial Distribution, and Organization: Implications for the Archaeological Record*. In *Theory Building in Archaeology*. L. R. Binford, ed. pp. 251-283.
- Sussman, Robert W. 1972. *Child Transport, Family Size, and Increase in Human Population During the Neolithic*. *Current Anthropology* 13:258-259.
- Suttles, Wayne. 1968. *Coping with Abundance: Subsistence on the Northwest Coast*. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 56-68. Chicago: Aldine.
- Taqqia, Fr. Rafael de. 1856. *Mappa dos Índios Cherentes e Chavantes da nova povoação de Theresa Christina do Rio Tocantins, ao norte desta província de Goyaz, aldeados aos 24 de junho de 1854*. *Revista do Instituto Histórico e Geográfico Brasileiro* 19:119-122.
- Taunay, Afonso de Escagnolle. 1954. *Relatos Sertanistas*. *Revista Histórica paulista* 7.
- Thomson, A. M. 1977. *The Development of Young Children in a West African Village: A Study in Human Ecology*. In *Human Ecology in the Tropics*. J. P. Garlick and R. W. J. Keay, eds. pp. 113-126. *Symposia of the Society for the Study of Human Biology*, vol. 16. (2nd edition). New York: Halstead Press.
- Thomson, Donald F. 1939. *The Seasonal Factor in Human Culture: Illustrated from the Life of a Contemporary Nomadic Group*. *Proceedings of the Prehistoric Society* 5:209-221.

- Truswell, A. Stewart and J. D. L. Hansen. 1976. Medical Research Among the !Kung. In *Kalahari Hunter-Gatherers: Studies of the !Kung San and Their Neighbors*, R. B. Lee and I. DeVore, eds., pp. 166-194. Cambridge, Massachusetts: Harvard University Press.
- Turnbull, Colin M. 1968. The Importance of Flux in Two Hunting Societies. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 132-137. Chicago: Aldine.
- Turner, Christy S. II. 1979. Dental Anthropological Indications of Agriculture Among the Jomon People of Central Japan. X. Peopling of the Pacific. *American Journal of Physical Anthropology* 51:619-636.
- Turner, Terence S. 1966. Social Structure and Political Organization Among the Northern Kayapó. Ph. D. dissertation, Harvard University.
- Turner, Terence S. 1979a. The Gê and Bororo Societies as Dialectical Systems: A General Model. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis ed. pp. 147-178. Cambridge, Mass.: Harvard University Press.
- Turner, Terence S. 1979b. Kinship, Household and Community Structure. In *Dialectical Societies: The Gê and Bororo of Central Brazil*. D. Maybury-Lewis ed. pp. 179-217. Cambridge, Mass.: Harvard University Press.
- Vayda, Andrew P. 1969. Expansion and Warfare Among Swidden Agriculturalists. In *Environment and Cultural Behavior*. A. P. Vayda, ed. pp. 202-220. Garden City, N. Y. The Natural History Press. (Original 1961.)
- Vianna, Urbano. 1927. Akuen ou Xerente. *Revista do Instituto Histórico e Geográfico Brasileiro* 155:33-48.
- Vickers, William T. 1979. Native Amazonian Subsistence in Diverse Habitats: The SionaSecoya of Ecuador. In *Changing Agricultural Systems in Latin America*. E. F. Moran, ed. pp. 6-36. *Studies in Third World Societies*, Publication No. 9.
- Vickers, William T. 1980. An Analysis of Amazonian Hunting Yields as a Function of Settlement Age. In *Studies in Hunting and Fishing in the Neotropics*. R. B. Hames, ed. pp. 7-29. *Working Papers on South American Indians* No. 2. Bennington Vt.: Bennington College.
- Vidal, Lux B. 1977. Morte e Vida duma Sociedade Indígena Brasileira: Os Kayapó-Xikrin do Rio Catete. São Paulo: Editora Hucitec.

- Wagley, Charles. 1973. Cultural Influences on Population: A Comparison of Two Tupi Tribes. In *Peoples and Cultures of Native South America*. D. R. Gross, ed. pp. 145-158. Garden City, New York: The Natural History Press. (Original 1951).
- Wagley, Charles. 1977. *Welcome of Tears: The Tapirapé Indians of Central Brazil*. New York: Oxford University Press.
- Ward, R. H., H. Gershowitz, M. Layrisse, and J. V. Neel. 1975. The Genetic Structure of a Tribal Population, the Yanomamo Indians. XI. Gene Frequencies for 10 Blood Groups and the ABH-Le Secretor Traits in the Yanomamo and Their Neighbors: The Uniqueness of the Tribe. *American Journal of Human Genetics* 27:130.
- Warminq, Eugenio. 1973. Lagoa Santa: Contribuição para a Geographia Phytobiologica. Belo Horizonte: Editora Itataia. (Original 1908).
- Watson, James B. 1965. From Hunting to Horticulture in the New Guinea Highlands. *Ethnology* 4(3):295-309.
- Weinstein, E. David, J. V. Neel, and F. M. Salzano. 1967. Further Studies on the Xavante Indians. VI. The Physical Status of the Xavantes of Simões Lopes. *American Journal of Human Genetics* 19(4):532-542.
- Wendorf, Fred and R. Schild. 1976. The Use of Ground Grain During the Late Paleolithic of the Lower Nile Valley, Egypt. In *Origins of African Plant Domestication*. J. R. Harlan et al., eds. pp. 269-288. The Hague: Mouton.
- Wendorf, Fred, R. Schild, and A. E. Close. 1982. An Ancient Harvest on the Nile. *Science* 82 3(9):68-73.
- Werner, Dennis W. 1978. Trekking in the Amazon. *Natural History* 87(9):42-55.
- Werner, Dennis W. 1980. The Making of A Mekranoti Chief: The Psychological and Social Determinants of Leadership in a Native South American Society. Ph. D. dissertation, City University of New York.
- Werner, Dennis W. 1981a. Gerontocracy Among the Mekranoti of Central Brazil. *Anthropological Quarterly* 54(1):15-27.
- Werner, Dennis W. 1981b. Are Some People More Equal than Others? Status Inequality among the Mekranoti Indians of Central Brazil. *Journal of Anthropological Research* 37(4):360-373.

- Werner, Dennis W. 1982a. Chiefs and Presidents: A Comparison of Leadership Traits in the United States and among the Mekranoti-Kayapó of Central Brazil. *Ethos* 10(2):136-148.
- Werner, Dennis W. 1982b. Leadership Inheritance and Acculturation among the Mekranoti of Central Brazil. *Human Organization* 41(4):342-345.
- Werner, Dennis W. 1983. Why do the Mekranoti Trek? In *Adaptive Responses of Native Amazonians*, R. B. Hames and W. T. Vickers, eds. New York: Academic Press.
- Werner, Dennis W. ms. a. Fertility and Pacification Among the Mekranoti of Central Brazil.
- Werner, Dennis W. ms. b. Nomad Warriors: A Personal Chronicle of Fieldwork Among Brazil's Mekranoti Indians.
- Werner, Dennis W. n.d. Personal Communication.
- Werner, Dennis W., N. M. Flowers, D. R. Gross and M. L. Ritter. 1979. Subsistence Productivity and Hunting Effort in Native South America. *Human Ecology* 7:303-315.
- White, Leslie A. 1949. *The Science of Culture*. New York: Farrar Straus and Cudahy.
- Willey, Gordon R. 1971. *An Introduction to American Archaeology*. Vol.2: South America. Englewood Cliffs, N. J.: Prentice Hall.
- Wilmsen, Edwin N. 1973. Interaction, Spacing Behavior, and the Organization of Hunting Bands. *Journal of Anthropological Research* 29:1-31.
- Wilmsen, Edwin N. 1978. Seasonal Effects of Dietary Intake on Kalahari San. *Federation Proceedings* 37(1):65-72.
- Winterhalder, Bruce, and E. A. Smith, eds. 1981. *Hunter-Gatherer Foraging Strategies: Ethnographic and Archaeological Analyses*. Chicago: University of Chicago Press.
- Woodburn, James. 1968. An Introduction to Hadza Ecology. In *Man the Hunter*. R. B. Lee and I. DeVore, eds. pp. 49-55. Chicago: Aldine.
- Woodburn, James. 1972. Ecology, Nomadic Movement, and the Cooperation of the Social Group Among Hunters and Gatherers: An East African Example and Its Implications. In *Man, Settlement and Urbanism*. P. J. Ucko et al., eds. pp. 193-206. London: Duckworth.

- World Health Organization. 1978. A Growth Chart for International Use in Maternal and Child Health Care. Geneva: World Health Organization.
- Wynne-Edwards, V. C. 1962. Animal Dispersion in Relation to Social Behavior. Edinburgh: Oliver and Boyd.
- Wynne-Edwards, V. C. 1965. Self-Regulating Systems in Populations of Animals. Science 147:1543.
- Yellen, J. E. 1977a. Archaeological Approaches to the Present: Models for Reconstructing the Past. New York: Academic Press.
- Yellen, John E. 1977b. Long-Term Hunter-Gatherer Adaptation to Desert Environments: A Biogeographical Perspective. World Archaeology 8(3):262-274.