

Coffee Agroecosystem in Mexico: Productive Culture between Tradition and Change

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ABSTRACT

Objective: To know the productive cultural dynamic that underlies to coffee agroecosystems in Sustainable Rural Development District 005 of Fortín, Veracruz, Mexico.

Methodology: A survey with open and closed questions was applied. Information submitted to variance analysis, Tukey tests and frequency tables.

Results: Coffee agroecosystems in Mexico are complex systems with an underlying particular cultural dynamic that expresses a worldview and that not only influences life, but also the reproduction of certain handling practices the logic of which goes beyond economy. Coffee activity is performed mostly by tradition (39%), characterized by *Coffea arabica* agroecosystems under the shadow (100%), with a performance lower than 5.87 t ha⁻¹.

Limitations: It is a case study for a specific zone of the state of Veracruz and the results reflect a local reality.

Findings: Producers perform up to four economic activities external to their trade to complement their family income; the paradox is that this has served as a foundation for continuing the coffee-growing activity, reduces its economic vulnerability and eases the continuity of their production mode and lifestyle.

Keywords: coffee-growing industry, social system, handling practices.

INTRODUCTION

Coffee-growing in Mexico began in the last decade of the 18th century; more than 200 years after its introduction, this aromatic crop is still considered to have great economic, sociocultural and environmental importance (Pérez & Díaz, 2000). Coffee-growing agroecosystems are distributed in 14 states of Mexico on a harvested area of 629 mil ha (SIAP, 2020). Nevertheless, Chiapas, Veracruz, Puebla and Oaxaca concentrate 93% of the production of coffee, an activity performed mainly by small producers (FIRA, 2016). The coffee-growing industry in Mexico involves directly 404 municipalities, which comprise



4,571 towns (Contreras, 2010) and 510,544 producers, of which 180,000 are indigenous population (Flores, 2015). This way, the coffee-growing industry is deemed to be a fundamental strategic activity in the country, as it allows integrating productive chains, generating currency and jobs, and it also allows the subsistence mode of small producers, many of whom belong to indigenous groups, to persist. Coffee plantations are appraised nowadays as ecological reserves, as more than 90% of this surface is grown under a diversified shade. This production form contributes to preserve biodiversity and provide environmental services that are crucial for society (Giovannucci and Juárez, 2006), utilized through the consumption of food, timber, wood, medicine herbs, soil conservation, carbon capture and water (Méndez et al., 2013).

Notwithstanding, the coffee-growing industry in Mexico has been subject to a recurrent crisis since the 1990s, when the international value of coffee went down. This situation became worse with the gradual abandonment of the activity by the Mexican State as part of neoliberal policies implemented as of 1988. The participation of the Mexican State in boosting the coffee-growing industry was reduced with the disappearance of the Mexican Institute of Coffee, the main function of which was to support producers in the production and marketing of this bean. This crisis has deepened in recent years, derived from the overproduction of coffee in other producer countries such as Brazil and Vietnam, which saturates world markets and brings instability to the international price of coffee (Ramírez & González, 2006; Rivadeneira & Ramírez, 2006; Vandermeer, 2011).

The effects derived from climate change (Gay et al., 2006), which has modified the weather regime and hence the behavior of main agroclimatic variables such as rain and temperature, should be added to this situation. These conditions have allowed an increase in plague populations and diseases; this is the case of stem rust. In the 2014-2015 and 2015-2016 periods, stem rust reduced the income of producers drastically just as it has happened in other coffee-growing areas in the country (De Adelhart et al., 2017). In this context,

this research the objective of which was to understand the productive cultural dynamic that underlies to coffee agroecosystems in in the region associated to Sustainable Rural Development District 005 of Fortín, Veracruz, Mexico, was performed.

MATERIALS AND METHODS

The study area comprised 13 municipalities (Chocamán, Comapa, Córdoba, Huatusco, Ixhuatlán, Sochiapa, Tenampa, Tepatlaxco, Tlacotepec, Tlaltetela, Tomatlán, Totutla and Zentla) that belong to Sustainable Rural Development District 005 of Fortín (DDR005-Fortín), Veracruz, Mexico. This district has a territory of 617,644 ha and a political division of 56 municipalities.

In accordance with the study objective, a questionnaire with open and closed questions that allowed the capture, systematization and analysis of information was designed. In order to calculate the sample size, the formula created by Scheaffer et al. (1987) was used with a reliability of 95% and accuracy of 10%, which generated an approximate sample of 145 coffee producers in the region (Table 1), in accordance with a list of producers of the Veracruz coffee-growing registry. The questionnaire was applied through the snowball technique, the only requirement of which was being a coffee producer and with no regard to the size of the land devoted to this activity and having a free desire to participate (Taylor & Bogdan, 1987).

The "satisfaction by income" variable was deemed to be the measure that indicates to what degree the producer is satisfied upon covering his basic subsistence needs. In order to measure this variable, a Likert-type scale with five response alternatives was used: very satisfied=5, satisfied=4, regular=3, unsatisfied=2 and very unsatisfied=1.

The information obtained were analyzed through the Statistica software version 7.0, with the application of a variance analysis on unbalanced data, Tukey tests and frequency tables. Frequency tables were made for variables such as: reason why producers continue producing coffee, cropped variety and activities external

Table 1. Coffee producers surveyed in DDR 005 (Rural Development District) Fortín, Veracruz, Mexico.

Municipality	Total producers
Totutla	41
Comapa	24
Huatusco	14
Tenampa	14
Ixhuatlán	12
Tlacotepec	11
Tlaltetela	7
Zentla	5
Sochiapa	5
Tepatlaxco	4
Tomatlán	4
Córdoba	3
Chocamán	1

to the trade, as well as locating the level of satisfaction for producers with their income from coffee sales between among three producer-owned surface ranges.

A variance analysis was applied to the property size, satisfaction level by income generation. When statistic differences were found, the Tukey test was performed.

RESULTS AND DISCUSSION

As shown in results from the survey performed in DDR005-Fortín, the continuity in the production of coffee bean should be sought as this goes beyond financial reasons. Regarding the question on why coffee producers continue their activity despite the conditions facing the sector, 39% of producers answered that they do it for mere tradition, 19% because they enjoy it, 19% because they have no other choice, 14% because this generates income for them and 9% for other reasons. In other words, there is a strong sociocultural component that encourages them to continue growing coffee, although they face the effects of a recurrent financial crisis for more than three decades. Coffee growers are still bonded to this crop when they practice growing forms and the handling of coffee plantations that their parents and grandparents taught them as part of their historical evolution (Rizzo, 2012). On one hand, this productive culture limits their capacity to adapt before market conditions that give little market benefits to the family's income and the adaptation to climate change; this phenomenon has brought water stress to coffee trees and the presence of stem rust, which has brought the plummeting of historical production volumes, as well as affected the coffee bean quality (De Adelhart et al., 2017). On the other hand, producers have been allowed to reproduce the coffee ecosystem with lesser environmental impact and even favoring biodiversity.

As for the production system, from the total surveyed producers, 100% grows their coffee trees under the shade. Producers grow the Arabica (99.9%) variety almost exclusively and Robusta with imitations (0.1%). This contributes to diversifying both flora and fauna in their agroecosystems, as coffee trees and tree species used as shade work as habitat providers for other species (De Adelhart et al., 2017). This handling of shade allows the producer to have certain degree of diversification with wood and fruit species, as well as other species important for their food, medicinal, ornamental or religious habits. On the other hand, big corporations give preference to varieties such as Costa Rica, with beans of rapid ripening

and produced in the open, such as plantations in Brazil and Vietnam (Bolaños & González, 2008; Vandermeer, 2011).

This way, the local coffee-growing industry is more than a production system, the function of which is to provide income to producers as part of an economic system (Londoño, 2008). Ironically, this has started to change in the last decades, as coffee producers began seeking productive alternatives (Vázquez, 2010; Rosales-Martínez et al., 2018). The above is closely related to the productivity of coffee, as the average yield in Mexico accounts for 1.92 t ha⁻¹ (Benítez-García et al., 2015); this yield has been considered to be low when compared to other regions of the country, especially when compared with the productivity of countries like Brazil and Colombia (Martínez, 2012). The survey observed that producers in the municipality of Tomatlán have a greater coffee yield (5.87 t ha⁻¹), when compared to that of the municipalities of Córdoba (5.24 t ha⁻¹), Huatusco (5.19 t ha⁻¹) and Tlaltetela (2.61 t ha⁻¹). Benítez-García et al. (2015) mention that, as well as weather, the production and yield of coffee plantations is due to technology level, agricultural practice application form and production scale.

In order to search for an explanation for these data, a variance analysis was made on the size of the property and the level of satisfaction from the generation of financial income from the coffee-growing activity as a factor. Significant differences ($P=0.002$, Tukey) were found between the satisfied and unsatisfied levels ($P=0.016$); and between the regular and satisfied levels ($P=0.044$). Also, it was found that 12% of producers with the greater property size range were among the those very satisfied by coffee sales income and no producers with the smallest properties were within this group (Figure 1). It is foreseen that this satisfaction level of producers associated to the grown surface size will decrease eventually as the surface per producer is growing smaller mainly as a result of inheritance procedures, as it is the case of the coffee region of Chiapas (Tarrío & Concheiro, 2006).

Upon analyzing the level of satisfaction of income of producers from coffee sales per municipality within the study area, there are significant differences ($P=0.0001$) (Figure 2). Producers from Comapa, Huatusco and Tlacotepec de Mejía show a greater degree of satisfaction, which can be explained by their close

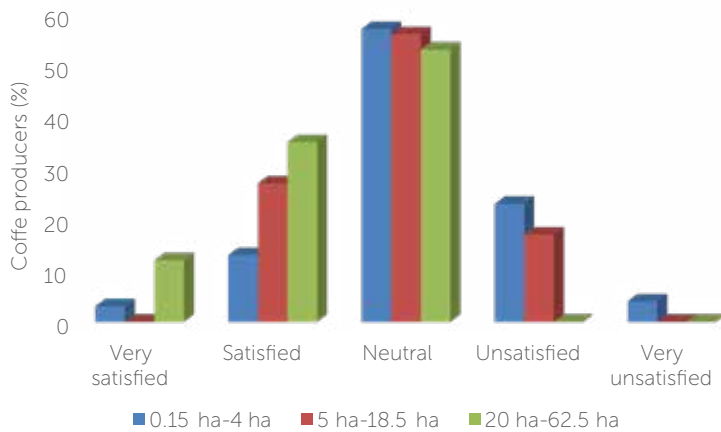


Figure 1. Satisfaction level per coffee income of coffee producers according to their property size.

distance to Huatusco, which is a municipality deemed to be a development pole for the region with greater bean production (Piętak, 2011). As for dissatisfaction among coffee producers, 80.4 % of coffee producers in these municipalities state that the decrease in coffee prices does not allow them to cover production costs nor expenses for their entire family; these results meet the research made in Costa Rica by Guido & Castro (2007). Above all, when the income derived from the sale of coffee harvest is insufficient to pay meals and disbursements on health, domestic electricity, clothing, etc. (Martínez, 2012).

Before this ongoing issue, producers are seeking for alternatives that allow them to continue their trade, and this situation brings them away from their activity as gradual changes in the handling of their agroecosystem are generated. From their viewpoint, however, this is worth the try in order to adapt to the demands of the financial system, in particular within the context of economic liberalization and globalized agriculture (Eakin *et al.*, 2006; Luhmann, 2006; Casanova-Pérez *et al.*, 2015). In this sense, the results from this research show that 31% of respondents grow coffee as their only activity, 52% perform an economic activity different than the production of coffee, 14% perform two extra activities, barely 1.5% perform three extra activities and another 1.5% perform up to four

extra activities apart from their coffee-growing activity in order to get economic gains. Benítez-García *et al.* (2015) also report that producers of Cuetzalan, Puebla turn to non-agricultural activities in order to improve their income among which are masonry, trading and employees. This way, as no sufficient financial resources are gained in order to guarantee the subsequent productive cycle, coffee growers place their workforce for hire either temporarily or permanently (Contreras, 2010). Boltvinik (2007) mentions that, in some cases, this off-farm income more than 50% of their entire income. Nevertheless, in DDR005-Fortín, only 20.68% of coffee growers are devoted to working as laborers, 15.85% have their own business, 10.34% work as coffee cutters and 10.34% work in a trade, and the remaining 8.9% perform a combination of the above mentioned activities (Figure 3).

That is, 45.5% of surveyed coffee producers may be considered as a multi-occupational workforce as a response to the crisis in the coffee-growing industry and a means for surviving it. This is a consequence of what was posed by Cruz & Torres (2015), who considered culture to be a decisive element that allows society to act before certain circumstances and manifestations of environmental components in order to adapt to the latter. Ironically, this deep-rooted culture may also be an obstacle to change processes among coffee producers,

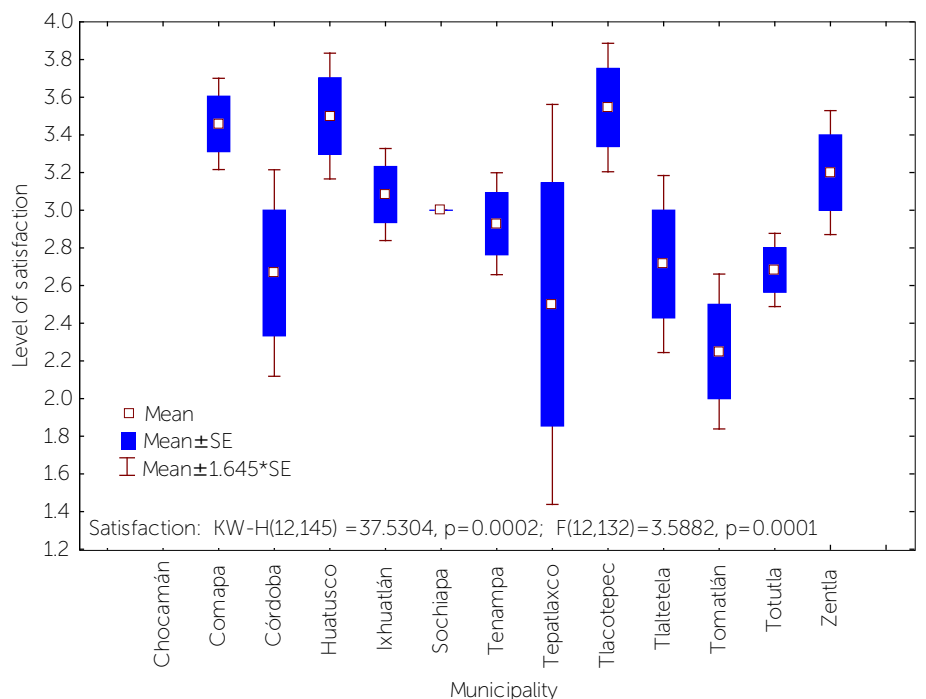


Figure 2. Satisfaction level from coffee among producers per municipality.

as there are difficulties to convince persons to do perform these when they are already used to certain coffee-handling practices (Perea & Rivas, 2008).

CONCLUSIONS

Coffee agroecosystems, even with their contradictions and drowned in a deep financial and environmental crisis without precedent, will continue their reproduction at least in the short and medium term. This is due to the fact that producers have a deep coffee culture that makes them think that coffee is still feasible as a means of subsistence for their families. Nevertheless, they do acknowledge that coffee is grown at certain degree of uncertainty which is evaded through the performance of other off-farm activities. This increases the complexity of the agroecosystem, and the irony is that this situation fosters its reproduction in an unstable balance.

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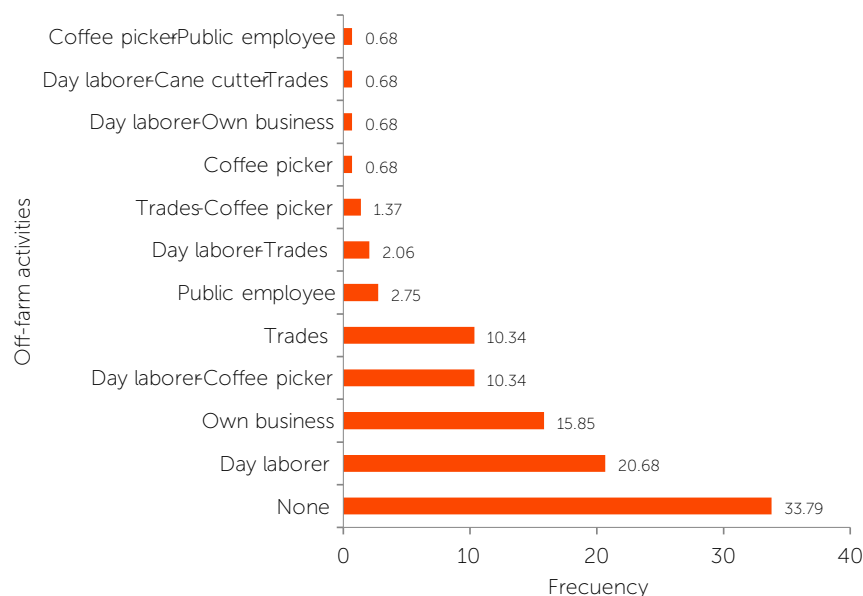


Figure 3. Off-farm activities of coffee producers in District 005 of Fortín, Veracruz, Mexico.

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