

## **Evaluation of the soft systems methodology of the chain productive coffee in Guerrero**

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### **Abstract**

In order to make a preliminary assessment of the current problem surrounding coffee production in the state of Guerrero, information obtained from interviews in 2019 with producers from the municipalities of San Luis Acatlán, Chilpancingo de los Bravos, Chilapa de Álvarez and Atoyac de Álvarez was organized to recognize, through Checkland's soft systems methodology (SSM), processes and strategies that can strengthen the coffee production chain in the state. The results show that coffee production in Guerrero has decreased by almost half in the last 18 years, affecting more than 20 thousand producers in the region. The causes and consequences are megadiverse, including disinterest of government agencies, lack of public policies, lack of technology and programs to combat phytosanitary problems. It is identified that these problems intensify and change as the time and spatial scale is analyzed. The major interest that arises from coffee producers in Guerrero is to transmit to the new generations the respect and use of the crop.

**Keywords:** coffee growers, problem, production, system, value.

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The coffee production chain in Mexico has undergone changes because of the lack of national and international public policies, which have reduced plantation and production; however, since 1980, attempts have been made to carry out comprehensive projects for the development of agro-industrial complexes that provide alternatives to rural coffee problems from a more comprehensive perspective (Santoyo *et al.*, 1995).

Akaki and Huacuja (2006) identified that producers have been the weakest link in the coffee chain, both because of the lack of public policies and the collapse and volatility of prices, while marketing companies are the hegemonic agents of the chain. Contreras-Medina *et al.* (2019); Díaz (2015) mention that, in order to have greater equity in the distribution of resources in the coffee production chain, innovation processes formulated from inclusive participation networks (especially women and young people) and self-management of actors are required, and despite being complicated processes, especially in certifications and traceability, they have managed to achieve local and regional consolidation.

Guerrero is one of the states with the most problems in the cultivation of coffee, in the last 20 years it decreased its production by almost half, going from 68 000 t and yields of 1.74 t ha<sup>-1</sup> in 2000 to 38 000 t and yields of 0.94 t ha<sup>-1</sup> in 2019 (SIAP, 2019). This reduction in production affects more than 20 000 producers from the state, who are mainly dependent on the cultivation, and who are now beginning to diversify their incomes into tertiary activities including trade.

In addition, in the state there is a lack of support and there is low or no technology for the production of the coffee, as well as the low articulation in coffee-producing areas (Contreras-Medina *et al.*, 2019). In this context, this study assesses the current situation of the coffee production chain in the state of Guerrero, Mexico, through the soft systems methodology (SSM) (Checkland, 1999), in order to recognize the processes and strategies that strengthen the coffee production chain.

### **Soft systems methodology**

SSM is useful for accounting for the observer's inherent cultural prejudices, in a culturally sensitive approach that can provide inclusive techniques (Wheeler *et al.*, 2000). Checkland (1999); Checkland and Poulter (2006) describe SSM as an operation of the infinite circle of experiences for an action, as it presents itself as a better alternative to treating poorly defined problems, with uncertainties and abstractions. It can be applied several times to the same situation until the problem is clarified and this cyclic repetition drives change and adaptation (Cezarino *et al.*, 2016).

The implementation of SSM for the evaluation of the productive chain arises as a response to the restrictions of hard systemic thinking on social system problems, as social support programs have been, which in principle have a strong political context and do not contribute to solving the problem of origin (Díaz, 2015).

Research through SSM incorporates different models to intervene in the real world, allows to choose new solutions from different points of view, choosing consensually one when the conflicts of the problem situation are best resolved, this cyclic repetition drives change and adaptation (Cezarino *et al.*, 2016). Figure 1 shows the description of the stages of the SSM evaluation.



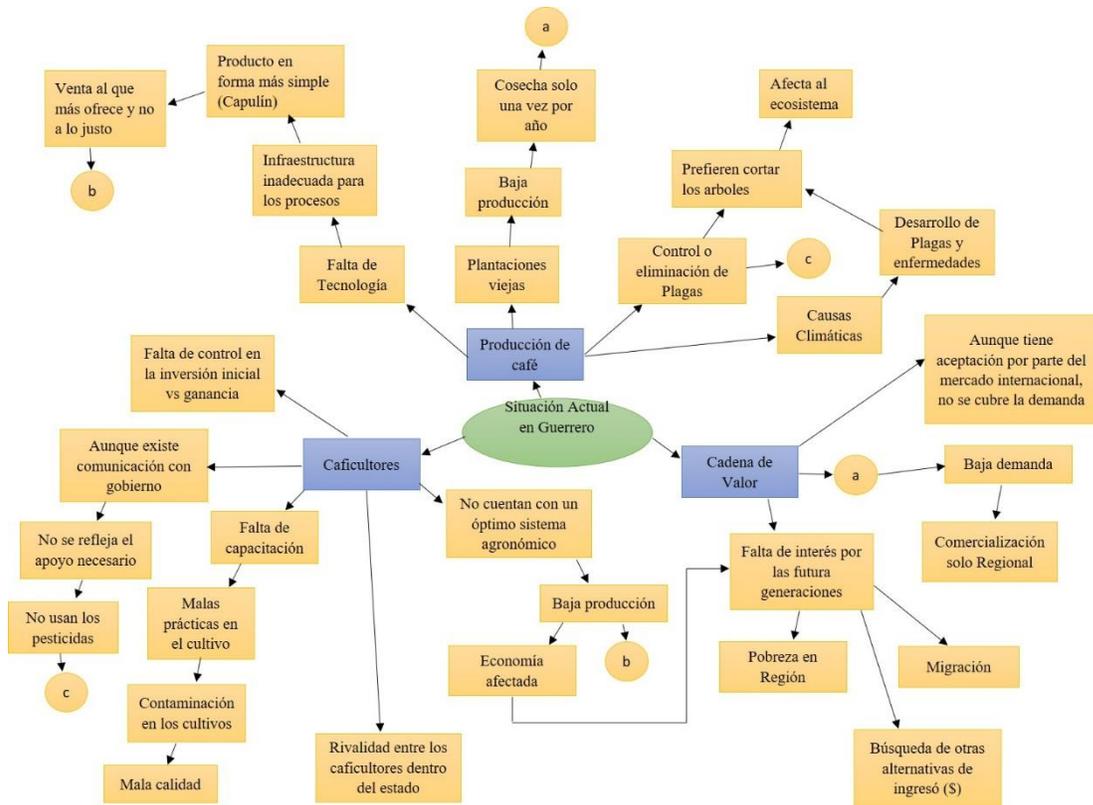
**Figure 1. Stages of the soft systems methodology (SSM) (Checkland and Poulter, 2006).**

In process 1 ‘Unstructured problem situation’, it was identified that the main problem of coffee in the State of Guerrero is the drastic drop in production in 2019, identifying climate variability, international price volatility, control of pests and diseases, increased violence, migration and marginalization as momentous causes; these causes recognize that they have affected the production chain, from input processes, production, transformation, marketing, until reaching the final consumer.

It not only impacts the actors who carry out these activities, but there is also an impact at the national level by the currencies generated by the sale of coffee abroad. To show the expression of the problem situation, a conceptual map was made as shown in Figure 2.

The definition of relevant systems was constructed from the different problem situations, beginning to explore individuals who relate to the activities of the system. The lack of technology, lacking in much of the state, in addition to the null investment by the government or supports granted for that purpose, the process made to coffee is natural or capulín, so it is sold at a very low price ‘at first the kilogram can be close or a little more than \$50.00 pesos, but low to \$20.00 or \$18.00 pesos’ (Flores-López *et al.*, 2018).

This process has led producers to change production activity or replace their coffee trees with more profitable crops, in other cases it activates the migration of the youngest. Old plantations, because coffee plants are about 50 years old or older, only one harvest per year is obtained, it makes it difficult to prune and clean the bushes of the coffee tree, besides, in the state, coffee plantations are surrounded by other plantations such as soursop, bananas and avocados, pests and diseases, coffee is one of the plants that phytosanitary problems can have, rust and coffee berry borer are the most active in the zone, in addition, they mention that climate variability has increased pest problems (Flores-López *et al.*, 2018; Higuera and Rivera, 2018).



**Figure 2. Conceptual map of the problem situation.**

Coffee growers confessed that they do not constantly do pruning, fertilization, cleaning or weeding activities of coffee plantations and even use little of the pesticides provided to them by the State Government, because there is no training on their use. Few or no support for the cultivation of coffee and the existing ones misdirected or with non-compliance with its clauses, example of this is Nestlé’s initiative with its ‘common code for the coffee community’, which coffee growers express that they have taken advantage of regional needs’ (Flores-López *et al.*, 2018).

Disinterest of future generations, many of the producers are seniors (> 60 years old) and young people show no interest because they have seen the problems faced by their parents, friends, acquaintances, etc., they realize that the income is not very profitable and requires great physical effort (Higuera and Rivera, 2018).

For this reason, producers propose to look for economic sources as a lost fund, which consists of government economic support given to entrepreneurs or active entrepreneurs, this money does not generate interest or commission, provided that the objective for which it was used has been fulfilled. There are several programs working with lost funds, for example: the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), the National Institute of Social Economy (INAES), the Ministry of Social Development (SEDESOL), the National Commission for the Development of Indigenous Peoples (CDI), the National Institute of the Entrepreneur (INADEM), the National Commission of Protected Natural Areas, among others. Lost funds can be a good alternative to get the money that is directed to the purchase of the machinery (DOF, 2019).

The use and implementation of integrated pest management (MIP) programs proposes an alternative to reduce the economic damage caused by the presence of pests, seeking a balance with the agroecosystem. This requires trained staff to support coffee growers of the state, achieving a balance between profitability and sustainability. The program provides technical, methodological and pedagogical elements that allow the construction of competencies necessary for effective performance in pest control activities (Barrera *et al.*, 2004).

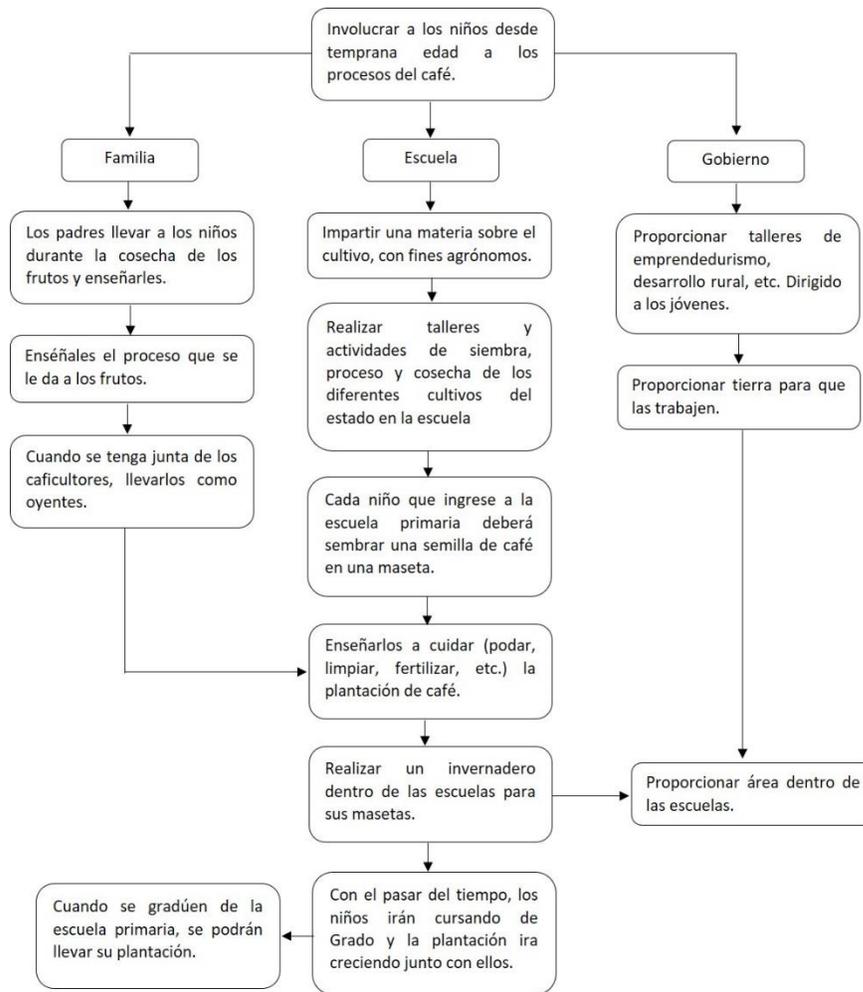
It also encompasses topics such as cultural practices work, ethological, biological and manual controls, genetic resistance, environmental care and chemical application. The training has an economic cost that could be financed by contributions from government agencies and the other by coffee growers. In this sense, there is a gap that must be narrowed, since according to data from Cuevas *et al.* (2012), producer training is given in 70.8% by technicians, 17.7% by producers, 2.8% by academic or research institutions and 1.5% by firms; although technical support coverage is very low, as 3% of the total national production units have this service.

One of the factors that can intervene so that government supports do not reach producers is possibly the lack of resources for this sector or that the resource is not sufficient to meet the needs of the cultivation. An alternative would be to present detailed projects to improve the production chain, especially in the first links (inputs, production, collection), it is collaborative work with a focus on participatory actions, as demonstrated by Mills-Packo *et al.* (1991) in generating and transferring agrotechnology to the first links of the coffee chain and other crops in Hawaii.

On the other hand, consultancy throughout the production chain is fundamental, especially in the first links, because coffee growers in the zone and in the country have a basic level of education, with an average of 5.6 years of education (Rosales-Martínez *et al.*, 2018). For some, education is an impediment to understanding, applying or even generating new business models, growth strategies, technological solutions, etc., for others they can be challenges that, combining traditional knowledge with technology, could add more value to production that makes them more competitive nationally and internationally (Benítez-García *et al.*, 2015).

Finally, the conceptual model generated by producers due to the lack of interest of future generations for the cultivation of coffee (Figura 3). Part of the solutions proposed by the actors are to involve children in the coffee process, supported from the family, education and programs from the authorities of the different levels, that include the award of scholarships, workshops, practical activities, among others, carried out inside and outside the school (Flores-López *et al.*, 2018).

These activities are considered important by the participating actors, since the transmission of traditional knowledge on the phytosanitary care of the crop, the process and times of planting and harvesting, the processes of transformation and even the marketing part to the new generations could generate more consolidated structures in the production of the coffee and strengthen the production chain (Higuera and Rivera, 2018).



**Figure 3. Conceptual model to interest future generations.**

This activity of transmitting knowledge arises from the concern that 70% of producers from the main coffee regions of the country could decide to change crops for more profitable ones (Rosales-Martínez *et al.*, 2018).

### Conclusions

The soft systems methodology (SSM) can provide an overview to understand how the coffee production chain situation in Guerrero is. Through SSM an outline of the problems affecting the weakest link in the chain, which are producers and the production of their coffee, was given, in addition to generating some ideas to address the situation from the base, as well as creating solutions that improve the situation of producers and their families.

There are several people interested in providing solutions to producers of the state; however, it takes time to just understand the problems faced by coffee growers. The results of the methodology provide possible solutions as support to generate a radical change to the situation that is impacting the coffee production chain.

In the evaluation process, it was identified that there are causes that interrelate, for example, old plantations are susceptible to pests and diseases, and not having government support such as training good health practices can lead to problems of yields and economic losses. In addition, if the coffee growers of the state do not have the technology necessary to add value to the process and not make sufficient profit to live from their crops causes future generations not to have the interest in continuing to grow coffee cherry and continue the coffee tradition.

Guerrero is a state with a potential area for coffee production, even more than other states such as Oaxaca, Chiapas and Puebla; however, the fragmentation of coffee lands, soil-ecological and climatic conditions and sociopolitical structure cause the state to have yields below  $2 \text{ t ha}^{-1}$  (Cruz, 2017). The soft systems methodology (SSM) can drive various actions involving participation between actors of the coffee production chain, this joint recognition and the generation of alternatives can be an important basis for the planning of activities that benefit not only the production stage but throughout the aromatic coffee production chain.

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