Charcoal: Its Multifarious Effect in a Rural Guatemalan Community

Hehr
CHARCOAL: ITS MULTIFARIOUS EFFECT
IN A RURAL GUATEMALAN COMMUNITY

by

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Charcoal Movement from Cajola to Quezaltenango
INTRODUCTION

In the underdeveloped countries of the world there are vast numbers of illiterate people living at subsistence levels. These people, caught in the continuum of poverty, have little hope of obtaining the technological conveniences of modern societies. In the Guatemalan highlands there are large numbers of Indians who are living in such a manner, and their suppression maintains a backward mode of life.

The writer spent three months living in Guatemala's western highlands among a predominately Indian population. The poverty and oppression which the Indian masses endure is omnipresent, and the antagonisms that exist between the upper-classes and the Indian masses are readily evident. In the city of Quezaltenango, the inhabitants are essentially Westernized; in the rural scene, the residents follow a traditional way of life as they have for centuries. In the municipio of Cajolá, which is located ten miles to the northwest of the city of Quezaltenango, live approximately 5,000 Indians who maintain an age-old traditional culture. The inhabitants
in this area live on a subsistence-agricultural basis, but the pressure of population and limited cultivable land has forced them to seek alternative sources of income. They have long supplemented their meager earnings through the production and sale of charcoal. The residents of Cajolá sell their charcoal in the city of Quezaltenango to those who can afford to purchase the product.

The purpose of this study is to investigate the charcoal industry and its various manifestations in both Cajolá and the region as a whole. Why are the inhabitants of Cajolá being forced to find alternative forms of employment? Can they produce charcoal for an unlimited period of time without heeding the limitations imposed by the natural resources of the area? What will be the effect on the inhabitants when charcoal production begins to decline? These questions pose critical problems for the residents of Cajolá. Unfortunately few, beyond the limits of this community, show concern.

This investigation was carried out primarily through interviews with inhabitants of the area. Since the majority of the population lacks a formal education much of the information obtained had to be carefully scrutinized. Thus, only through numerous and sometimes frustrating interviews was the entire story and implication...
of charcoal production learned. Data on Guatemala and its western highlands was obtained from sources in both Guatemala and the United States.
CHAPTER I

THE BASIN OF QUEZALTENANGO

The Physical Setting

Inland and parallel to Pacific coastal Guatemala lies a mountain front which forms an effective barrier between the Pacific lowlands and the interior highlands. This chain of volcanic mountains attains altitudes in excess of 12,000 feet and stretches the entire length of Guatemala's Pacific coast with a northwest to southeast orientation. The Pacific coastal plain which lies to the south of this range has a width varying from thirty to fifty miles and is tropical in climate with a dry season which lasts from late November to the end of April. The mountainous rise from the coastal plain is abrupt and magnificent with few paved roads giving access to the interior. In western Guatemala, within twenty-five miles one may travel from sea level over the volcanic row and to the highland interior lying 8,000 to 9,000 feet above the Pacific.

In the highlands, adjacent to the volcanic front, a series of basins parallel the mountains throughout their entire length. Quezaltenango, the second largest city
in Guatemala, lies on the floor of one of these basins in the western highlands at an altitude of 7,730 feet above sea level. The volcano Santa Maria, located just south of the city, rises majestically to an elevation of 12,363 feet and is a distinct feature of the area.

Mountains which for the most part attain altitudes between 9,000 and 10,000 feet surround the Basin of Quezaltenango. It has a length of approximately twenty miles and a width that averages four miles with many variations and minor appendages occurring along its entire length. The mile and a half high basin becomes progressively greater in relief near its margins but has prime agricultural areas of low relief in its central portion. The surrounding mountains have shaped it into an arcuate form, concave toward the north or interior. The opposite ends of the concavity curl around the Cerro de Olintepeque which forms the northern limits of the basin floor. The extensions of the arc contain two villages, Cajolá on the west and Totonicapán to the east. These villages are approximately ten miles from the city of Quezaltenango which is located midway between them. Just east of Quezaltenango is the Rio Samala, the only river outlet for the region. It flows to the south toward the Pacific Ocean carrying the runoff for the entire area.
The physical environment has a profound effect upon the basin through limitations imposed by the elevation and especially the climate which is classified as tierra fria. Monthly temperatures average just under 60°F. with the warmest monthly average of 62°F. occurring in May and an average low monthly temperature of 51°F. in January. Even though the region is located in tropical latitudes, frost can be expected on any night from December through April depending upon location and slope. Frost has also occurred during the other months of the year usually inflicting disastrous results. The lowest temperature ever recorded was 26°F. and the highest 83°F. The minimum temperatures are of prime importance to the agricultural economy, for the temperature controls the type of crops that can be grown and the seasons in which they can be produced. Thus, temperature is perhaps the most critical element to this primarily subsistence-agricultural economy.

The frost period from December to April also corresponds with the dry season. During this period there is a conspicuous absence of cloud cover and the landscape is parched to a brown desert-like scene. The rainy season commences in May and continues to early November with rainfall maxima occurring in June and again in September. Rainfall data for the region are lacking with
only one station currently recording precipitation and temperature; and these records are of questionable value.¹ The topography is such that various slopes and barriers can create large differences in amounts of precipitation within short distances. The village of Cajola, situated in an isolated pocket, receives a markedly different quantity of precipitation than does the city of Quezaltenango, which has an open location. Thus, the precipitation received in different sections of the basin may vary from thirty to eighty inches annually.² The effect of the elevation and mountain barriers on the temperature and precipitation patterns has, to a considerable extent, dictated the mode of life in the area. These factors are responsible for patterns of agriculture that have changed little for hundreds of years.

The two basic crops of this region are wheat and corn, wheat being the cash crop and corn the subsistence crop. In the central portion of the basin a considerable

¹A study of the temperature and precipitation records at the local Agricultural Experimental Station, Labor Ovalle, reveals that the manner in which the data is collected and recorded is subject to error.

quantity of land is devoted to wheat production. The farmers in areas of dense population, such as Cajolá, are forced to grow large quantities of corn in order to subsist and less land is devoted to wheat. Minor crops include beans, squash, and a variety of fruits, but these too are restricted by limitations imposed by altitude.

The natural forest cover of predominantly pine, oak, and cypress, has long been depleted in areas fit for cultivation and the inhabitants' dependence upon wood has stripped many of the slopes of their forest cover. In the cultivable areas of the region the only form of natural vegetation is found along streams and in barrancas and is predominantly cypress and pine. A forest does exist on the cumbre surrounding the basin where topographic conditions inhibit cultivation. Here the pine, cypress, and fir are usually found intermixed in groves, while the oak tends to grow in pure stands. The cutting for firewood and charcoal production has reduced the pure oak stands and permitted the encroachment of pine.\(^3\) The cumbre is being reduced to barren slope in many areas because of continued cutting which is seriously depleting the remaining forest reserves.

The soils in the Basin of Quezaltenango are volcanic in origin. The eruption of the volcano, Santa Maria, in 1902 did much to alter the present-day soil characteristics in the western section of the area. The soils in the central and eastern sectors of the region are Suelos Quezaltenango (Qe), and those in the west are Suelos Quezaltenango fase quebrada (Qeg). Being volcanic in origin, the soils are generally a light brownish color at the surface and nearly white at sub-surface levels. The ash is very gritty and coarse permitting the rapid penetration of precipitation. This coarse soil texture results in poor retention of moisture and a soil which becomes quite desiccated during the dry season. Erosion is a negligible problem on the flat areas but on barren and cultivated slopes the soil can be readily eroded during periods of heavy rainfall.

The natural fertility of the soils is dependent upon location and slope but they tend to be generally poor. One major problem facing the agriculturalists is the absence of organic materials in the soil. The upper-class wheat farmers compensate for this by using chemical

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4Charles S. Simmons, José Manuel Tarano T., José Humberto Pinto Z., Clasificacion de Reconocimiento de los Suelos de la República de Guatemala (Guatemala: Ministerio de Agricultura, 1959), p. 157.
fertilizer on their landholdings; the subsistence farmer has little capital and is restricted to use what manure he can obtain.

Structure of Society

Of the countries comprising Middle America, Guatemala has retained the highest percentage of indigenous population with 60 per cent being Indian. The remaining countries of this region have Indígena (Indian) populations below 20 per cent except Mexico where they comprise 30 per cent of the inhabitants. The western section of Guatemala contains a large number of Indígenas with the Basin of Quezaltenango having one of the highest concentrations. In the 1950 census, the Department of Quezaltenango was recorded as having 124,473 Indígenas and 59,740 Ladinos, the latter concentrated in and around the urban centers. The latter, even though in the


6 The term Indígena represents those who have retained traditional modes of life and dress, while a Ladino is one who has taken to Western modes of culture and dress.

7 República de Guatemala, Sexto Censo de Población, Dirección General de Estadística, Abril 18 de 1950, XXXIII, Cuadro XI.
minority, control virtually the entire Department from the largest city to the smallest village complex. The Indígenas living in close proximity to the urban centers are beginning to Ladinize rapidly as a consequence of continued contact with new ideology, while the isolated tend to retain their centuries-old mode of life. With improving transportation, those in isolated areas are entering a period of transition which will eventually break down the age-old traditional culture. The village of Cajolá being nearly 100 per cent Indígena is an example of an isolated area in which regular bus service has only recently been introduced, but already it has brought about noticeable change.

The Ladino and his accompanying ideology is infiltrating the Indígena society throughout the basin especially near areas of high Ladino concentration. Being in control of political, social, and economic forces, the Ladinos exercise a great deal of control over the destiny of the Indígenas resulting in antagonism between the two factions. The suppression of the lower classes stems in part from the fear that they would, if permitted, rise-up against their masters and eliminate them. Thus, the Ladino with his superior position, out of self-preservation, must keep the Indígena in a state of backwardness if the present power structure is to remain intact. In
areas of high Indígena concentrations the ideologies are very conservative. They wish to be left alone to live as they have for centuries. They suspect the Ladino of bringing about change in order to exploit their meager resources. The Ladinis look with displeasure on increasing numbers of transitional villagers and fear that this emergence of peoples suppressed for centuries may have disastrous results upon the existing system.

The Charcoal Market

Charcoal is produced by Indígenas and a few Ladinis who must supplement their incomes in order to subsist. The product is marketed solely in the city of Quezaltenango where there is a large Ladino concentration with sufficient income to purchase it. To a large extent it is relied upon as a fuel for cooking purposes and to a lesser degree for heating. Restaurants, barbershops, and tailoring shops also use considerable quantities.

The production of charcoal is usually carried on by individual families who market it from door to door in Quezaltenango. There is a conspicuous absence of large commercial sales, although it is taken to coastal areas in quantities by truck where carboneros (makers of charcoal) also sell it from door to door. It is produced in and around the Basin of Quezaltenango from trees found on
isolated and sparsely inhabited mountain slopes unsuited for cultivation. The carboneros prefer to use oak for production purposes, but often must utilize other species because of shortages resulting from depletion. Buyers prefer charcoal made from oak because of its hardness which permits longer and more economical burning. The high cost of the product has restricted its use to the emergent middle class and upper strata of society in the city of Quezaltenango.

In the past, blacksmiths consumed large quantities of charcoal as a heating agent in fashioning horseshoes. However, the introduction of the truck as a mode of mass transportation is eliminating this market. This initially reduced the quantity consumed, but increasing wages of emerging urban inhabitants have resulted in a stabilized market. Today, primarily due to its cleanliness and fine qualities as a heating agent, large quantities are being consumed in households and restaurants. The barbershops use charcoal to heat water and the tailors utilize it in ironing clothing, but individual households and restaurants burn by far the largest quantity today. In areas outside the city, inhabitants use firewood as a cooking and heating agent because it is cheaper and easier to obtain.
Fig. 1. A charcoal-fired iron in front of a tailor shop in Quezaltenango.

Fig. 2. A charcoal-fired water heater in front of a barbershop in Quezaltenango.
Advancing Technology and Charcoal

The introduction of Western culture and attendant technology have caused considerable change in the Basin of Quezaltenango. Although only a few have benefited from Westernization, the impact upon the impoverished who would like to obtain Western goods and services is of considerable consequence. The Ladino, by purchasing modern goods which are unavailable to the masses because of cost, is, therefore, creating a source of discontent among the lower classes. The imported technology is also affecting isolated areas by causing obsolescence of many products which the Indígenas manufacture for supplementing their incomes. The small villages are thus caught by the processes of advancing technology and have little idea of the significance of Westernization upon future demands for their output. The production of charcoal has remained relatively constant with small fluctuations in demand. Although the influx of modern fuels has reduced the demand for the product by wealthier families, certain industrial firms, and larger restaurants, this has been countered by an increasing demand and ability to purchase among the lower and middle class city dwellers. Westernization, while by-passing the Indígena masses, has provided new jobs and more income for the emerging city.
dwellers which in turn supplements the carboneros' income through the creation of new markets which substitutes for the loss of others.
CHAPTER II

THE INDIGENISTA COMMUNITY OF CAJOLA

The Isolated Pocket of Cajolá

Characteristic of the highland communities in western Guatemala is the concentration of specialized occupations within single villages. Various municipios in the highland areas produce articles not made to any great degree in adjacent communities and thus many villages are dependent upon others for some of the necessities of life. This specialization occurs in many areas in and around the Basin of Quezaltenango with Totonicapán being noted for finished wood products, Salcajá for weaving, Momostenango for woolen blankets, Almolonga for vegetables, and Cajola for charcoal.

A study of current records in the Forestry Office in the city of Quezaltenango, which is responsible for the entire Department and several isolated areas beyond its border, reveals that charcoal production is concentrated to the northwest of Quezaltenango in the municipios of Cabricán, Huitán, Sibilia, and San Carlos Sija (see Fig. 3). However, these records indicate the municipio and

1Forestry Office, Quezaltenango, #5, Tala Comercial Bosques Particulares, Libro de Control de Tipo Comercial
specific aldea in which the cutting of trees is carried out but give no reference to the resident municipio of the carboneros.\textsuperscript{2} Further investigation in the Forestry Office and an actual road count on the outskirts of Quezaltenango revealed that the greatest number of carboneros supplying the city lived in the municipio of Cajola. The count of carboneros coming into Quezaltenango indicated that 85 to 90 per cent of the charcoal was being transported to the city by residents of that community.\textsuperscript{3}

The municipio of Cajola located ten miles to the northwest of Quezaltenango in an isolated pocket on the northwest limits of the Basin of Quezaltenango is typical of those communities specializing in one product. The altitude in the village of Cajola is approximately 8,200 feet above sea level or 470 feet above the city of Quezaltenango. Cajola is surrounded on the west, north, and

\textit{Que Lleve Esta Oficina de la Supervisoría Forestal: Quezaltenango, 1959-1965.}

\textsuperscript{2}An aldea is a political subunit within the municipio.

\textsuperscript{3}The director of the Forestry Office at the time, Gustavo Barascant R., stated that 80 to 90 per cent of the charcoal produced in the Basin of Quezaltenango was a product of Cajola.
and east by mountains which tower 1,000 to 1,600 feet above the village. The altitude in the municipio is lowest at its southwestern limits and increases toward the north, northeast, and east. The area adjacent to the village and to the southwest is characterized by low relief. The remaining quadrants are either mountainous or dissected scarp. The mountains form a horseshoe around the area with all drainage converging on a narrow floodplain to the southwest. From here the Rio Tumalá flows westward into an adjoining municipio.

The boundaries of the municipio to the west, north, and east extend a little more than three-fourths of the way to the top of the cumbre surrounding the village. To the south, the boundary runs east-west along the top of an ash cliff which faces the village. At the base of the ash cliff flows the Rio Tumalá. Near the mid-point of the southern east-west boundary, the Rio Tumalá and flanking ash cliff swing off to the northeast while the boundary continues eastward for another three miles before turning to the north. Beyond the southern boundary of Cajolá lie the municipios of Ostuncalco and San Miguel Sigüilá, to the west, Palestina de los Altos, to the north, Sibilia and San Carlos Sija, and to the east, San Francisco La Unión.

The soil, as in the entire Basin of Quezaltenango,
is volcanic in origin and varies in fertility with location. In general, the soils in the municipio are more productive on the flatlands near the Rio Tumalá, but the dissected slopes in the upper reaches of the river are poorly suited for cultivation. Of the eight square miles constituting the municipio, a little less than four can be classified as land suitable for cultivation. The gathering of firewood for cooking and the production of charcoal has deforested the mountainous regions surrounding the municipio to such an extent that soil erosion is well advanced. In addition, the pressure of population has accelerated the utilization of all available land including these rapidly eroding areas. As a consequence, future population increases can no longer be supported by placing more land under cultivation.

The absence of mechanization and the use of hand labor from the preparation of the soil to harvest are typical of the agricultural practices of isolated rural villages in this section of Guatemala. Little is being done presently to improve the farming techniques of the Indígenas contributing to the problem of food shortages.

The economy of Cajolá is based upon subsistence-agriculture with the majority of the available land utilized for the community's prime products of corn and wheat. Of the total land in production, approximately

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70 per cent is devoted to corn while the remaining 30 per cent is in wheat. The corn produced in the milpas is consumed locally and accounts for nearly 50 per cent of the inhabitants' caloric intake, while the wheat is sold as a cash crop. Beans and other minor crops are also grown in nearly every milpa and constitute a measurable portion of the diet. The beans are supported on the corn stalks, and it is a common sight to see parts of a corn field harvested while the stalks supporting beans remain standing until they are ready for harvest.

The only motor route into Cajolá is from the village of Ostuncalco by dirt road via the village of San Miguel Sigüílía. During the dry season, lasting from December to April, all vehicles wanting to chance passage can make the four and one-half mile trip in thirty minutes. During parts of the rainy season passage through several barrancas is impossible for all vehicles excepting those with four-wheel drive. Over the past eleven years there has been bus service operating between Cajolá and the city of Quezaltenango. It is estimated that even today only half of the people traveling from Cajolá to Quezaltenango use the bus while the remainder walk. The ten-mile walk takes nearly four hours at a brisk pace but makes use of a more direct route than the road traveled by vehicles. The consequence of a backward transportation
system has been the isolation of the inhabitants of Cajola which has contributed to their retention of traditional modes of life. Isolated and at the end of a road as a consequence of mountain slopes which surround the community, Cajola has never benefited from the introduction of modes or ideas that come with the passage of commerce to a point beyond.

The Society of Cajola

The population of the municipio of Cajola in the 1964 census was 4,457, giving the area a population density of 556 persons per square mile. The increase in population during the last fifteen years was 584 or a percentage of 15.1. This slight increase in population, when compared with Guatemala as a whole for the same period, may be attributed to several factors: first, because of ineffective methods used in taking the census an error may have occurred, and second, excessive out-migration to coastal areas where work and food can be obtained may have reduced the number of permanent residents.

In 1950, the number of Ladinos listed as residents

of the municipio was placed at 175, the remainder of the population being Indígena. The latter group is composed of Mam Indians of whom all speak the Mam dialect. The majority of the males speak both Mam and Spanish while the females, for the most part, speak only Mam. In the home this is the only dialect spoken. The children begin to learn Spanish if and when they start school.

Education in Cajolá is at a bare minimum. In 1950, of approximately 500 children between the ages of five and ten, only 263 attended the primary school. The majority of these completed only the first three grades and then left school to work for the family. At that time only four members of the entire municipio were recorded as attending secondary school which further indicates the lack of formal education within the community. The problem of illiteracy in Cajolá contributes a great

5 República de Guatemala, Sexto Censo de Población, Dirección General de Estadística, Abril 18 de 1950, Cuadro 1, p. 2.

6 The number of Ladinos in Cajolá is highly questionable because of ineffective methods used in taking the census; it has been placed at from six to ten by the Reverend and Mrs. Dudley Peck, missionaries who reside in Cajolá.

7 República de Guatemala, Sexto Censo de Población, Dirección General de Estadística, Abril 18 de 1950, Cuadro 23, p. 141.
deal to the Indígena's isolation and the backward modes of life maintained in the municipio. Census materials from 1950 also indicated that there were only 267 literates among Cajolá's 3,873 inhabitants. Thus, education is of prime importance in the area if future generations hope to initiate a better life for themselves. However, if present levels are continued, only minor changes will occur in traditional patterns for years to come.

The family structure in Cajolá consists primarily of the extended family although this system is slowly breaking down in Cajolá as in other Indígena areas because of improved transportation and out-migration to coastal areas. They are also experiencing a further enlightenment through radio broadcasts aimed at them through the transistor radio which is a very popular item in rural Guatemala. In all probability coastal work is bringing about the greatest change for the Indígena because they join the money economy if only on a limited scale. This traditional society, which has resisted change for so long, is thus beginning to change as a consequence of Ladino ideology and the Indígenas' internal struggle with over-population.

An understanding of the basic society of Cajolá

\[8\text{Ibid.}, \text{Cuadro 20, p. 127.}\]
requires the study of religious attitudes and beliefs of the inhabitants. Being a pure Indígena municipio isolated for so long from the outside world, the inhabitants have retained their centuries-old shamanism. The shamans or witchdoctors still wield a powerful force on the people and any foreign ideologies are looked at with great skepticism. Elements of change introduced from the outside are resisted mostly by the shamans, for their position is threatened if rapid change develops in the community. They have for centuries played on the ignorance of the people and Westernization can only jeopardize their power structure. For this reason outsiders are treated with a great deal of suspicion and, as students of Indígena culture have found, it takes years to break through the barriers and to grasp the undercurrents and forces that control the community.

The government of Cajolá is run hand-in-hand with the forces that control the culture. The governing body is made up of an alcalde (mayor), secretary, and treasurer, with a number of mayores (errand boys) who are always on hand to assist the officials if anything is needed. The alcalde, being an illiterate from Cajolá, knows little of the governmental ties which his municipio has with Quezaltenango or the country as a whole. Since the local inhabitants are essentially illiterate, they
have been forced by law to hire a literate secretary and treasurer from the outside. Contacts with areas beyond the municipio are thus carried out by employees who are not native to the area, and a certain measure of antago­nism has developed between the two outsiders and the townspeople. The present alcalde of Cajolá, Cruz Huinil Lopez, besides being an illiterate is a practicing shaman and thus his powers in the community are perhaps much greater than might be expected. Therefore, the leaders of local government and religion are one and the same, forming a power structure that is resistant and slow to change.

Incentives for Charcoal Production in Cajolá

Other than subsistence agriculture there is little one can do in Cajolá to earn a livelihood. The combination of isolation, traditionalism, land shortage, and lack of education have retarded any economic improvement in the area. With increasing population pressure the problem of obtaining food is becoming critical. Alternative employment within the municipio is limited as it is in most remote villages in the area. In Cajolá there are a few carpenters, butchers, cloth makers, and two specialized industries devoted to the production of roof shakes and teja de barro (roof tiles). Specialization in
the production of charcoal has become the most apparent local source of income with which to supplement their meager earnings.

It has been estimated that 75 per cent of the male population in Cajolá is engaged in the production of charcoal at one time or another during the year.\(^9\) However, this figure may shortly begin to drop because of insufficient forest reserves near the municipio. The road count of carboneros bringing charcoal into Quezaltenango during a one-week period substantiated the estimated percentage of males involved in the industry. During the week approximately 200 carboneros entered the city either on foot or by bus with nearly twenty tons of charcoal. However, the production of charcoal is very erratic with each carbonero producing when he has the time or needs the money.

An industry that undoubtedly involves many inhabitants of Cajolá is the production and sale of illegal liquor but very little is known about the economic aspects of the industry. The liquor is sold locally for cash and is cheaper than the government-sponsored brand. A large problem within the municipio involves drinking

\(^9\)República de Guatemala, Datos Sociológicos del Municipio de Cajola (Guatemala City: Instituto Indígenista Nacional, Mayo 1949), Monografía No. 34, p. 16.
during the week and especially on weekends when most everyone drinks to excess. During the writer's three-month stay, there were four cases of death occurring in Cajolá from the over-use of alcohol and the drinking of poisonous liquor. The government, of course, makes attempts to stop the illegal production of spirits but has had little success because of its widespread production.

A major problem now confronting the inhabitants of Cajolá relates to overpopulation. Through the years it has been traditional in the extended family to divide the landholdings evenly among surviving members of a family when the head of the household died. This tradition has broken up the landholdings to such an extent that plots are badly fragmented and much too small for a family to subsist on. A study carried out by Guatemala's National Indian Institute substantiated the shortage of land in the municipio of Cajolá. Their findings indicated that the amount of land needed to feed a family of five in the area for one year amounted to 2.2 acres and that the average landholding was .98 acres or 44 per cent of what the individual landowner needs to subsist.10

10 Repúlica de Guatemala, Boletín del Instituto Indigenista Nacional (Guatemala City: Instituto Indigenista Nacional, 1957), Vol. 1, pp. 75-76.
Fig. 4. View looking northwest across the village of Cajola showing the density of houses and the intensive cultivation.

To find further means of supplementing their incomes the inhabitants have been forced to look beyond the Basin of Quezaltenango. For the majority of the people in this situation the only solution is migration to the coast during a part of the year in order to grow additional corn or to work on one of the numerous farms. Since few of the inhabitants of Cajolá can grow enough corn or earn money within the municipio to last the entire year they are thus forced to migrate.
If forced to migrate to the coast because of food shortages in Cajolá, a man will usually grow two lowland crops of corn per year or work for several months on a coastal farm. The first planting of corn on the coast usually takes place in the middle of April and is harvested near the middle of August. During this time a family makes two or three round trips from the highlands to the coast. The second planting takes place near the end of August and is harvested just before Christmas and involves the same number of trips to the coast. Taking a family of five to the coast one-way involves nearly $5 in bus fares which is a considerable expense in an economy where the average man makes $125 per year. A family gains very little monetarily by traveling to the coast but continues to do so out of necessity and a fondness for travel. The current movement to the coast is speeding up even though the highlanders have found that numerous diseases are easily contracted in the lowlands which they can not afford to combat.

A large number of Indígenas also migrate to the coffee and cotton farms located on the coastal plain because of the money that can be earned to supplement their incomes. Here again, a man will take his entire family to the coast but in this case it is more profitable because the family can work as a unit. The Indígena laborers are
paid by the amount of picking they do, thus an entire family can move into the field and earn a considerable amount of money daily. The possibility of joining the money economy has had its effects upon the extended family structure. The case of a young man from Cajolá seemed typical of many individuals in the area who aspire to earn money on their own. This young man having traveled to the coast with his parents saw an opportunity to earn enough money to buy a radio and clothing if he worked on his own. Thus, he and others like him are breaking away from the traditional family system, which is contributing to the slow breakdown of the Indígena culture.

The production of charcoal has been a long standing tradition in the community of Cajolá. In the past this specialized activity provided an economic balance and maintained the well-being of the inhabitants of the community. Today, a restricted supply of raw materials and a stabilized demand pose a crisis in the industry which has for so long been the hallmark of Cajolá.

Historical Aspects of Charcoal Production

Of prime importance in Cajolá is the charcoal industry, which aside from agriculture and possibly liquor, is the single most important economic activity. The charcoal
industry was apparently brought to the New World and taught to the Indígenas by the Spaniards who felt superior and thus would not lower themselves to the level of making charcoal. The word carbon (charcoal) is a Spanish word for which there is no equivalent in the Mam language which indicates that the Indians knew nothing of charcoal production until the Spanish moved into Guatemala. The question of how production became centered in an isolated pocket in the Basin of Quezaltenango presents an interesting problem for which there is no concrete answer. Cajolá was a logical center for production because of the abundance of oak trees on the slopes surrounding the municipio.¹¹

The continued increase of population has far out-shadowed the small improvements in agriculture and the need for additional means of income is building at an

¹¹Reverend Dudley Peck put forth a theory which could account for the making of charcoal in Cajolá. During the Colonial Period the Spanish, as they moved into Guatemala, brought with them large numbers of prisoners from Spain who were settled in remote areas. Two of these areas were located to the north and northeast of Cajolá and comprise the present-day communities of Sibilia and San Carlos Sija. It is thought that these prisoners accustomed to using charcoal for cooking but not wanting to bother themselves with its production taught the Indígenas in and around Cajolá how to produce charcoal. To this day the Ladino descendants of these prisoners have retained the reputation as being bandits or horse thieves and few of the Indígena trust them.
ever increasing rate. However, the production of charcoal has remained essentially stationary because of the difficulty in obtaining trees and the problem of depletion in the forests. Informants stated that as little as thirty-five years ago there were suitable trees for production in and around the municipio of Cajola. Upon entering the area today, it is apparent that the forests on the slopes surrounding the municipio are all but non-existent. Years of cutting at a pace that has increased with time has brought about a shortage of trees in the entire Basin of Quezaltenango and little has been done to date with reforestation. "Titulo III" in Ley Forestal states that for every tree cut five seedlings are to be planted. This law and its corollaries are designed to conserve the forests of Guatemala, but unfortunately they have rarely been observed.

The forests in the municipio of Cajola have been depleted to such an extent that the carboneros have been forced to move great distances in order to find trees for production. Thus, the charcoal industry is beginning to suffer from the lack of trees and the inhabitants are finding themselves looking for alternative employment.

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12 República de Guatemala, Ley Forestal, Ministerio de Agricultura, 1962, Decreto Número 170, Cuarto Edicion, pp. 7-12.
which is almost nonexistent. Over the years production of charcoal has provided the residents a cash income with which to supplement their meager earnings. The shortage of trees is now beginning to affect the industry which could bring about disastrous results to the economy and inhabitants of Cajolá.
CHAPTER III

THE PRODUCTION OF CHARCOAL

Purchasing the Trees

The procedures a carbonero follows in order to obtain the necessary licenses to work within the forest are cumbersome, and the permits are often difficult for an Indígena to acquire. Overseeing the sale and use of forest products in the Department of Quezaltenango is the Forestry Office, which is controlled from Guatemala City through a director in the city of Quezaltenango. The Forestry Office is considered an important sector of the local government because of the economic significance the products of the forest have in the everyday lives of the inhabitants. The operation of the office was found to be chaotic because of the employment of a secretary who was an alcoholic and the changing of the directorship on three different occasions during the writer's three-month stay in Quezaltenango. The director and secretary are the sole employees in the Forestry Office, and are responsible for the maintenance of forest reserves for the entire Department and several isolated areas beyond its border. It is apparent that the existing office is
insufficiently staffed to exercise control over the use of natural resources within the Department.

Interviews with each of the three directors and the secretary disclosed that they were inadequately educated in the efficient operation of an office in charge of natural resources, and were, in fact, political appointees with little interest in the maintenance of forest reserves. The forestry officials carried out the required mechanics of their job but lacked enthusiasm for improving the serious conditions developing in the realm of forest resources. Furthermore, the employees of the Forestry Office, being Ladinos, frequently hampered the Indígena's attempt to obtain the necessary permits to work in the forest and often flatly refused to issue licenses. On the other hand, Ladinos wanting to obtain licenses had little difficulty in acquiring them, and if they were influential or wanted to contribute to the funds of the forestry officials, the laws were conveniently overlooked. Thus, the Forestry Office can be described as a political tool, staffed by men appointed in Guatemala City who have little interest in the efficient operation of an office in charge of forest resources.

Interviews with the local forestry officials also produced four different stories concerning the proper procedures to be followed by those wanting to secure licenses
to work in the forest. However, information obtained from the carboneros did reveal some consensus concerning the steps required by those wanting to obtain a cutting permit. The forestry officials did agree upon one point; they admitted that large quantities of illegal cutting takes place within the Department. The law requires that each tree to be cut must first be inspected and stamped by the officials. However, the director is faced with an almost impossible job even if he is conscientious because of the size of the Department and areas within it that are completely isolated. Thus, in remote sectors of the Department, which are usually the only areas with extensive forest cover, there is little control over the cutting of trees and nothing is being done at present to alter the situation.

A carbonero living in Cajolá wanting to purchase a number of trees must first find a landowner willing to sell. Today the shortage of trees has reached a point where the inhabitants of the area are forced to travel to the north and northeast over the cumbre to the municipios of San Carlos Sija, Huitán, Cabricán, and Sibilia. The carboneros travel by foot to their cutting areas, which may be as much as ten miles from the village of Cajolá, further indicating the need the inhabitants have for finding ways of supplementing their incomes. The
situation is becoming critical because of the rapid cutting of forest reserves in the above mentioned municipios for the production of not only charcoal but also cal (lime). The latter is produced from limestone by heating it to high temperatures, thus consuming in the firing process a considerable quantity of wood. The inhabitants of Huitán and Cabricán have especially been active in the production of cal. The forest reserves in the northern sections of these two municipios have been completely depleted. The consequence of this has been a southern movement in logging by the inhabitants of Huitán and Cabricán,

Fig. 6. View looking northwest across Huitán showing the extensive forest depletion and consequent erosion.
while the residents of Cajolá have been forced to purchase trees to the north and northeast of their municipio. The result of these movements is obvious; the two logging operations are working toward each other at a rapid pace, and when the intervening forest reserves are gone a disastrous situation will have developed for the communities involved. Even today, an observer can see only small isolated patches of forest left between the two areas, and at the present rate of cutting the remainder will last only a short time. The carboneros of Cajolá can still find trees to purchase, yet they probably realize that the scarcity of trees is eventually going to limit the manufacture of charcoal.

The inhabitants of Cajolá usually hear by word of mouth that a landowner in an adjacent municipio has trees to be sold and travels there on foot to negotiate directly with the landowner. The price of trees is dependent upon a number of factors. The preference in the market place is for charcoal made of oak and other hardwoods which not only burns longer than charcoal made from softer species such as pine but also brings a higher price in the market. However, the writer observed that carboneros may purchase a variety of suitable species and may even be forced to put several species into the horno (oven), further indicating the problems they have in
obtaining the proper raw materials.

A second factor governing the price of trees is their size. Trees with diameters of approximately forty inches usually sell for $5 while a tree twenty-five inches in diameter brings the landowner $3. Smaller trees with diameters of twelve inches or less can be purchased for $1 apiece, but the carboneros prefer the larger trees; however, in areas of critical tree shortages even the smaller trees are being felled to provide additional sources of wood. The carboneros must pay for the trees in cash, for the landowner does not extend credit. Thus, because of lack of funds the producer is often idle. If the carbonero is fortunate enough to have the currency, he will try to bargain for five or six trees so he can produce in the same area for a considerable length of time.

The charcoal is manufactured at the cutting site because it is more convenient to transport the finished product than carry the logs back to Cajola. The larger trees, those of forty inches or more in diameter, usually last from one and one-half to two months each if the carbonero travels into Quezaltenango once a week with 150 pounds of charcoal. A tree with a twenty-five inch diameter will last approximately three to four weeks at the same rate of consumption. If the carbonero operates
more than one horno at a cutting site, the rate at which trees will be consumed will increase accordingly. The carboneros use the entire tree for production purposes except for the smallest branches which they leave for the landowner or carry back to their homes to be used for firewood.

Following the purchase of a number of trees from a landowner, the process of obtaining the proper licenses and paying the fees commences. The secretary of the Forestry Office stated that the landowner is required to purchase the necessary papers and pay the fees, but the writer often observed the carboneros performing this task for those landowners who do not want to be bothered. Again it should be noted that many observers believe that the legal method of purchasing trees and applying for the proper licenses for cutting may be the exception in the Department of Quezaltenango and that the majority of the cutting in the area is illegal.

The required papers include a certification of ownership costing 50 cents, an aplicación de solicitud costing 50 cents, and a receipt of payment of 50 cents for every tree to be cut down. The solicitud must also be accompanied by 45 cents in government stamps, which are purchased in the city of Quezaltenango, making the entire licensing procedure rather expensive for the landowner.
Because many of the landowners are illiterate much of the paper work is taken to a lawyer which adds still further to the cost. The shortage of trees in the Department has been beneficial to the landowners because they have started to charge the cost of the various licenses to the carboneros as part of the transaction. This has increased the cost of the raw materials for the carbonero. The fees for application are paid in the Administracion de Rentas, and the receipt of payment must be shown in the Forestry Office before the cutting license is issued. The aplicacion de solicitud also must be signed and stamped by the alcalde of the municipio in which the cutting is to take place. In many cases a small additional tax is charged by the municipio.

Trees can also be obtained from communal lands within some municipios. These cost from $1 to $5 apiece depending upon their size, the money going directly into the treasury of the municipio. The cutting of trees on communal lands is restricted, and in many areas the only stands of timber left are located on these lands. The carbonero is required to purchase a cutting license from the Forestry Office even though he is cutting on communal land, and he therefore saves little money by purchasing trees from a municipio.

From the initial application to obtain a cutting
permit to its issuance usually takes one month and costs the landowner or carbonero, depending upon the agreement, between $2 and $3. In 1965, 409 applications to cut 2,373 trees for the production of charcoal were entered in the records of the Forestry Office in Quezaltenango. The majority of these were for the cutting of oak.

The officials in the Forestry Office state that they are required to field inspect every tree licensed to be cut down for any use. This is, of course, impractical with only two men employed in the office. The officials do move into the field when the cutting location is accessible or in close proximity of Quezaltenango, otherwise the cutting areas are seldom checked. The occasional apprehension of an illegal cutter and the infliction of a cash penalty ranging from $5 to $500 plus the normal 50 cents per tree charge adds somewhat as a deterrent to illegal cutting. The isolation of the remaining forest reserves in the Department of Quezaltenango makes their control a difficult task and contributes to the depletion of one of Guatemala's most important natural resources.

The Firing Process

The process of producing charcoal follows the issuance of a cutting license to either the landowner or
carbonero. Since the majority of the cutting sites are a considerable distance from Cajolá, the carboneros usually leave their homes at dawn to reach their working areas before noon. An horno can be constructed in approximately two to three hours if the raw materials are available. Thus, a carbonero will take enough food to sustain him for the day and return to his home by nightfall. If the cutting site is a considerable distance from Cajolá, a carbonero will sleep on the ground and carry the necessary food with him. Their only tools are an axe, machete, and azadón (hoe). The axe is utilized to cut the trees down and into smaller pieces while the machete is used to cut branches up to five or six inches in diameter (see Appendix, Plate I-A and I-B). The azadón is used to dig a pit and is used later to cover the entire horno with dirt. The carboneros use these tools with great skill and are especially accurate with the machete, which most Indígenas carry with them from childhood.

Production is initiated with the cutting of a single tree and enough wood is cut to fill the pit. The remainder of the tree is left lying until the next firing. With the wood cut the carbonero turns his attention to the building of an horno which is constructed in close proximity to the cutting area.

The horno is constructed with the azadón by digging
a circular pit eight to ten feet in diameter and two to three feet in depth. The size of it is governed by the amount of wood the carbonero has available and the quantity of charcoal he wants to produce.

The bottom of the pit is sometimes covered with pine boughs which are placed between two logs located at right angles to the stacked wood (see Appendix, Plate I-F). Thus, there is an air pocket under the stacked wood which the carboneros have found produces a more efficient burning process. The wood used to construct the bottom of the stack is cut for that purpose. The length of the logs put into an horno will normally range between twenty and thirty inches in length. However, the wood above the first layer may be of any length if there is a shortage of it. As the carbonero stacks the wood, he places many wood chips and pieces of ocote (pitch-covered pine) into the small openings in the stack to help promote the burning process.

Also necessary in constructing an horno is a species of grass called pajón, which is used to cover the wood. Pajón is preferred by the carboneros, but there is, at present, a scarcity of it, and any type of bunchgrass near the cutting site is utilized. With the necessary raw materials assembled and the horno constructed, the carbonero can begin the actual firing process.
The quantity of wood put into an horno depends upon the availability of wood and the transportational modes the carbonero has at his disposal, but rarely does it contain less than one vara or more than one tarea of wood.¹

The first step in the firing process is the building of a small fire near the pit to produce hot coals to ignite the wood. There are two methods a carbonero can use to ignite an horno. Since the process of charcoal production is passed on from generation to generation the method used to ignite the oven is usually the same as that of their fathers. The first method is initiated by putting the burning coals directly into the bottom of the pit and piling the wood over the coals. The second method involves the stacking of the wood into the horno first, and then the placing of the coals against the base of the stacked wood. There is no apparent advantage to either method. After the wood has been stacked in the pit and ignited, the carbonero begins to cover it with layers of pajon or bunchgrass to keep the dirt, which is pulled over the entire horno, from sifting down into the

¹One vara is a stack of wood twenty-five inches high and twenty-five inches long, with the length of the individual logs varying between twenty and thirty inches; one tarea is made-up of four varas, which is approximately one-eighth of a cord.
stacked wood and extinguishing the fire.

Prior to igniting the wood, the carbonero frames in a series of three or four air holes which permits air to enter the mound after it is covered (see Appendix, Plate II-B and II-G). If firing occurs by placing coals at the bottom of the pit, the horno may have four air holes evenly placed about its base; if it is fired by placing coals against one side, air holes will be located at the base of the remaining sides. Using his hoe, the carbonero then begins the final task of pulling dirt over the entire horno being careful to keep the air holes free of debris. All that is visible then is a mound approximately three feet high and six to ten feet in diameter. Minutes after the horno is covered smoke begins to emit from the air holes, which are from six to ten inches in diameter. The carbonero then checks the air holes to be certain that they are free of debris.

During the rainy season many of the carboneros cover their hornos with a roof of pajón supported on sticks forming a shelter called "El Rancho," which keeps water off the mound or from seeping inside. The fire in those not covered, and even in those covered, is sometimes extinguished by excessive amounts of precipitation. If this occurs, the carbonero must uncover the entire horno and again initiate the complete firing process. The fire
can also be extinguished by improper ignition or by debris obstructing the air holes. Through long years of experience the carboneros have developed the art of firing an horno into a precise pattern, and a fire is rarely extinguished.

The length of time an horno needs to be fired must be learned through experience, but at the best it is a matter of guessing as to when the wood has been completely charred producing charcoal. The carboneros stated that one to two varas of wood would be completely charred in two days if the fire burned properly, three varas of wood in three days, and one tarea of wood in four to five days. Each carbonero has his own method of constructing an horno and firing it, but the description given in the preceding account follows fairly closely the practices used by most carboneros.

Opening an Horno

With the completion of the burning process, the carbonero returns with his tools including a net bag to carry back the finished product. If the quantity of charcoal to be transported back to his home is in excess of his carrying capacity, the carbonero brings a burro, if he owns one, or members of his family. With his hoe he clears a twenty square foot area in front of the horno.
and begins to scrape dirt off the top, being careful not to dig down into the cover of pajón. After pulling five or six inches of dirt off, the pajón is exposed and the carbonero clears away the debris accumulated in front of the horno.

The first phase completed, the carbonero's next operation is to carefully pull the pajón off the top of the horno. He utilizes two curved sticks approximately fifteen to twenty inches in length as hooks to pull off the pajón. This is a very slow process because he tries to save as much of it as possible for the next firing. When the layers of pajón covering the wood are pulled away smoke begins to rise from the top of the mound. If the wood has been completely charred, the amount of smoke is very small. However, the premature opening of an horno produces considerable quantities of smoke and the sections of wood not charred through completely actually break into flames. If flames occur, the carbonero will throw sand or dirt onto the flaming areas to extinguish the fire. In most cases the wood that ignites must be put back into the horno during the next firing; however, some of it may be charred sufficiently and can be taken into Quezaltenango to be sold.

An horno opened after complete charring has occurred presents no problems to the carbonero and is quickly
emptied with the two curved sticks. The charred logs are generally broken when pulled from the mound. Those which are not are broken into smaller pieces with a machete. The carbonero usually breaks the pieces of charcoal into small lumps not more than three to four square inches in size, which is approximately the size of the most desirable charcoal. It is pulled into the open area in front of the pit where it cools and is then put into nets. When the cooling has been completed and the charcoal put into nets, the carbonero clears the area and begins to ready the horno for the next firing. Thus, the carbonero can, if he has wood available, maintain a cycle of burnings that average two per week.

The quantity of charcoal obtained from the trees depends upon the type of wood used in the firing. Pine, which is softer than oak, yields less charcoal per pound of wood than does the harder and heavier oak. The carboneros stated that two varas of pine would produce two arrobas (fifty pounds) of charcoal, while only one vara of oak was required to produce the same volume. Informants also stated that one tarea of oak would, on the average, yield six to seven arrobas of charcoal, but that the production was dependent upon the amount of success the carbonero has in the firing process. Thus, a tree with a forty inch diameter will yield approximately 1,200
pounds of charcoal, while a tree with a diameter of twenty-five inches will yield approximately 700 pounds. However, the volume of charcoal obtained is dependent upon the type of wood put into the horno.
CHAPTER IV

PRODUCTION CYCLES AND MARKETING

Cycles of Production

Charcoal is manufactured throughout the year by the inhabitants of Cajolá, but there are periods during the year when production increases or decreases substantially. The pattern of charcoal making is very erratic and is predicated upon the cycles of agriculture and related out-migration. In the subsistence-agricultural economy of Cajolá there are months during the year when all efforts are put into the field, and the production of charcoal is forgotten until other work is completed. Migration to coastal areas to grow corn or work on the coffee and cotton farms also follows a precise pattern that affects the production of charcoal.

Agriculture and out-migration cycles have established patterns of charcoal manufacture affecting both the inhabitants of Cajolá and the purchasers in the city of Quezaltenango. The cyclic production produces periods of surplus and shortage in the city, which is reflected in its price. In the course of one year, the price of charcoal varies between $1.50 and $3 per 100 pounds.
In January many inhabitants of Cajola return from the coast with a supply of corn and a small amount of ready cash that is soon spent. Since the upland harvest has been completed and preparation for the planting of new crops is not initiated until late February, there is little to occupy these people during this span of time. In January, therefore, a substantial number of Indígenas turn to the manufacture of charcoal in order to supplement their income.

During February and the first weeks of March the Indígenas ready their milpas for the planting of corn; consequently the production of charcoal falls off considerably creating a period of shortage. Nearly every inhabitant of Cajola is forced to work in the milpa during this period to insure a supply of food for the coming year. Corn is sown during the latter weeks of March and the majority of the fields are planted by the end of the month. There are a small number of carboneros producing charcoal through the planting season, but these are insignificant when compared with months of intensive production.

April initiates the beginning of out-migration to coastal areas for the planting of corn to supplement the food supply of those inhabitants of Cajola who are unable to produce enough in the highlands to subsist for the
year. April is also the Lenten season, and in the largely Catholic city of Quezaltenango there is a demand for fish. Many of the inhabitants of Cajolá travel to the Pacific coast during the closing weeks of March and the first few weeks of April to obtain fish, which are dried on the coast and transported back to the highlands and sold in the market.

The result of out-migration to coastal areas is an overall decline in the manufacture of charcoal. However, a base supply is manufactured by the 400 to 500 families in Cajolá who, with the exception of the upland planting and harvesting seasons, produce throughout the year.

The inhabitants of Cajolá spend the month of May sowing wheat, and charcoal manufacturing again decreases substantially. In June and July the production increases, but not as much as would be expected because of the beginning of the rainy season. In August a decline in charcoal making is related to an out-migration of inhabitants to work on coffee and cotton farms. This also coincides with the first harvest of corn on the coast. Thus, a large number of families leave Cajolá for the coast, and the production of charcoal is left to the carboneros remaining in the municipio. At this time the price of charcoal in the city of Quezaltenango begins to rise somewhat because of minor shortages. Informants
stated that during August, September, and October, at least half of the 1,000 families residing in the municipio migrate to the coast in order to earn money and to harvest the first and sow the second crop of corn. Although the manufacture of charcoal is reduced in the three-month period, the shortage is not critical in Quezaltenango.

During the first two weeks of November the majority of the families return to the highlands from the coast, and the harvest of corn and wheat begins. The harvest in November and December brings the manufacture of charcoal to a virtual halt. In the city of Quezaltenango there is a shortage of charcoal, and the price reaches the high point of the year, $3 per 100 pounds. As indicated initially, the price begins to fall with increased production in January.

Seasonal Variations in Price

The cycle of charcoal production produces periods of shortage and abundance in the city of Quezaltenango resulting in a monthly fluctuation in price. The fluctuations in price follow the cycles of agriculture and out-migration, with the highest prices occurring during periods of intensive agricultural activity. The price for charcoal may also vary from day to day depending upon
the quantity being brought into the city. If a large amount of charcoal is transported into the city and sold, the next day may bring lower prices because the carboneros have a difficult time finding customers. A carbonero coming into the city knows the current selling price and will try to obtain that amount. If he has regular customers, he will usually succeed in selling his entire load, which may consist of several hundred pounds depending upon available transportation. However, a carbonero who has few regular customers is often forced to sell from door to door and may have difficulty in disposing of his entire load. As he moves from door to door, he will, as the day passes, lower the price until he sells the charcoal. During the writer's three-month stay, he never observed a carbonero carrying his product back to Cajola.

It is difficult, therefore, to quote a set price when bargaining is so much a part of the marketing system. During the year price trends can be followed by observing the quantity of charcoal entering Quezaltenango and piecing together the prices given by both the buyer and seller. The highest price obtained for charcoal in the cycle occurs during the highland harvest in November and December. The price during this period is near $3 per 100 pounds. In the sowing seasons—February to May—the
price is slightly lower with the bargaining figure near $2.50 per 100 pounds. During periods of major out-migration—August to November—the production of charcoal decreases and prices fluctuate near $2 per 100 pounds. In January, when the majority of the populace is present in the municipio manufacturing charcoal, its price drops to $1.50 per 100 pounds in the city of Quezaltenango, which is the lowest price obtained during the year. Thus, a carbonero selling charcoal at $2 per 100 pounds will make approximately $16 from a tree forty inches in diameter, while the profit from a tree twenty-five inches in diameter is approximately $8. Because of the irregularity of production it is virtually meaningless to state an average individual or family income derived from this activity. It is obvious that this profit is little reward for the time involved in production, transportation, and sale of the final product.

Transporting Charcoal to Cajolá and Quezaltenango

The carboneros, upon completing the firing process, transport the finished product to their homes in the municipio of Cajolá. It may be transported by burro or mule or by humans. Approximately 40 to 50 per cent of the carboneros own pack animals and use them to transport charcoal from the firing site to Cajolá. The remaining
50 to 60 per cent are forced to carry the charcoal on their backs. If it is to be carried by human bearers a carbonero will usually take several members of his family to the horno. The charcoal is taken to the carbonero's home, where it is stockpiled until he has enough to justify a trip into Quezaltenango. The maker of charcoal, depending upon the time of year, may travel into the city twice a week. The quantity he transports is dependent upon the amount stockpiled, available transportation, and the demand within the city of Quezaltenango.

The quantity of charcoal a carbonero stockpiles is in proportion to the amount of money he has on hand. If he has the necessary funds and can acquire the trees, he will usually maintain a small stockpile of charcoal. A carbonero usually stores his charcoal in net bags which are kept under a shelter near his home. Thus, he can transport any desired quantity into the city of Quezaltenango on a given day in order to take advantage of a momentary rise in charcoal prices. The carbonero lacking funds finds it difficult to stockpile charcoal because he must sell it as he manufactures it in order to maintain working capital. Therefore, he often finds himself selling charcoal at a low price in the city which limits his income and therefore his ability to purchase trees. Thus, a carbonero with little working capital will
manufacture charcoal irregularly throughout the year because he often lacks the funds to purchase trees; the maker of charcoal with the necessary money can stockpile his product and maintain a regular pattern of production and sale.

Charcoal can be transported from Cajolá to the city of Quezaltenango via three modes of transportation. The most important of these is the burro, by which one-half of the weekly supply is carried into the city. The movement of charcoal by bus accounts for approximately one-fourth of the weekly supply, while the carboneros carried the remaining quarter on their backs. The majority of the charcoal is transported into Quezaltenango by burros and humans because most vendors cannot afford the round-trip charge of 40 cents per person plus the additional cost of 10 cents per net of charcoal.¹

The average burro can carry approximately 200 pounds of charcoal, while a man can transport nearly 100 pounds. If a carbonero desires to move larger quantities of charcoal into the city, he must have several burros or use the bus. Informants stated that many carboneros are now taking the bus because their burros have died. Not only

¹Charcoal transported by bus is taken into the city and sold in nets. Each net of charcoal weighs approximately 125 to 135 pounds.
does the bus save time over walking but it also has an appeal to the Indígenas who are increasingly becoming tempted by it. Those carrying charcoal on their backs or transporting by burro leave Cajolá at 4:00 or 5:00 a.m. in order to arrive in Quezaltenango by 8:00 or 9:00 a.m. The ten-mile walk takes nearly three and one-half to four hours at a brisk pace.

Fig. 7. View on the outskirts of Quezaltenango showing a carbonero carrying approximately eighty pounds of charcoal on his back.

Four buses are quartered and operate out of Cajolá. The number used on a given day depends upon the amount of traffic. Each bus makes one round-trip and terminates

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its run in Cajolá, which forces anyone wanting to travel from Quezaltenango to Cajolá either to stay overnight or to walk back to the city. On a busy day all four buses are put into use departing Cajolá at 6:30, 7:00, 7:45 and 8:00 a.m. for Quezaltenango, the last bus arriving in the city at approximately 9:30 a.m. The buses travel from Cajolá to Quezaltenango by way of Ostuncalco.

The carboneros may be required to pay an impuesto (tax) on the charcoal they transport into Quezaltenango. Those walking normally escape paying the tax, but the carboneros traveling by bus must pay the fee. The impuesto for moving charcoal between Cajolá and Quezaltenango by vehicles can be paid in either Cajolá or Ostuncalco. However, the impuesto charged in Cajolá is 5 cents per net, while the carboneros are charged 2 cents per net in Ostuncalco. Thus, they wait until their bus arrives in Ostuncalco before paying it. The buses are often stopped by the police or at the military zone on the outskirts of Quezaltenango where the carboneros must show their tax receipts and tree cutting permits. Those traveling on foot or with burros are seldom stopped and therefore rarely pay the impuesto. Because the carboneros pay the fees for transporting charcoal in Ostuncalco, the municipio of Cajolá loses considerable revenue.

Charcoal is transported into Quezaltenango in
quantity six days per week. Few carboneros travel into the city on Sunday because the stores are closed and the people do not want to be bothered. The quantity of charcoal moved into the city is shown in the following table:

**TABLE I**

CHARCOAL MOVEMENT FROM CAJOLA TO QUEZALTENANGO (in pounds)

<table>
<thead>
<tr>
<th></th>
<th>Mon.</th>
<th>Tues.</th>
<th>Wed.</th>
<th>Thurs.</th>
<th>Fri.</th>
<th>Sat.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burro</td>
<td>1,150</td>
<td>1,580</td>
<td>1,830</td>
<td>2,075</td>
<td>2,630</td>
<td>10,785</td>
<td>20,050</td>
</tr>
<tr>
<td>Man</td>
<td>1,310</td>
<td>890</td>
<td>1,040</td>
<td>1,250</td>
<td>2,380</td>
<td>2,445</td>
<td>9,315</td>
</tr>
<tr>
<td>Bus</td>
<td>2,700</td>
<td>2,200</td>
<td>800</td>
<td>1,400</td>
<td>1,400</td>
<td>900</td>
<td>9,400</td>
</tr>
<tr>
<td>Total</td>
<td>5,160</td>
<td>4,670</td>
<td>3,670</td>
<td>4,725</td>
<td>6,410</td>
<td>14,130</td>
<td>38,765</td>
</tr>
</tbody>
</table>

*Obtained by a road count taken during a one-week period (October 9, 1965 through October 16, 1965).*

The movement of charcoal into Quezaltenango is reasonably uniform Monday through Friday; Saturday is the exception, and is by far the most important day for the carboneros. The market place is open daily in Quezaltenango, Saturday being the most important trading day corresponding with the largest movement of people into the city. Thus, the carboneros transport the greatest quantity of charcoal into the city of Quezaltenango on Saturday in order to participate in that day's market.
Distribution within Quezaltenango

The carboneros entering Quezaltenango with burros or carrying charcoal on their backs begin to arrive at approximately 7:00 a.m., and for two hours they stream into the city. Near 9:00 a.m. the flow of carboneros slackens, and only a few stragglers are seen. Upon entering the city, they first go to their regular customers where they usually sell their entire load; those without regular customers are forced to sell from door to door. During the morning it is a common sight to see carboneros moving through the streets of Quezaltenango carrying charcoal either on their backs or by burro. By noon they have usually sold their loads, and begin the walk back to Cajolá. To save time, many of the carboneros that carry charcoal into the city pay 20 cents for the bus trip back to Cajolá.

Carboneros transporting charcoal by bus enter the city of Quezaltenango between 8:00 and 9:30 a.m., depending upon the time they leave Cajolá. The buses from Cajolá are unloaded in front of a charcoal depository located near the market place. The carboneros often bring eight to ten nets of charcoal into the city by bus, a quantity of which is left in the depository while they are out selling the rest. The owner of the depository
charges 2 cents per net storage fee, and occasionally permits the carboneros to sleep overnight with no added charge if they fail to sell their charcoal.

Fig. 8. View in Quezaltenango showing a bus from Cajolá being unloaded in front of a charcoal depository.

Charcoal is also sold in the market place by a woman vendor who regularly buys from the residents of Cajolá in large quantities at a lower price of $1.50 to $1.60 per net when it is available. The carboneros deliver the charcoal to her home where she stockpiles it in order to maintain a supply in times of scarcity which occurs during the highland harvest. As each net is brought into her courtyard she weighs it on a romana (scale) to ascertain
the quantity of charcoal being purchased. She pays an Indian employee 10 cents per net to transport charcoal to the market place where it is sold. The municipality of Quezaltenango charges a 10 cent tax for each net of charcoal sold in the market place. The price of charcoal in the market place varies between 2 and 3 cents per pound during the year, and her weekly sales total approximately fifteen to twenty nets. The vendor stated that her average profit ranged between 20 cents and $1.10 per net.

Charcoal can also be purchased from the carboneros by the pound, and during the year prices vary between 2 and 3 cents per pound. The lower income families in the city usually buy in small quantities because they lack the money to purchase larger quantities.

The consumption of charcoal is dominated by individual households and restaurants. Most of the homes within the city of Quezaltenango use charcoal as a cooking agent, and thus consume the largest quantity. A family using charcoal to cook every meal will burn approximately 75 to 100 pounds per week. The restaurants, excepting the larger ones using propane gas, consume approximately 400 to 500 pounds of charcoal during a normal week. Barber and tailor shops burn small additional quantities.

The sale of charcoal in the market place and its sale by carboneros going from door to door is the only
source the inhabitants of the city of Quezaltenango have for the product. Agricultural cycles and related out-migration influence ups and downs in charcoal production and prices fluctuate accordingly. Aside from this, prices will tend to rise as forest reserves begin to decline.

Movement of Charcoal to the Coast

Charcoal is transported to the coast on buses and trucks. The largest movement of charcoal from Cajolá to the coast takes place in January, just after harvest in the highlands, and in August during the corn harvest on the coast. During the remaining months of the year the shipment of charcoal to coastal areas is insignificant. Several families in Cajolá will buy 80 to 100 nets of charcoal from their neighbors and hire a truck in Quezaltenango to transport it to the coast. Charcoal can usually be purchased in Cajolá for $1.25 per 100 pounds, making the initial investment $100 to $125. The cost of hiring a truck in Quezaltenango is approximately $25, and this includes taking the charcoal to the coast and returning to Cajolá with a load of corn. They are also required to purchase a license to transport the charcoal to the coast which can be obtained in the Forestry Office for $2.
The carboneros load the trucks with charcoal in Cajolá, and pay the 2 cents per net impuesto in Ostuncalco. They are usually stopped by both the police and the military who check their impuesto receipts and various permits. The carboneros take the charcoal to either Retalhuleu, Mazatenango, or Coatepeque, where they sell it from door to door. Informants stated that charcoal brings from $2.50 to $3 per 100 pounds on the coast throughout the year. They sell 200 to 300 pounds of charcoal at each home quickly disposing of the entire truckload. Thereafter, they pick up their corn and transport it back to the highlands. The income on a business venture of this sort for four carboneros is approximately $35 apiece. With the supply of trees reaching a critical point, the gathering of such a quantity of charcoal in Cajolá is becoming more and more difficult. The initial investment in the charcoal also restricts its shipment to the coast. Thus, the majority of the movement occurs when the carboneros have corn to transport back to the highlands which absorbs a portion of the initial cost. Informants stated that only six to seven truckloads of charcoal have left Cajolá for the coast during the past year. The commercial farm owners occasionally have contracts with the highlanders to buy truckloads of charcoal, which the carboneros produce in
the highlands and transport to the farms by truck.

The bus line operating out of Cajolá on Saturday has one bus that travels from Cajolá to Coatepeque, which charges 30 cents per net of charcoal and 50 cents for a one-way trip to the coast. It transports approximately ten to fifteen nets on each trip. Arriving in Coatepeque, the carboneros unload the charcoal at a house, called a depository, where they are charged 1 to 2 cents per net storage fee. Since a man can only carry 100 pounds of charcoal on his back, he will, if he brought three or four nets, have to leave the remainder at the depository while he sells each net. They sell the charcoal rapidly, and in the afternoon take the bus back to Cajolá. The bus travels from Cajolá to Coatepeque because the municipio of Cajolá owns land on the coast to the southeast of the city, and the inhabitants are continually traveling back and forth to cultivate their crops.

Carboneros migrating to the coast to work on the commercial farms may also produce charcoal, either for the owner of the farm or to sell in the cities. According to informants, production carried out in this manner is insignificant. Because limited quantities of charcoal are produced on the coastal plain there is a continual demand for the product. Costs and shortages of trees are restricting the movement of charcoal to the coast in any
greater quantity than is presently being transported.
This keeps the price of the product high during the entire year.
CHAPTER V

FUTURE OF THE CHARCOAL INDUSTRY

Deforestation and Its Significance

The cutting of trees in the Department of Quezaltenango has been continuous for centuries, and the inhabitants are still dependent upon wood for cooking and heating. The absence of a government reforestation program throughout Guatemala's history is beginning to manifest itself in the form of erosion, serious shortages of timber, and the loss of valuable cropland. This has been especially so in and around the Basin of Quezaltenango where there are large numbers of Indígenas who supplement their incomes through the sale of charcoal and firewood.

There are extensive areas of slope within the region and these have been damaged to such an extent that their reclamation is virtually impossible. In the northern sections of Huitán and Cabricán, the forest has been completely cut over to provide wood for the firing process necessary in the production of cal. Extensive areas have been subsequently eroded into a network of gullies that...
are ten to fifteen feet deep. To the south of the city of Quezaltenango in the aldea of Las Majadas, the production of charcoal during the 1950's was substantial. The records in the Forestry Office indicated that the manufacture of charcoal came to a halt in 1960. Further investigation revealed that extensive forest depletion on the east and northeast faces of the volcano Santa Maria was contributing to severe local erosion. Thus, the officials of the aldea stopped the cutting of trees in the entire region in order to conserve the remaining forest and halt soil erosion.

The carboneros of Cajolá are also feeling the effects of deforestation within the municipio and in adjacent cutting areas which are continually receding further from their homes. The forest has long been cut over within the municipio of Cajolá, and the remaining trees are too small to bother with or are on communal land. The depletion of trees and the existence of a large population living on a subsistence-agricultural basis has severely taxed the region's capacity to support its populace. The makers of charcoal are now traveling up to ten miles from the municipio in order to find suitable trees for raw materials; with the passage of time the distance to cutting sites will prohibit travel by foot or burro resulting in the halting of charcoal manufacture. As
trees become more difficult to find, the cost of purchasing them may rise to the point where a carbonero will find it uneconomical to produce charcoal.

With the population density approaching 560 persons per square mile in the municipio of Cajolá, the problem of deforestation and soil depletion is rapidly reaching a critical point. The inhabitants are dependent upon subsistence agriculture, and with approximately four square miles of the eight square mile municipio unfit for cultivation, securing a sufficient supply of food locally is often impossible. The complete absence of conservation practices and modern agricultural methods further increases the plight of the people, and increasing numbers are going to find it necessary to migrate in order to subsist. In the municipio of Cajolá, of 767 farms studied, there was not a single farmer using chemical fertilizer in 1950.¹ In 1964-65, records in the offices of a national wheat cooperative indicated that there were five farmers using chemical fertilizer in Cajolá, which is representative of the slow progress the inhabitants are making in the modernization of agriculture.

¹Repuública de Guatemala, Cantidad de Abonos Empleada y Superficie Irrigada en Las Fincas de la República, Por Municipios, Dirección General de Estadística, Oficina Permanente del Censo, Cuadro No. 152, Mayo 1949-Abril 1950.
As the cal producers of Huitán and Cabricán move further south in quest of fuelwood to support their industry, they are being met by the charcoal makers of Cajolá coming from the opposite direction. The intervening forest reserves in the region will dwindle until production of both products is halted. The consequence of forest depletion will not only be the loss of cal and charcoal production but also the exposure of marginally cultivable land to erosion which the inhabitants depend upon as a means of earning a food supply. Agricultural output is nearing its maximum in the region with existing practices, and continued soil depletion with increasing population is going to have disastrous effects upon the populace unless the government steps in. Thus, the inhabitants of Cajolá and their neighbors to the north are faced with a critical problem, and little is being done to remedy the situation.

The significance of forest depletion to the city of Quezaltenango are twofold; first, there is going to be a gradual increase in the price of charcoal, and second, modern means of cooking and heating will be introduced as the price of charcoal becomes prohibitive. Thus, the high cost of charcoal resulting from forest depletion may eventually halt its sale in the city.
Social Implications

As the problem of obtaining trees becomes more difficult, the inhabitants of Cajola will be forced to find new ways of supplementing their incomes. The outlook for alternative forms of employment within the municipio are limited, and, therefore, the populace will have to look to the outside in hopes of obtaining additional income and supply of food. The extended family will suffer initially from out-migration and the system will begin to break down as the out movement increases. As the inhabitants move in and out of Cajola in their annual trips to the coast, new ideas and modern goods will be introduced into the society. As a consequence the local power structure will be confronted with foreign ideology and will have to change its manner of control or face internal conflict.

The culture within the municipio of Cajola has changed very slowly in the last century, but through improved transportation and increasing out-migration, change is destined to occur more rapidly in the next several decades. As the inhabitants become aware of the modern world through increased contact, the entire pattern of life within the municipio will evolve to meet the new ideology. The shamans will begin to lose their grip on
the people, and many ancient practices and myths will be broken paving the way for change. Thus, as the production of charcoal begins to decrease and comes to a halt in the future, the inhabitants will be forced to find alternative means of supplementing their incomes and this will, in the process, initiate the beginning of a new era in Cajolá.

**Economic implications**

With the decline of the charcoal industry, the inhabitants of Cajolá are going to find it increasingly difficult to secure additional sources of income because technological advances are not likely to accrue to the advantage of the Indígena. For example, the educational gap between Ladinos and Indians is widening at an ever increasing rate, and there is little immediate hope that the trend will be reversed. The economy of Cajolá has been sustained for several hundred years through the manufacture of charcoal and the residents of the municipio are deficient in other skills with which to supplement their incomes. The modernization of local agricultural techniques and practices is imperative if progress is to be initiated. However, the government would have to be the initiator of such a program, and there is little hope of this occurring in the near future. Out-migration to
work in coastal areas occurs on a seasonal basis; and those who migrate usually return to Cajolá upon completing their tasks in the lowlands. The consequence of their return to the highlands is continued population pressure within the region which maintains the critical shortage of available agricultural land and food supplies. Thus, agricultural output will remain essentially static in the coming years; and there is little hope that the inhabitants will reclaim land lost to soil depletion.

The illegal production of liquor is an important sector of the local economy, but its potential as a source of additional income is questionable. As transportation improves, the manufacture of illegal alcohol may be hindered because the government will have increased access to Cajolá and thus exercise greater control over its production.

The conflict between the Ladino and Indígena is a problem basic to the Guatemalan culture and will not be resolved for years to come. The Indígenas have difficulty in securing employment from the upper-classes, and opportunities are limited because of the slow growth of the Guatemalan economy and the lack of education among the masses. The Ludios control the economy and thus, the Indians, whom they suppress in every possible manner. The influx of modern Western products into the Guatemalan
society has eliminated the need for most specialized products and handicrafts which the Indígena manufacture and therefore, the inhabitants of Cajolá are left with few opportunities for producing articles to be sold in the market.

Migration to coastal areas to grow corn and work on commercial farms will increase substantially as forest reserves decline, but the possibility of raising the annual income of the migrant above his present income is limited. The populace can grow two crops of corn a year on the coast, but when added to their highland crop this provides for no more than a subsistence level of living. Work in lowland commercial agriculture falls into patterns which the inhabitants of Cajolá follow; but the growth potential of this activity is presently limited because of internal political conflict and the low prices their products bring on the world market.

Conclusion

The outlook for the municipio of Cajolá is very dim, and as forest reserves decline causing a reduction in charcoal production, the situation within the region will become critical. Locally, there is little hope for increased employment opportunities in the near future, and the inhabitants will be forced to migrate to the coast.
Government policy is presently ignoring the situation in areas such as Cajolá, and a change of policy toward the Indígenas in the next decade does not appear to be forthcoming. As forest reserves dwindle and the plight of the inhabitants of Cajolá worsens, the forces that lead to social revolution will begin to intensify.
APPENDIX

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A. A carbonero from Cajolá, Miguel Alonzo, using a machete to cut branches to be used for making charcoal.

B. Miguel Alonzo using an axe to cut a tree trunk into smaller pieces so they may be placed in the pit.

C. View of a pit with embers of burning charcoal in the foreground which are used to ignite the wood.

D. The carbonero is shown clearing the site of debris prior to stacking the wood in the horno.

E. Shown are the main cross braces in the bottom of the horno. The pit is approximately two and one-half feet deep.

F. View of Miguel Alonzo placing pine boughs in the bottom of the pit to help promote a better burning process.

G. Placing the first layer of wood at right angles to the main cross braces.

H. View of the stacked wood after several layers have been added. Note the net bag which contains small wood chips and ocote.
A. View of the completed wood stack with an intermixture of many small sticks, wood chips, and pieces of ocote which help initiate the firing process.

B. Showing the main braces used to construct the air holes that permit air to enter the horno after it has been covered with dirt.

C. Profile of the wood stack showing an air hole to the right and the front of the stack where ignition takes place.

D. Miguel Alonzo using an azadón to ignite the horno from the front by placing burning coals against the base of the stacked wood.

E. The horno after it has been completely covered with bunchgrass and other green vegetative matter.

F. Miguel Alonzo using his azadón to pull dirt over the wood stack.

G. The completed horno is shown with an exposed air hole. Note the smoke rising from an air hole to the left.

H. Miguel Alonzo and his son shown standing behind the completed horno. The charcoal will be removed from this horno in two to three days.
BIBLIOGRAPHY
LIST OF BOOKS, ARTICLES AND PERIODICALS


Forestry Office. #5, Tala Comercial Bosques Particulares, Libro de Control de Tipo, Comercial Que Llave Esta Oficina de la Supervisoria Forestal: Quezaltenango, 1959-1965, Quezaltenango, Guatemala.


Standley, Paul C. "Notes on Some Guatemalan Trees," Tropical Woods, No. 84 (December 1, 1945), 1-17.

Urrutia, Mateo Morales. La División Política y Administrativo de la República de Guatemala, Con Sus Datos Históricos y de Legislacion, Toma II. Guatemala City, 1961.
LIST OF INTERVIEWS


Personal interviews with the Reverend and Mrs. Dudley Peck, missionaries, Cajola, Guatemala. September, October, November, and December, 1965.