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SHORT COMUNICATION

The coffee stain: A brief environmental history of coffee cultivation in the state of Veracruz

La mancha del café: Breve historia ambiental sobre la cafeticultura en el estado de Veracruz

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ABSTRACT

The study analyzed the development of coffee cultivation in Veracruz during the 20th century, highlighting its impact on the economy, society and the environment. From the end of the 19th century, coffee production expanded rapidly, becoming one of the main economic activities in the state. Córdoba was the first city to grow coffee trees, followed by Xalapa and Coatepec, consolidating a production network that positioned Veracruz coffee in the national and international market.

The climatic and geographical conditions of Veracruz favored coffee cultivation, with regions of humid and temperate climate that ensured a successful harvest. However, the industrialization of the processing required large amounts of water, generating a considerable ecological impact. The introduction of capitalist production systems in the 20th century led to the expansion of crops and soil degradation, affecting the environmental balance.

The study also examined the relationship between coffee farming and migration, noting that the expansion of crops attracted day laborers from nearby communities, which encouraged urban growth. Over time, the climate crisis and global competition affected production, forcing coffee growers to replace their crops with more profitable ones such as citrus and bananas.

The article concluded that coffee growing played a central role in the economic and environmental history of Veracruz, influencing the transformation of the landscape and land use.

Keywords: Coffee Growing; Veracruz; Climate Change; Economy; Migration.

RESUMEN

El estudio analizó el desarrollo de la cafeticultura en Veracruz durante el siglo XX, destacando su impacto en la economía, la sociedad y el medio ambiente. Desde finales del siglo XIX, la producción de café se expandió rápidamente, convirtiéndose en una de las principales actividades económicas del estado. Córdoba fue la primera ciudad en cultivar cafetos, seguida de Xalapa y Coatepec, consolidando una red de producción que posicionó al café veracruzano en el mercado nacional e internacional.

Las condiciones climáticas y geográficas de Veracruz favorecieron el cultivo del café, con regiones de clima húmedo y templado que aseguraron una cosecha exitosa. Sin embargo, la industrialización del proceso de beneficiado requirió grandes cantidades de agua, generando un impacto ecológico considerable. La introducción de sistemas de producción capitalista en el siglo XX llevó a la ampliación de cultivos y la degradación del suelo, afectando el equilibrio ambiental.

El estudio también examinó la relación entre la cafeticultura y la migración, señalando que la expansión de

los cultivos atrajo jornaleros de comunidades cercanas, lo que incentivó el crecimiento urbano. Con el paso del tiempo, la crisis climática y la competencia global afectaron la producción, obligando a los caficultores a sustituir sus cultivos por otros más rentables como cítricos y plátanos.
El artículo concluyó que la cafeticultura desempeñó un papel central en la historia económica y ambiental de Veracruz, influyendo en la transformación del paisaje y el uso del suelo.

Palabras clave: Cafeticultura; Veracruz; Cambio Climático; Economía; Migración.

INTRODUCTION

Since the late 19th century, coffee rust began to spread throughout different parts of Mexico, causing coffee farming to become one of the new economic activities taking off at the beginning of the 20th century. It only took a few years for Mexican coffee to gain national and international importance, but all that remains of those boom years are memories.

Right now, global coffee farming is in crisis due to surprising but expected changes in regional climates that directly affect the proper growth of the plant. Unprecedented climate issues are now hitting crops, so studying coffee farming from a historiographical perspective, such as environmental history, is extremely important.

That is why this research aims to relate and analyze the evolution of the social aspects that emerged around Veracruz coffee farming and its physical and natural environment during the 20th century. After all, humans are not isolated from the environment in which they develop socially, culturally, and, in this case, economically.

Therefore, it is essential to mention that what environmental history seeks to do is precisely that: to place nature or the environment as a historical problem. David Arnold mentions that, environmental history is usually understood as the history of human relations with the physical world, with the environment as an object, agent, or influence. Here, nature figures unashamedly as human habitat, and the seasons, soils, vegetation, topography, and animal and insect life are seen as significantly influencing human activity, productivity, and creativity. Because it influences land use and viable modes of subsistence, nature encourages or prohibits certain types of social structure, economic organization, and even specific belief systems.[1]

Land use generates a relationship with the social structure of those who work it, which, in my view and for this research, creates a triad. This consists of the environment, the actors, and the economy. In the case of coffee farming, as a productive activity, it has a strong relationship with the economy, which is not far removed from the physical environment in which it takes place. This assertion is based on the principles of capitalism, in which progress takes precedence over the natural resources from which raw materials are extracted and those products from which profits can be generated. Karl Marx located the dynamics of human history not in the dialectic between humanity and nature but in dialectical materialism, successive modes of production, such as feudalism and capitalism, and class struggle.[2]

However, the geographical characteristics of Veracruz stretches like a long strip along the coast of the Gulf of Mexico, and its geographical location is between 17°8’ and 22°28’ north latitude and 93°55’ and 98°38’ west longitude from the Greenwich Meridian. It is bordered to the north by the state of Tamaulipas, to the east by the Gulf of Mexico, to the south by the states of Tabasco and Chiapas, to the south and east by Oaxaca, and to the east by a highly indented and irregular line by Puebla, Hidalgo, and San Luis Potosí.

The population is distributed across 7 872 localities that make up 197 municipalities. The main cities, in order of population, are, in addition to the capital, the Port of Veracruz, Orizaba, Minatitlán, Córdoba, Coatzacoalcos, Tuxpan,and Coatepec.

Geologically, the soil consists of igneous, sedimentary, and metamorphic rocks; sedimentary rocks are the most abundant in the territory, followed by igneous rocks, which occur in isolated areas of relatively small surface extent, and finally, metamorphic rocks, which outcrop only in tiny areas.[3]

Due to its geographical location and environmental characteristics, the state of Veracruz is a territory with extensive biodiversity from one end to the other. Therefore, in each region of Veracruz, whether in the north, center, or south, different agricultural activities are carried out, each contributing to the state and national economy in various ways. Likewise, each group responsible for the development and labor of these activities uses the natural resources of their location according to their convenience and needs.

Therefore, reviewing Veracruz’s coffee cultivation and its relationship with environmental degradation is interesting. Specifically, land use for the germination and growth of coffee trees differs from that of other crops. If we analyze the coffee-growing areas of Veracruz, we find several similarities. One of the most important is the climate and the factors under which coffee crops develop optimally.

The coffee plant is a small shrub that tends to grow into a tree between two and six meters tall, depending on its age. Its growth has four phases, during which the coffee seed becomes a tree that flowers and bears fruit. The most critical factors for proper coffee plant growth are altitude, latitude, soil type, light, precipitation,

and humidity. In the case of Veracruz, being a state with significant climatic variations at the macroclimate, mesoclimate, and microclimate levels, several of its regions are optimal locations (i.e., they meet the main requirements mentioned above) for successful cultivation that results in high-quality coffee.

As mentioned in the introduction, the state of Veracruz has a variety of climates within its territory. Although it is mainly associated with a hot environment, some regions have humid and temperate climates. Although Veracruz's climates have changed rapidly and noticeably in a short period, before the 21st century, the following climatic characteristics prevailed in Veracruz, making it favorable for coffee cultivation:

According to the terrain, areas below 800 meters above sea level have a hot tropical climate (or warm climate) with average minimum temperatures around 68°F. Temperate climates correspond more or less to altitudes between 800-1 000 and 1 500 meters, with monthly averages of 64°F during the summer; in winter, temperatures sometimes reach 32°F. Cold climates are found in mountainous areas above 2,000 meters above sea level, with average temperatures ranging between 10-15°C.

The rainy season lasts from summer to fall, with little rain in winter. Precipitation increases from east to west. Thus, while Veracruz has an annual average of 1,600 mm, in Orizaba and Córdoba, higher regions, up to 2 100 mm are recorded annually.

The prevailing winds in the Veracruz-Xalapa region are from the north and east, while in Córdoba, they are from the southeast, and in Orizaba, from the east. However, during the winter, the "Nortes del Golfo" (trade winds) considerably modify the stability of the prevailing winds. The high humidity in the atmosphere resulting from evaporation from the Gulf favors a long rainy cycle.

The hot-humid (or subhumid) climate, with summer and fall rains, is found in the coastal plain up to the base of the Sierra Madre Oriental. Humidity increases towards the south and the mountains. However, one anomaly is a small dry climate area (the driest of the sub-humid regions) located in the triangle formed by Xalapa, Veracruz, and Córdoba in the Rinconada region.

A semi-warm-humid climate (according to GARCIA) or temperate climate (according to SOTO) is found at the altitudes of Córdoba and Xalapa on the slopes of the mountains. Several subtypes related to humidity variations exist. GARCIA (1970) incidentally observes that this climate is the most suitable for coffee cultivation.

Within the subtypes, there is a group of temperate-humid climates (1 300-2 800 meters above sea level), with warm summers and cold winters (according to GARCIA), which does not appear on our maps as such but does appear in the category of cold or semi-cold-humid climates.[4]

As mentioned in the previous quote, the ideal climate for coffee cultivation is a humid climate, which is characteristic of the central part of the state. The central region (Misantla, Martinez de la Torre, Xalapa, Córdoba, and Orizaba) is made up of a series of natural features that make it diverse, as it has a mountainous complex with a cold climate above 1,500 meters above sea level. Rainfall averages between 1,500 and 2,000 mm per year.[5]

In this sense, there are three important coffee-growing areas that make up this central region: Córdoba, Xalapa, and Coatepec.[6]

Córdoba, Veracruz is located at the following coordinates: north latitude 19° 00'; south latitude 18° 50'; east longitude 96° 52'; and west longitude 97° 01'. It is a municipality with a flora consisting of low deciduous forest,[7] high deciduous forest, and mesophilic mountain forest, as well as an extensive list of fauna. With a mesoclimate that varies between three types of climate:

- Humid semi-warm with abundant rainfall in summer (ACm). This climate covers most of the municipality, accounting for 80% of its total area.
- Semi-humid with rainfall throughout the year (ACf). This climate is found in the northwestern part of the municipality, on the borders with Chocamán and Tomatlán.
- Humid with abundant rainfall in summer (Am). This climate is found in the southernmost part of the municipality, specifically on the borders with Amatlán de los Reyes.[8]

Xalapa, the state capital, located in the capital region, lies between parallels 19° 29' and 19° north latitude; meridians 96° 48' and 96° 58' west longitude; altitude between 700 and 1 600 m.[9] Its macroclimate comprises a semi-humid warm climate with abundant rainfall in summer (54,30 %), semi-humid warm with rainfall throughout the year (44,62 %), warm sub-humid with rainfall in summer (0,92 %), and temperate humid with rainfall throughout the year.[10]

Now then, the municipalities of Xalapa and Coatepec are located in the central mountainous region of the state of Veracruz, between 19° 21' and 19° 36' north latitude and between 96° 47' and 96° 58' west longitude. They have a semi-warm to humid temperate climate with rainfall distributed throughout the year and a hot dry season. The average temperature for both seasons ranges between 19,3-19,6 °C. Xalapa and Coatepec have an average annual rainfall of 1368,2 mm and 1800,8 mm, respectively. They are characterized by high humidity conditions.[3]

Therefore, Córdoba was one of the first cities to cultivate coffee trees. There are several discrepancies

regarding when, how, and where this plant was first introduced to the Veracruz region. However, everything points to it being on a Spanish hacienda in Córdoba, Veracruz. It was in this municipality that coffee began to spread to other neighboring municipalities (Amatlán, Huatusco, Zongolica, Chocamán, and Ixhuatlán from Café), as it was a product of national necessity, and other regions of Veracruz saw an opportunity to take advantage of this agro-industry. This is how Córdoba would obtain a privileged place in the state of Veracruz and Mexican coffee growing due to the concentration of coffee production that was transported by rail to the port of Veracruz, especially after its inauguration in 1873.[4]

After Córdoba and its surrounding municipalities, Xalapa and Coatepec began planting, producing, and marketing the product, these municipalities quickly and effectively integrated into the market, joining the municipalities that would contribute to the successful development of coffee farming in Veracruz and Mexico during the 20th century. Both coffee-growing municipalities had very different paths, developments, and continuities that characterize each one.

As explained above, the basic requirements for good coffee plant growth can be summarized as follows: humidity and shade. Although these characteristics may seem unrelated to biological or agronomic knowledge, they contributed to the maximum use of the land where coffee was grown. Thus, during the 20th century, the agricultural landscapes of Córdoba, Xalapa, and Coatepec were made of coffee plantations with their respective shade trees. These could be orange trees, lemon trees, trees native to the area, or, in some cases, banana plantations. This had the multiple objectives of protecting the coffee trees from excessive light and making the most of the land. This led to a trend of fruit trees being planted alongside small coffee bushes, thus doubling profits thanks to the variety of crops on a single plot of land.

In the case of Veracruz, coffee growing was an activity carried out by small farmers who saw coffee as an opportunity for growth. Therefore, during the 19th century, most crops consisted of small plantations. These did not meet capitalist demands, and production remained moderate. However, in the 20th century, coffee farming in Veracruz changed thanks to international demand, changes in the price per quintal, and political crises in some Latin American coffee-producing countries, such as Cuba. Veracruz crops responded to high demand, becoming part of large coffee plantations. As a result, coffee farming ceased to be a small- and medium-scale peasant practice and became extensive; capitalist agriculture developed on plantations with tens and hundreds of thousands of coffee trees each.[5]

In this sense, the above factors pushed producers to contribute to land degradation and abrupt changes in land use. However, in areas with a high indigenous population, even if they wanted to expand their crops, the distribution of land that took place after the Mexican Revolution did not contribute to increased production on their land, as some of it was unworkable due to the lack of essential resources for successful agriculture. However, in areas of Xalapa and Coatepec, where the indigenous population was almost non-existent, crops expanded and grew at the rate of demand that emerged around the 1940s.

On the other hand, these municipalities tended to receive migrants from neighboring towns, as the large-scale crops required more labor for maintenance and harvesting. In response to this, Beaumond states the following:

While coffee is the area's economic mainstay, its cultivation requires abundant labor in all stages (planting, pruning, weeding, fertilizing, hoeing, covering, replanting), especially during harvest. This accounts for the significant movement of day laborers and localized, temporary migratory flows concentrated mainly in coffee and other rural activities.

These are people's movements from the highlands (west and southwest) to the "coffee heartland" of Coatepec-Xico Bajo and Teocelo. According to municipal authorities in the highlands (such as Ayahualulco), up to 75% of the population of certain localities migrate depending on the year. This flow occurs between the corn harvest (November in the highlands) and the new planting in March.[6]

Because of this, coffee farming encouraged migration, contributing to urban growth, as many migrants brought their families with them. This created a need for housing. For private crops, space was provided for families to live while the harvest season ended. In other cases, those with the means could acquire small plots of land close to central areas, such as the center of Xalapa.

As mentioned above, coffee cultivation is very different from corn cultivation, to give one example. In the case of coffee farming in the Xalapa-Coatepec region and Mexico is still very traditional and has low yields per hectare compared to other Latin American countries. The most common coffee varieties are Arabica (a traditional national variety, still present in a proportion of 30 %), Bourbon, Mundo Novo, and Caturra, which are improved varieties with higher yields. Recently, INMECA-FE introduced the Garnica variety, which is resistant to rust, a disease that currently threatens Mexican coffee plantations. The density of trees per hectare is low, estimated at 1 420 trees/ha on average for Mexico; the Coatepec delegation (INMECAFE) has the highest density in the country with 1,884 trees/ha, and on some farms visited, this density has varied from 800 to 2 500 trees/ha. Coffee is consistently grown in shade or semi-shade, using trees of the genera Inga or Jinicuil or by associating coffee plantations with fruit trees, especially orange and banana trees (HERNANDEZ-CORDOBA,

1979); no cultivation operations are mechanized.

According to INMECAFE (Coatepec Delegation), the average yield for Mexico is 12,6 quintals/ha; for the state of Veracruz, it is 143 quintals/ha; and for the Coatepec Delegation, it is 19,1 quintals/ha. All these yields are low (in Mexican coffee farming, a good yield is considered to be over 25 quintals/ha) and have been stagnant since the 1970s.[7]

For this reason, crop owners did not choose to cut down or deforest the land, as they knew that preserving the trees, regardless of species, would benefit the maturation of their coffee trees and, subsequently, the fruit's health. The variety of climates makes Veracruz exceptional in terms of its agricultural products. These trends led to the farming landscape of the areas dedicated to coffee cultivation being recognized for this reason. The periodical "XX Settembre" mentioned the following: "The coffee of Córdoba is exquisite, and the plantations of this precious shrub can be seen there and in other regions, in the shade of large banana trees that produce tasty fruits of varying quality".[8]

However, when the fruit is harvested, the production stage begins, and this action also generates a significant ecological footprint. The coffee cherry must undergo several processes to become a marketable bean. Consequently, the post-harvest production process consists of the following: Cherry picking (fruit from the coffee tree), pulping (the process in which the skin and pulp covering the coffee bean are removed), processing, drying, bean selection, and storage.

Of these stages of coffee production, the processing stage is the most notable in terms of its ecological footprint. This is the stage of cleaning the beans, in which water is essential, although it is not the only method, as there is also a dry method. The wet technique was one of the first ways of processing coffee and can be traced back to around 1909. As one of the most critical stages in coffee farming, the benefits are the places where these processing techniques take place, and there are wet and dry benefits. Wet benefits describe the first stage of processing, which goes from cherry coffee to parchment coffee, wet pulping, and drying, a process that must be carried out within 36 hours of harvesting.[9] It is at this stage that water use can be excessive, as washing the coffee is essential to obtain a clean bean free of impurities. During the period covered by this study, wet mills with a capacity of 11 200 kg/day were operating in the central zone; 15 of these are owned by INMECAFE, 13 are rented or privately owned, and 62 are maquila facilities.[10] Therefore, the regular amount used for a processing process ranges from 2 000 to 3 000 liters. Now, if we add the benefits, we get 90. Suppose we multiply this result by the water needed for this process. In that case, we get 270 000 liters of water (using the maximum amount of water presented above, i.e., 3000 liters) for cleaning the coffee beans per quintal or according to the processing plant's capacity.

CONCLUSIONS

In conclusion, coffee farming has a long history that is worth reviewing and reflecting on. Looking at coffee farming from a critical and analytical perspective based on environmental history makes it easier to appreciate that, despite being an economic activity with low yields for those who grow it, it contributes to the conservation of the soil and the species that live in the humidity of the coffee trees. However, the excessive use of water in the production process could significantly impact the environment. It is therefore essential to project the future direction of coffee farming and its effects on the environment because, unlike in the 20th century when natural resources such as water could still supply agricultural activities, in the 21st century, water is a scarce resource even for human use.

Currently, it is not only climatic difficulties that have affected the coffee industry. As an activity that has lost value due to global competition, coffee growers have opted to switch to crops better suited to the new climatic conditions in the area. The rise in temperatures in recent years has been detrimental to the optimal conditions for coffee, so climate change is forcing coffee growers to adapt their crops. As a result, only oranges, lemons, and bananas are now cultivated in areas where coffee was once grown, as these species thrive in warm climates. Similarly, the problems of rural abandonment have led to areas previously dedicated to agribusiness being converted into housing, encouraging urban sprawl and responding to the need to mitigate the housing crisis. However, this trend benefits humans, who are forced to sell their land to real estate agents for land use change and thus stop growing crops that they cannot sell.

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