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Organic coffee growing as a competitive strategy for Mexico in international trade

Yadira Zulith Flores Anaya[1], Deisy Milena Sorzano Rodríguez[2], Rafael Ravina-Ripoll[3], Esthela Galván-Vela[2]

[1]Faculty of Economics and International Relations, Autonomous University of Baja California, Tijuana, México
[2]School of Administration and Business, CETYS University, Tijuana, México
[3]Department of Business Organization, University of Cádiz, Cádiz, Spain
Corresponding authors: zulith.flores@uabc.edu.mx; milena.sorzano@cetys.mx; rafael.ravina@juntadeandalucia.es; esthela.galvan@cetys.mx
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ABSTRACT

Organic coffee growing has positioned itself as a competitive strategic activity in Mexican territory, representing a considerable income alternative for small national producers. However, in recent years despite this context, the country has lost positions, an issue analysed from the use of the method of analysis of *Constant Market Share* (CMS, for its acronym in English), which symbolises a statistical technique that helps to break down the growth of exports, and thus to study their behaviour, which finally allowed to estimate the index to measure the comparative advantages revealed for agricultural products. The results suggest at a general level that there is an increase in the world demand for organic coffee, which has benefited certain countries, together with the concentration of Mexican coffee exports in the markets that have grown most rapidly.

Key words: Organic coffee farming; competitiveness, Mexico.

1 INTRODUCTION

Nowadays, individuals are increasingly aware of their purchasing decisions, questioning where, how, when and by whom the goods and services they consume are produced. The new groups of consumers are responsible, informed, and concerned about improving their health and seeking to contribute to the conservation of the environment, which has led to an increase in the consumption of organic products, primarily in Western societies. Thanks to this increase in organic products and the implementation of agroecology, which aims to attack socioeconomic problems, it seeks to benefit the environment while empowering rural communities through local resources (Boza; 2010; Robles, 2011; Viartasiwi; Trihartono, 2020).

Understandably, coffee growing has not been exempt from this new trend. It has its sustainable organic activity. However, it revolves around diverse processes that, although they only leave visible the final good produced, in general, represent an *iceberg* that hides in the background a series of ecological problems, peasant resistance, struggles for the conservation of biodiversity and a constant search for more efficient coffee growers, among other elements (Moguel; Toledo, 1996; Robles, 2011).

Knowledge in science eludes to an inherent link between competitiveness and economic development, which is why the study of competitiveness in strategic sectors is paramount (Galván; Santos, 2019). In addition, there is evidence that shows that rural areas in Latin America are characterised by an entrenchment of poverty and environmental decline generated by some economic policies implemented in the region (Martínez -Torres, 2008), coupled with the constant state struggles to overcome these challenges as pointed out by Pin-Guerrero and colleagues (2019). Thus, sustainable agriculture represents a potential solution to their problems. Because this agricultural innovation brings a market made up of consumers who are sensitive to the problems of developing countries and are willing to pay a premium for these goods (Caviedes, 2019).

Mexico, in particular, has become a world leader in the production of certified organic coffee (Gumecindo-Alejo et al., 2021). This practice appeared from the hand of a group of small-scale coffee producers, primarily indigenous people from the state of Chiapas, who organised to seek new options in the socioeconomic context in which they found themselves. Despite the crisis that rural Mexico has faced since 1982, organic coffee has managed to position itself in the international context (Martínez-Torres, 2008).

These farmers are pioneers of organic coffee at the international level because they identified an opportunity during the situation suffered by the traditional coffee sector in 1989, when coffee production in the country collapsed as a result of internal and external factors, such as the fall in international prices resulting from the overproduction of coffee generated by Vietnam and Brazil in those years (Escamilla; Ruiz, 2006).

This new movement has led to the gestation of essential changes in the sector, such as a drastic reconfiguration of national and international markets, reorganisation of these small farmers into cooperatives, the birth of both

private and participatory national certifiers, creation and implementation of rural sustainable development policies, among other factors. It is why, during the 1980s-1990s, these producers became the most organised sector of the revitalised peasant movement in Mexico (Martínez-Torres, 2008).

Given these approaches, this document focuses its attention on the study of the organic coffee sector in Mexico, as it represents an essential alternative for income generation for small national producers. Specifically, the research objective was to study the behaviour of organic coffee farming, as well as to estimate the index to measure the comparative advantages revealed for products related to the sector. This research is structured as follows: In the first section, there is a conceptual review of the conventional coffee market in Mexico, to give way to the generalities of organic agriculture, specifically organic coffee. In the third section, the Relative Export Advantage (REA) of conventional and organic Mexican coffee is estimated, adding an analysis of the Constant *Market Share* (CMS). Finally, conclusions and recommendations are presented as a result of the research.

1.1 Mexican organic coffee growing

The dynamism of the organic food market has encouraged the conversion of conventional agriculture to organic agriculture. These products are monopolising the structure of the food market in the international environment so that the consumption pattern of individuals has been changing gradually, and more and more consumers are concerned about taking care of their health and protecting the environment; for this reason, they are demanding more organic products free of toxic residues, genetic modifications, among other harmful aspects for the individual and promoters of environmental degradation (Gómez; Gomez, 2004). Consequently, "the market analysis of organic food products at the international level from 1990 to 2012 shows that there has been a positive growth in the development of new lands dedicated to organic agriculture" (Flores, 2017).

In 2012, the world's organic land consisted of 37.5 million hectares, 26.5 million hectares more than in 2009. The number of producers amounted to 1.9 million, of which 600,000 were located in India and 169,707 in Mexico. A third of this agricultural land and more than 80 per cent of producers are in developed countries and emerging markets, which enhances the importance of this sector for Latin American countries. World *per capita* consumption stood at US$9.08 that year. The most critical permanent crops are coffee, followed by olives, nuts, grapes and cocoa (FiBL; IFOAM, 2014).

Organic coffee production was adopted mainly in those countries where producers lacked sufficient resources to buy agricultural inputs, such as fertilisers or pesticides. Subsequently, it has been applied in countries where small producers have cooperatives, like Mexico, Brazil and Colombia. In the beginning, large-scale intensive producers such as Brazil did not look at this type of production until they realised the high prices of organic coffee (*premium* price). More and more large producers were converting to this crop type (FiBL et al., 2021).

In addition, there are studies in Peru that surety to apply an integration model in coffee cooperatives is an alternative to evite the hight cost for intermediate and to optimize supply chain operations, give the increased volumes of organic coffee (Ramos et al., 2019). The coffee organic sector in Mexico have advantage in this point, because it has optimal distribution chain that can traduce in economic and social profits for the farmers (Mendoza; Gordon, 2019).

The role that Mexico has played in this new form of production is of utmost importance since, in 2012, it ranked third in the world in terms of several organic producers; it was also considered the sixth country on the list of The Development Assistance Committee (DAC) with the most significant area devoted to this type of production (FiBL; IFOAM, 2014) and the largest producer of organic coffee (FiBL et al., 2021). These issues can be evidenced in Table 1, where it is identified that Mexico is the leading exporter of organic coffee in the world, followed by Peru and Guatemala, as reported by the Fair Trade Labelling Organization (FLO).

Table 1: FLO- 5 Main exporters registered in fair trade of organic coffee, in tonnes. 2001.

Exporting country	FLO registered for organic fair trade
Mexico	7.380
Peru	2.430
Guatemala	2.115
Bolivia	780
El Salvador	515
Colombia	445

Source: (FiBL; IFOAM, 2014) and support. Organic coffee, cocoa and tea.

Similarly, it is shown that Peru is the main competition for Mexico in terms of organic coffee cultivation. As a leading coffee producer, Mexico has 16,000 certified producers in Chiapas; this product is in great demand in Germany, the USA, China and Japan (Lobatón, 2014).

1.2 Organic agriculture in Mexico

To define organic agriculture, we must remember the two existing approaches: organic or biological agriculture is based on the ideology of Western societies, which seeks to improve health and the environment. While the second approach, called

agroecology, arises to attack the socioeconomic problems of a given region. The first approach, according to Lampkin, seeks respect for the environment and therefore conceives organic production as a system that seeks to avoid the direct or routine use of chemicals, whether or not of natural origin or imitation of natural ones.

Agroecology is a multidimensional concept, which the International Federation of Organic Agriculture Movements (IFOAM) defines as a combination of tradition, innovation and science in order to benefit not only the environment but also to achieve fairer relations, which are transformed into an improvement in the quality of life of those who practice it (Boza, 2010). In summary, organic production focuses on biodiversity conservation, the soil's biological activity, and regional development. This production system is based on health, environment, justice and precaution (Comisión Nacional de Áreas Naturales Protegidas - CONANP, 2009).

The organic movement began in Europe in the 1950s. However, it was not until the 1980s that developed countries began to demand more agricultural goods. It was promoted by non-governmental organisations and religious groups such as liberation theology in Mexico. In 1967 the Finca Irlanda in the Soconusco region of Chiapas transitioned from conventional coffee production to organic production; later, the Union of Indigenous Communities of the Isthmus Region (UCIRI) in Oaxaca and the Indigenous Organization of the Sierra Madre de Motozintla (ISMAM) would follow suit. In 1984, organic bananas began to be produced in Jalisco by MEXIFRUT. In the 1990s, it was honey, hibiscus, vanilla, avocado and sesame (CONANP, 2009).

As such, Mexico has become a producer-exporter of organic food. These products are exported mainly to the U.S.A., Germany, Holland, Japan, England, and Switzerland. More than 45 organic products are grown, including coffee, corn, sesame, honey, milk, sweets and cosmetics. This agricultural production process facilitates conversion; that is, the diffusion of new technology: use of indigenous knowledge, combined with cosmovision (protection of mother earth) and training of peasant promoters (Gómez; Gómez, 2004; Gómez, 2017).

Organic agriculture has been gaining relevance in the agroindustrial sector in Mexico; if we look at Table 2, we can identify that the area per hectare in organic production had increased at an average annual growth rate of 33 per cent when in 2005 it represented 18.93% of the participation in the total conventional area. In addition, it has gone from 13,176 producers in 1996 to 83,174 for 2004-2005. It is also pertinent to mention that it has become a pole of attraction of foreign currency because it is a good that receives a *premium* price and is acquired by consumers with excellent purchasing power, such as the Americans and Europeans.

Along with this, Table 3 condenses information on conventional and organic agricultural production, which helps to formulate comparisons between both practices, thus detailing that during the period 2013, organic agriculture represented 0.27% of the total value of agricultural production, i.e. 1,056,848 thousand pesos against 395,508,061 generated by agriculture as a whole. The harvested area of organic products only represents 0.11% of the total harvested agricultural area. Of the 45 organic products produced in the country, organic coffee represented 82% of the harvested area in 2008. In 2013, it represented 92% of this area. It is an element that highlights its importance in the organic products sector.

Coffee is a perennial agricultural product in Mexico, which, although it does not generate the most significant amount of planting, as shown in Table 3, does generate the most significant volume of harvest; in addition, it is the second of the top five national goods causing the highest annual production value. In 2013, avocado provided 11% of the perennial production value, while coffee and sour lemon generated 4%. For the same year, coffee accounted for 3% of the harvested area of total agricultural products, while organic coffee generated 0.11%.

In addition to the review of national production indicators, it is essential to include that Chiapas is the leading organic food-producing state. In 2013, it harvested 43% of the total organic agricultural production. However, it only obtained 193,730 thousand pesos in production value against the 585,065 that Baja California received. This state has 86,684.36 hectares of organic surface, of which 91.15%, 78,738.73 ha. are destined for coffee. This aspect places it first in the national importance of organic coffee production (INEGI, 2014).

Table 2: Economic importance of organic agriculture, livestock and beekeeping, 1996-2004/2005. Mexico.

	1996	1998	2000	2004/2005	TCMA (%)
Surface area (ha)	23.265	54.457	10.802	307.692	33
Number of producers	13.176	27.914	33.587	83.174	23
Employment (thousands of daily wages)	3.722	8.713	16.448	40.747	31
Currency generated (US$1,000)	34.293	72.000	139.404	270.503	26

Source: Gómez et al. (2005).

Table 3: Indicators of total agricultural production, total perennials, main perennial products, total organic agriculture and organic coffee. Mexico: 2008-2013.

Year	Production	Total agricultural products	Perennials	Cherry coffee	Organic Coffee	Orange	Avocado	Handle	Sour lemon	Organic farming
2008	Sown	2.902.573	6.180.550	796.823		344.687	122.349	1.182,971	153.139	11.268
	Harvested	20.502.834	5.761.968	**766.984**	11.738	338.337	112.479	172.285	148.292	14.300
	Value (Thousands of pesos)	305.950.646	116.095.728	5.542.665		4.080.216	**12.459.371**	3.782.016	4.830.301	489.299
2009	Sown	21.832.754	6.196.825	791.917		339.424	129.354	183.893	146.274	13.217
	Harvested	18.688.835	5.803.435	**765.697**	14.564	333.555	121.491	170.027	140.368	15.986
	Value (Thousands of pesos)	294.661.931	119.984.860	5.346.596		4.160.716	**15.073.316**	3.991.826	4.919.557	470.878
2010	Sown	21.952.745	6.099.690	781.016		339.389	134.322	183.108	153.443	17.151
	Harvested	20.167.773	5.687.837	**741.411**	15.341	334.573	123.404	174.970	143.869	16.972
	Value (Thousands of pesos)	331.789.019	135.875.618	5.727.519		4.876.988	**14.165.758**	4.347.698	5.437.093	452.733
2011	Sown	22.136.742	6.425.414	760.974		335.472	142.146	184.768	166.580	17.236
	Harvested	18.093.807	5.850.049	**688.208**	20.248	330.175	126.598	175.674	149.608	21.921
	Value (Thousands of pesos)	354.656.859	152.184.650	6.815.879		5.903.848	**18.136.404**	4.059.595	6.305.659	614.135
2012	Sown	21.901.600	6.356.136	748.285		333.074	151.023	186,820	166,516	26.385
	Harvested	20.511.051	5.870.997	**695.350**	22.014	323.357	130,308	174,716	149,194	26.352
	Value (Thousands of pesos)	410.160.254	162.581.801	8,647,580		6.024.122	**16,608,147**	4,109,936	4,909,084	1.086.871
2013	Sown	22.113.663	6.501.601	737.578		334.659	168,114	186,964	169,522	24.454
	Harvested	20.710.982	6.071.609	**700.117**	22.048	320.655	144.244	178.263	150.215	23.906
	Value (Thousands of pesos)	395.508.061	164.586.097	6.060.314		5.512.259	**18.060.177**	4.621.577	6.510.202	1.056.848

Source: Own elaboration with information from El sector alimentario en *México*. (INEGI, 2014).

1.3 Mexican organic coffee

In Mexico, organic coffee generally belongs to the *Coffea Arabica L.* species. It is cultivated under shade, where the traditional polyculture system predominates, integrated by diverse native and secondary vegetation trees, fruit trees, and leguminous trees that belong to the genus *Inga*. This type of product provides benefits such as biodiversity protection and conservation, carbon sequestration, water capture and food generation. Most of the small coffee producers are smallholders, which means that they have plots of less than 2 hectares, so it is essential to take advantage of the coffee plantation to obtain food that can contribute to the precarious nutrition of families (Sosa; Escamilla; Díaz, 1999). A study about organic coffee production "suggests that low external input and sustainable agriculture can contribute to the alleviation of nutritional problems, disease and health related (…) [because, the] organic coffee is produced in much more geographically-isolated areas and producers are much more dependent on home-produced foods such as vegetables and back-yard chickens, which arguably provide a more nutritious and healthy diet" (Rios; Sánchez; Hellin, 2007).

Thus, sustainable production is both a solution to the problems local environmental issues derived from the traditional production system as, pollution, erosion, and soil degradation; as a strategy of food security to the social problem that faces the population that lives in conditions of extreme poverty at rural areas. Because, "[at] a local [conventional] system where production and consumption occur in the same place (...) [though], the food pattern seems resilient in economic and environmental terms, given the low cost for consumers due to the self-sufficiency (…). Malnutrition is common in this consumption system; therefore, [it] is not resilient due to health issues" (Ibarrola; Galicia, 2017).

Organic coffee production is based on the following principles: it must satisfy fundamental human needs, be ecologically sound, economically viable and profitable in the long term, and socially just and humane. The coffee

production technology is based on agro-ecological criteria and techniques, such as conservation and promotion of the biodiversity associated with the coffee plantation, population density of 1,200 coffee trees per hectare, application of fertiliser to the coffee trees, biological control of the coffee berry borer, social aspects in the relationship with the workers on the farm, and generating an average production of 16 Qq/ha. (Ibarrola; Galicia, 2017).

The first experience with organic production in Mexico was developed by W. Peter Grether in the sixties at the Finca Irlanda in Chiapas, an obligatory reference in the field of coffee. For its part, UCIRI was the first productive organisation in the country, representing 2,500 small producers from 55 communities located in rugged and challenging to access areas in Chiapas, who began exporting from the 1986-1987 cycle, supported by GEPA (*Gesellschaft Zur Förderung der Partnerschaft mit der Dritten Welt mbH)* in Germany . (Ibarrola; Galicia, 2017).

Since 1989, the production of organic coffee began its ascent, when conventional coffee presented a fall due to what was mentioned in the previous section, among other aspects due to the dismantling of Inmecafé. When the communities induced to produce coffee were exposed to the free market, the winners were the large oligopolistic consortiums of coffee commercialisation and roasting. Specifically: Ecom, Volckafé, Mercon Coffee and Kaffee Group. However, these began to lose market share when quality coffee appeared (Tardin et al., 2021). Specialised chains such as Starbucks promoted the taste for quality coffee, generating a more segmented market in which consumers incorporated environmental and ethnic traits into their consumption patterns. The quality economy is distinguished by retail prices where greater symbolic and material value is acquired. It is a strategy in which the differentiated product and varied taste can capture *premium* prices and increase the income of those who produce it (Rodríguez, 2014).

An aspect closely linked to organic coffee is certification since it has allowed national producers to access the international market. This activity was carried out for the first time in 1962 by an inspector belonging to the German certifier Demeter who inspected Soconusco. In the beginning, it was explained that conventional coffee presented a fall in prices from 1989; this drop represented a rise in organic coffee production as a result was generated by the incorporation of the US agency OCIA (*The Organic Crop Improvement Association*). In the early nineties, a University Committee for the Certification of Organic Products (CUCEPRO) of the University of Colima was established. It has led to the birth of an exciting innovation, participatory certification, which has reduced inspection costs, made new producers interested in participating in this sector, trained Mexican personnel with expertise in these inspection and certification processes, and held periodic events with technicians and promoters (Rodríguez, 2014).

Establishments like Starbucks have been forced to incorporate fair trade, indigenous and organic coffee into their range of choices. However, there is a latent concern that the relationship between small, poor producers and socially responsible consumers will be reduced. This relationship is at the service of the tastes and interests of the marketing companies. In the face of the growing fashion for "organic", standards are losing their identity, transforming into a confusing shower of brands and labels, where almost everything is sustainable or socially responsible, which can lead, for example, to the erosion of fair trade certification (Rodríguez, 2014).

Another warning sign is the following question: up to what level can the *premium* price be sustained if more and more producers are added? The answer may lie in the route of certification and the location of these niches or that producers begin to use "their cultural traits" as a letter of introduction for their product. Another strategy could be vertical integration in which producers relate directly to the final retailers of their processed coffee (Rodríguez, 2014).

In quantitative terms, in 2004-2005, organic cherry coffee generated a yield (ton/ha) of 2.80 versus 1.28 for conventional coffee, with a differential of 1.5 (Gómez et al., 2005). Chiapas is the official representative of Mexico, accompanied by Oaxaca and Guerrero. Figure 1 illustrates this state's degree of participation in organic coffee production at the national level. It represents 54% (78,738.73 ha.) of the national organic coffee surface, constituting 147,136.74 ha during this period.

For this period, Chiapas had 36,141 producers who had an average of 2.39 hectares and 14,485 are located in the range by several producers from 101 to 300 (Figure 2). Certimex reported that 942 communities in 72 municipalities in this entity were dedicated to organic coffee (Escamilla; Ruiz, 2006). On the other hand, 60% of the producers are indigenous; the groups represented are Cachiquel, Chatino, Chol, Mam, Mocho, Tojolobal, Tzeltal and Tzotzil (Gómez et al., 2005).

These statistics confirm what was previously described: organic coffee producers in Mexico are primarily indigenous and small producers, who, according to the socioeconomic conditions in which they coexist, can be recognised as a vulnerable population group that has found in sustainable coffee a viable possibility to generate income.

On another topic, the main pests to which organic coffee is exposed are rooster's eye in 31%, rust and a pink spot in 13% and leaf spot, leafhopper and root rot in 6% (Escamilla; Ruiz, 2006). This topic will not be discussed in-depth, but we only wish to recognise that this type of production is not exempt from diseases. Therefore, the designation of organic is not a guarantee of safety.

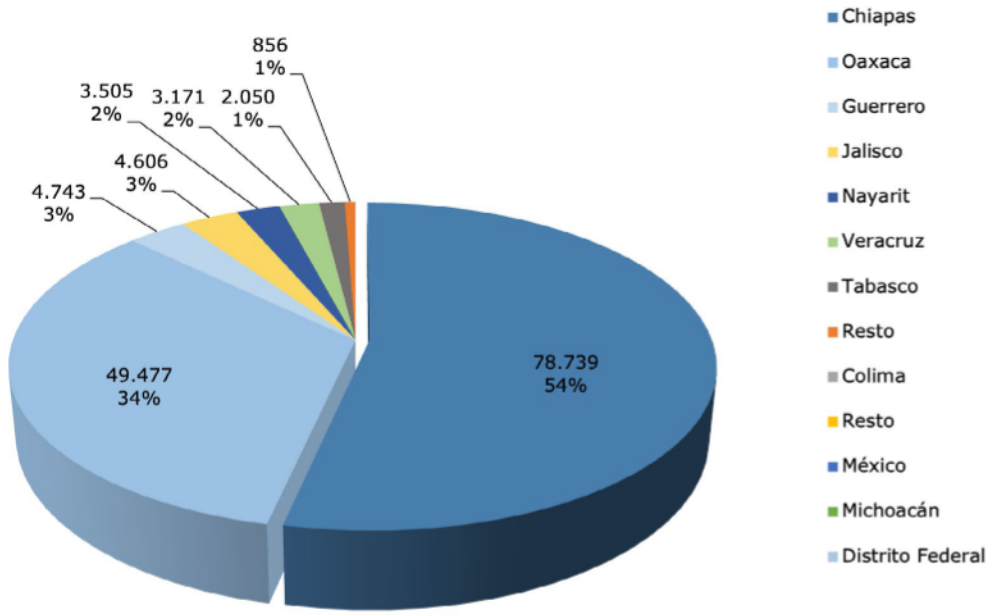

Figure 1: Organic coffee agricultural area by state. México. 2004-2005.

Source: Own elaboration with information from (Gómez et al., 2005). "Organic agriculture, beekeeping and livestock farming in Mexico-2005".

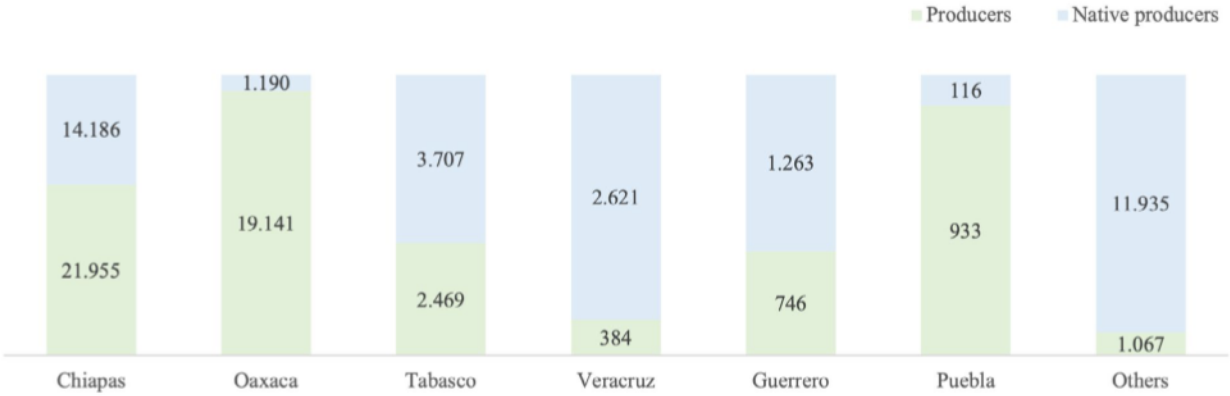

Figure 2: Shows that Chiapas has the third-highest number of indigenous organic producers. Before it is Oaxaca with 94%, followed by Puebla with 89%. 58% of the producers belong to an indigenous ethnic group at the national level.

Source: Own elaboration with information from Gómez *et al*. "Organic agriculture, beekeeping and livestock farming in Mexico-2005".

1.4 Certification as a competitive advantage factor

For organic coffee to reach the international market, it must comply with a series of international standards, among the official ones are the European Union regulation No. 1788/2000, the regulation for organic production in the USA from the National organic program, Japan's regulation 1608 (2008), Canada's organic product regulation (CAN/CGSB) and Argentina's regulation for organic products, among others, all depending on the target market (CONANP, 2009).

The organic coffee producer is also confronted with voluntary standards, including IFOAM, Naturland of Germany, Biosuisse of Switzerland, Soil Association of England and ECOCERT of France. For this reason, as mentioned in section five, certification is widely linked to organic coffee. Certification has allowed small producers to enter the international market because it is a sign that guarantees the quality of the product. The certifications have opened the doors to organic coffee because they comply with international requirements. In addition, it forces farmers to be more competitive if they want to pass the evaluations made by the certifiers.

In Mexico, the certification bodies approved to certify organic products are: Certificadora Mexicana de Productos y Procesos Ecológicos (CERTIMEX), Mayacert, Metrocert, Instituto para el mercado ecológico and Agricert México (Servicio Nacional de Sanidad, Inocuidad y Calidad Agroalimentaria - SENASICA, 2015). International certifiers

include Naturald and OCIA international, among many others. Unfortunately, this certification takes 2 to 3 years to obtain and is very costly for the small producer.

This problem gave rise to participatory certification, allowing producers who do not enter the international market to sell their products directly to local consumers (this certification is only valid at the national level). In addition, the need for organic producers has given rise to new social innovations such as fair trade certification and the network of organic markets and markets.

1.5 Export Relative Advantage Analysis

This section develops the methodology of Relative Export Advantage (REA) to understand the dynamics of organic coffee. In the absence of data regarding the international trade of this sound, so it was decided to choose to build three relative advantage analyses: the first is related to the performance of conventional green coffee in comparison with agriculture as a whole, the second alludes to the same conventional coffee but contrasting it with the performance of the horticultural sector; this to understand how the traditional production of Mexican coffee has behaved in the world, in order to understand the general context that has given rise to sustainable coffee production. Therefore, the third index allows us to observe the development of organic green coffee once the performance of conventional coffee is known.

2 MATERIAL AND METHODS

2.1 Relative Advantage Analysis

Vollrath, in 1991 proposed an index to measure the revealed comparative advantages for agricultural products; this index is called VRE and is described the methodology as follows (1):

$$VRE_{ai} = (x_{ai}/x_{ni})/(x_{ar}/x_{nr}) \quad (1)$$

Where:

VRE_{ai} = The relative export advantage of good and in-country i

x_{ai} = Value of exports of good and in-country i

x_{ni} = Value of total exports (excluding good an in-country i)

x_{ar} = value of exports of commodity a in the world (minus country i)

x_{nr} = Value of total exports (minus commodity a) in the world (minus country i).

A VRE lower than one represents a relative advantage; lower than one means disadvantage. The higher the index, the higher the degree of specialisation and, therefore, competitiveness; and vice versa (Galván; Santos, 2019; Contreras-Castillo, 1999).

2.2 Data

Conventional coffee exports are expressed in thousands of dollars, obtained from *The Global Agricultural Trade System* from the United Nations database. Exports of organic coffee are also in thousands of dollars. However, the source is *FAS US Trade,* specifically the *organics special* section, whose data comes from *US Census Bureau Trade Data.* This information is contained in (Foreign Agricultural Service - FAS, 2015).

3 RESULTS

Figure 3 shows that Mexico has a relative export disadvantage, going from 0.86 in 1990 to 0.11 in 2013. In 2010, it presented the lowest degree of specialisation, -0.05. The figure in general, aware that conventional coffee has lost weight in the international market, has a decreasing trend in relative advantage.

Figure 4 shows even more worrying behaviour, where the index of relative export advantage of conventional coffee concerning the world horticultural sector is negative. From 2011 onwards, the scenario became even more unfavourable. Even though it remained on a downward trend, it remained at positive values.

The relative advantage index went from 0.33 in 1990 to -0.33 in 2013; this may be due to the oversupply of coffee in the international market in 2000 by Vietnam and overproduction by Brazil.

Figure 5 was generated with the available information related to organic coffee; in this case, it is not compared against world performance but against what has been exported to the US by these six leading exporters of organic coffee. In the absence of data on each country's exports to this destination, it was chosen to take US imports as the original exports.

The interpretation of Figure 5 is that Mexico has lost the relative advantage concerning these exporting countries; its degree of specialisation is low for 2014, -0.02. For its part, Indonesia remains the leader in exporting organic coffee to the US; its index is positioned at 1.70, which denotes a high degree of competitiveness (specialisation). Peru has lost competitiveness in recent years, but Vietnam and Colombia have gained it.

In summary, conventional Mexican coffee has seen its relative export advantage decrease globally from 1990 to 2013. Conventional coffee in the US market for 2010-2014 presents a lower relative advantage to the rest of the competitive countries in exports.

3.1 Constant Market Share Analysis

The *Constant Market Share* (CMS) analysis method represents a statistical technique that helps to decompose exports' growth to study their behaviour. With this tool, it is possible to evaluate the degree to which structural and competitiveness factors can explain the performance of a good over given periods (Contreras-Castillo, 1999).

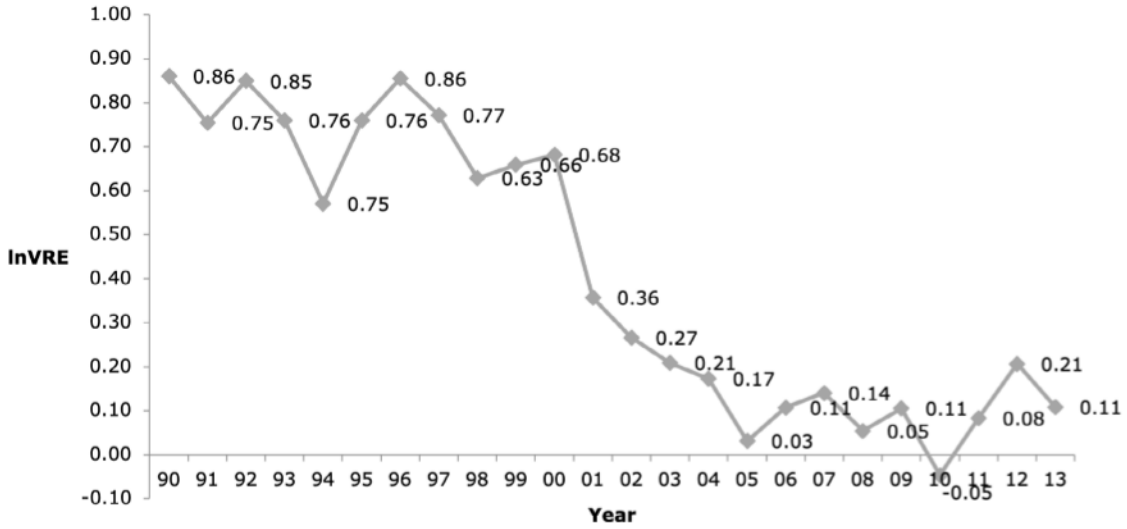

Figure 3: Relative advantage of conventional, non-roasted, non-decaffeinated coffee. Relative to the agricultural sector as a whole.
México, 1990-2013

Source: Prepared by the authors with information from Global Agricultural Trade System, United Nations Data, Foreign Agricultural Service. United Nations Commodity Trade Statistics, United Nations Statistics Division.

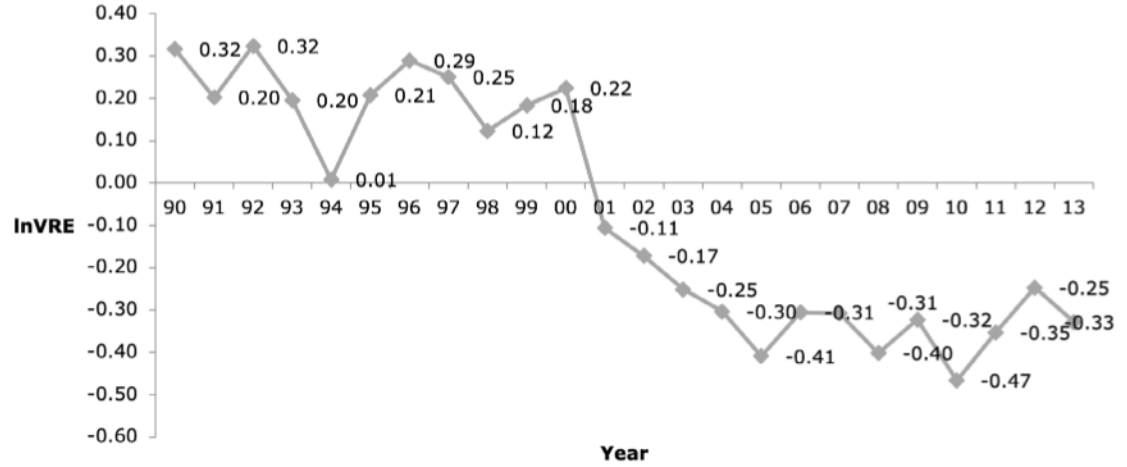

Figure 4: Relative advantage of unroasted, non-decaffeinated coffee. In relation to the horticultural sector**.** México, 1990-2013

Source: Prepared by the authors with information from Global Agricultural Trade System, United Nations Data, Foreign Agricultural Service. United Nations Commodity Trade Statistics, United Nations Statistics Division.

Market share can be defined as (2), this gives rise to the CMS methodology:

$$s = \frac{q}{Q} (2) \quad (2)$$

Where:
s = Market share of a specific country
q = Exports from the country to the relevant market
y, Q = Exports of the standard
By considering that . It is obtained by differentiating concerning the time that (3):

$$\Delta q = S\Delta Q + Q\Delta S \quad (3)$$

In which,
Δ = Indicates the change of the variable over time.
$S\Delta Q$ = Structural effect
$Q\Delta S$ = Residual effect

The above equation is only valid for infinitely short periods, so the decomposition applies only for discrete intervals. Therefore, the equation is written in different ways using the variables at the beginning and end of the period. As in (3a-3c):

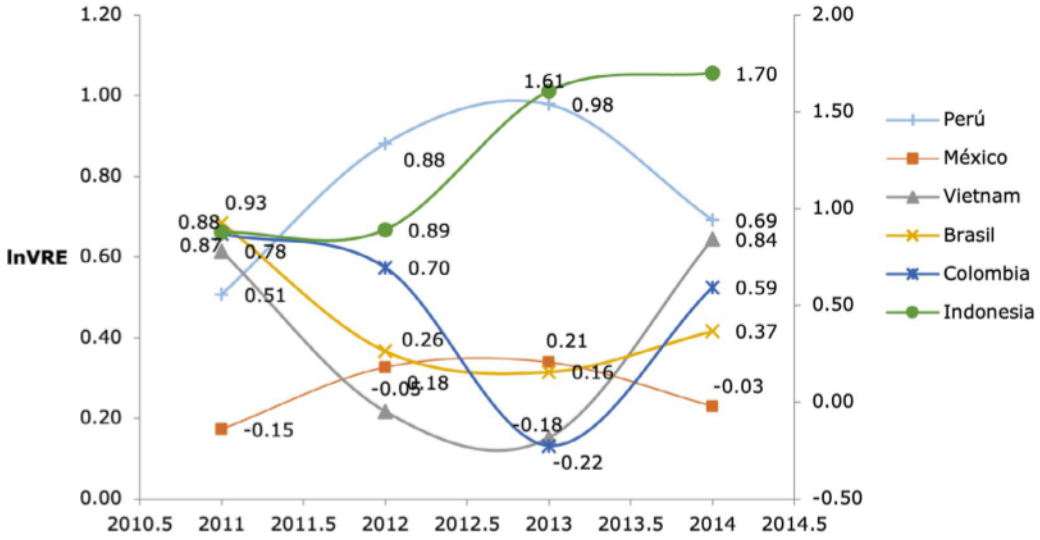

Figure 5: Relative advantage of organic Arabica coffee, unroasted, not decaffeinated. 6 main exporters to the E.U.A., 2011-2014.
Source: Global Agricultural Trade System, FAS US Trade, Organics selected. U.S. Census Bureau Trade Data. Available at < http://apps.fas.usda.gov/gats/default.aspx >.

$$\Delta q = S_0 \Delta Q + \Delta S Q_1 \quad (3a)$$

$$\Delta q = S_1 \Delta Q + \Delta S Q_0 \quad (3b)$$

$$\Delta q = S_0 \Delta Q + \Delta S Q_0 + \Delta S \Delta Q \quad (3c)$$

In these equations, the subscript 0 represents the beginning of the period and 1, the end; also, The model (3c) is a third competent, also known as the second-order effect (dynamic component). By disaggregating the number of exports into flows of various goods to various markets, incorporating 3c (4):

$$\Delta q = \Sigma\Sigma S_{ij0} \Delta Q_{ij} + \Sigma\Sigma Sij\, \Delta Qij_0 + \Sigma\Sigma \Delta S_{ij} \Delta Q_{ij} \quad (4)$$

Model (4) expresses that exports the standard of merchandise I to market j. The first section of the equation indicates the structural effect; the second is the residual effect, and the last is the second-order effect. Jepma in 1989 extended the previous model, considering in his case 8 effects: growth effect, the goods market, structural interaction, pure residual, static structural residual, pure second-order effect and dynamic structural residual (Contreras-Castillo, 1999).

This improved version of Jepman was adapted to the case of one product and one market by another author, Ahmadi-Esfahani. Their approach leads to the final Equations (5) and (6). For each year of the period, the value of exports of the specific country is compared to the standard group.

$$\Delta q = S_{j0} \Delta Q_j + \Delta S_j Q_{j0} + \Delta S_j \Delta Q_j \quad (5)$$

Residual structural effect second-order effect

Y,

$$\Delta q = S_{T0} \Delta Q_j + (S_{j0} \Delta Q_j - S_{T0} \Delta Q_j) + \Delta S_T Q_{j0} + (\Delta S_j Q_{j0} - \Delta S_T Q_{j0}) + \left(\frac{Q_{T1}}{Q_{T0}} - 1 \right) \Delta S_j Q_{j0}$$

Growth effect pure residual market effect pure residual structural static second-order residual pure market effect

$$+ \left[\Delta S_j \Delta Q_j - \left(\frac{Q_{T1}}{Q_{T0}} - 1 \right) \Delta S_j Q_{j0} \right] \quad (6)$$

Dynamic structural residual

Where in the first level of decomposition (5), we have that:
$S_{j0} \Delta Q_j$ = Structural effect, representing the expected change in exports if the country's initial participation in the world and specific markets is constant.
$\Delta S_j\ Q_{j0}$ = Competitiveness effect or residual indicates the part of the change in exports attributed to the changes in competitiveness over the period.
$\Delta S_j \Delta Q_j$ = interaction or second-order effect, it is in charge of estimating the influence of the interaction between changes in market share with changes in demand.

The second level of decomposition (6) denotes the following:
$S_{T0} \Delta Q_j$ = The growth effect measures the part of a country's export growth that can be attributed to the increase in world demand for that good.
$(S_{j0} \Delta Q_j - S_{T0} \Delta Q_j)$ = Market effect measures the expected additional change in exports if the exporter maintains its initial share in the specific market during the period analysed.

$\Delta S_T\, Q_{j0}$ = Pure residual effect denotes the proportion of the hypothesised change in exports attributable to changes in overall competitiveness.

$(\Delta S_j\, Q_{j0} - \Delta S_T\, Q_{j0})$ = Static structural residual effect refers to the part of the hypothetical change in exports attributable to changes in competitiveness in the specific market.

$\left(\frac{Q_{T1}}{Q_{T0}} - 1\right)\Delta S_j Q_{j0}$ = Pure second-order effect calculates the interaction between changes in an exporter's share of the specific market and changes in the level of world demand.

$\left[\Delta S_j \Delta Q_j - \left(\frac{Q_{T1}}{Q_{T0}} - 1\right)\Delta S_j Q_{j0}\right]$ = Dynamic structural residual effect assesses the interaction between changes in an exporter's share of the specific market and the level of demand in the specific market country.

3.2 Data

In this case, the specific group in the USA, and the standard group, is composed of Brazil, Colombia, Indonesia, Mexico, Peru, and Vietnam. They were the countries that exported the most coffee to this destination market. Exports are valued in unconverted FAS (cumulative amounts to date). This information is contained in Foreign Agricultural Service (2015).

3 RESULTS

In this case, the CMS methodology was developed for conventional and organic coffee. Table 4 shows that Mexico has lost competitiveness in terms of the former for 1991-2013 but gained it in organic coffee from 2011 to 2014, as indicated in Table 5.

Table 4 shows that exports of conventional coffee from Brazil, Colombia, Peru, Indonesia and Vietnam to the USA increased from 1991-2013. However, Mexico decreased the volume of exports to this destination country. The growth of US demand for coffee increased the exports of the six countries considered in the analysis; firstly, Brazil and, successively, those Mexico.

The competitiveness of Mexican and Brazilian coffee exports fell during this period, as shown in Table 4, presenting a negative sign, while Vietnam presented an increase in its level of competitiveness. The interaction in the changes between market share and demand has been detrimental to Mexican and Brazilian exports; Peruvian coffee has benefited the most from the changes in North American demand.

In the second level section of the decomposition of the change in exports, the growth effect indicates that the increase in world demand for conventional coffee has benefited all the countries considered in the study during these 22 years. The value of zero for Vietnam does not mean that it has been indifferent to the increase in world demand, but rather that this country began exporting coffee to the USA only in 2000.

The market effect is positive; this is understood as a concentration of Mexican coffee exports in the markets that have grown most rapidly. On the other hand, the pure residual effect indicates that Brazil, Colombia, Indonesia and Mexico lost competitiveness in the international market; Peru and Vietnam being the winners in competitiveness, especially the latter. The static structural residual effect is interpreted as a loss of competitiveness by Mexico and Vietnam in the USA.

Table 4: CMS non-roasted, non-decaffeinated conventional Mexican coffee in the USA 1991-2013.

Effects	Expression	Brazil	Colombia	Indonesia	Mexico	Peru	Vietnam
Change in exports	Δq	46.850.50	47.860.80	44.390.40	-90.597.00	51.813.50	133.429.60
		The first level of export change decomposition					
Structural effect	Sj0 ΔQj	48.150.44	27.797.85	2.733.45	47.646.08	0.00	0.00
Competitiveness effect	ΔSj Qj0	-1.113.59	17.497.37	37.005.72	-106.330.99	46.434.46	128.705.28
Second order effect	ΔSj ΔQj	-186.35	2.565.58	4.651.22	-3.912.09	5.379.04	4.724.32
		The second level of decomposition of the export change					
Growth effect	St0 ΔQj	84.602.03	45.986.85	19.839.98	20.859.22	0.00	0.00
Market effect	(Sj0 ΔQj - St0 ΔQj)	-36.451.59	-18.189.00	-17.106.53	26.786.87	0.00	0.00
Pure residual effect	ΔSt Qj0	-273.144.50	-244.440.93	-76.490.08	-56.232.41	35.491.73	218.141.90
The static structural residual effect	(ΔSj Qj0 - ΔSt Qj0)	272.030.91	261.938.30	113.495.80	-50.098.58	10.942.73	-89.436.63
Pure second-order effect	(Qt1 / Qt0 - 1)ΔSj Qj0	-2.647.19	41.062.39	67.488.35	-192.057.06	72.016.86	151.620.21
Dynamic structural residual effect	ΔSj ΔQj - (Qt1 / Qt0 - 1) ΔSj Qj0	2.460.84	-38.496.81	-62.837.12	160.144.97	-66.637.82	-146.895.89

Source: Own elaboration with USDA-United Nations Commodity Trade Statistics, United Nations Statistics Division.

Table 5: CMS organic, unroasted, non-decaffeinated Arabica coffee in the USA 2011-2014.

Effects	Expression	Brazil	Colombia	Indonesia	Mexico	Peru	**Vietnam**
Change in exports	Δq	-4.201.20	-4.852.40	1.819.00	-178.50	-22.50	1.008.20
The first level of export change decomposition							
Structural effect	Sj0 ΔQj	-1.754.70	-1.203.14	-1.170.12	-1.024.52	-2.019.69	-235.32
Competitiveness effect	ΔSj Qj0	-2.811.99	-4.114.04	3.768.57	1.027.39	2.474.24	1.520.47
Second-order effect	ΔSj ΔQj	365.50	464.77	-779.45	-181.36	-477.05	-276.95

Source: Own elaboration with data from USDA- FAS US Trade, organics selected. U.S. Census Bureau Trade Data.

The indicators of the pure second-order effect indicate that Mexico and Brazil have not been able to expand their share of the US market while world demand has increased. The growth results, market and second-order effect could be interpreted as a change in Mexico's export priorities, where it has preferred to prioritise other markets, possibly Europe. The residual structural dynamic effect means that Mexico and Brazil are gaining positioning in the US market.

The findings of the CMS estimate for organic coffee are shown in Table 5. Vietnam and Indonesia have absorbed the increase in exports from 2011-2014. While Brazil, Colombia, Mexico and Peru have reduced their exports to the USA.

US demand for organic coffee increased exports from all the countries considered in the study. Indonesia has increased its competitiveness the most in the US market, followed by Peru, Vietnam and Mexico. However, Brazil and Colombia have reduced their competitiveness.

The second-order effect defines that the combination of market shares and demand changes has boosted exports from Brazil and Colombia. However, not so for the rest of the economies, whom this interaction has harmed. Unfortunately, in the absence of information on world exports of organic coffee, it was impossible to estimate the second level of decomposition of the change in exports. For this reason, we can only contextualise the effects of organic coffee exports to the USA. Mexico is considered the world leader in exports of this organic good, but this is not visualised in the results of Table 4; however, this may be because the analysis does not include the European market, one of the largest demanders of this sustainable aromatic.

In conclusion, coffee exports to the US have been reduced; the increase in US demand has increased exports of conventional Mexican coffee but has reduced organic coffee. The former has lost competitiveness in this market, while organic coffee has gained competitiveness. In another aspect, the interaction between fluctuations in market share and demand has limited Mexican coffee exports to the US in general terms. Authors like Barham et al. (2011) have identified competitiveness in this market, however within the results of one of their investigations they indicate that it is important to keep in mind that: "while better opportunities can be generated through markets for certified agricultural or other local products, we would not anticipate transformative gains from such initiatives unless they are combined with efforts to also improve management practices that enhance labor productivity.".

4 CONCLUSIONS AND RECOMMENDATIONS

In recent years, the coffee crisis induced by the fall in international prices has accentuated the poverty of the country's indigenous farmers. However, they have found a potential alternative to their problem in producing organic coffee. Chiapas is the state representative par excellence at the national level because it is the largest producer of this aromatic.

The need for these small producers led to the conversion of conventional coffee production to organic; now, they are organised in cooperatives, and their search for new international markets has given birth to organic certification in the country. It has set a precedent for the emergence of the current Law of Organic Production and allowed the flourishing of the national network of organic markets and markets and participatory certification.

Mexico is the world leader in organic coffee exports. Although the results of the CMS indicate that it has gained competitiveness in the US market, it is losing it to its competitors from Indonesia and Peru. Likewise, the VRE expresses a low level of competitiveness compared to the rest of the countries considered in the research.

Given the above, it would be advisable for future research to evaluate the value chain of organic coffee from Chiapas to identify the factor detracting from the competitiveness of Mexican coffee. Perhaps, small producers do not require more fantastic encouragement for certification but for incorporating innovations in their production practices or more excellent promotion in organic coffee consumption in the domestic market.

Chiapas is a central pole of attraction for government programs aimed at poverty reduction in Mexico due to its high rates of marginalisation and multidimensional poverty. However, these public policies may be paternalistic if they

focus simply on the proportion of direct cash transfers to families. Supporting organic coffee production may be a better way to counteract these social and economic problems because it would strengthen an economic activity that represents an essential source of income for these households. It would be a sustainable and sustainable way to minimise the poverty present in the national coffee growers; through the recognition of the capacities of the producers and the incentive to the agricultural innovation.

Mexican organic coffee is one of the national crops most recognised for its quality in international trade. This crop is widely accepted for wide and Arabica varieties. It generates a significant economic impact in the south and southeast of the country, mainly in Chiapas, Veracruz, Puebla, Oaxaca and Guerrero. Its production is mainly because, in recent years, the crisis of conventional coffee induced by the fall in international prices has accentuated the poverty of the country's indigenous farmers. They have sought alternative methods to solve the lack of demand and the low prices of coffee through organic production.

The need of these small producers led to the conversion from conventional to organic coffee production, and they are currently organised in cooperatives; likewise, the search for new international markets has given birth to organic certification in the country and has set a precedent for the emergence of the current Organic Production Law; it has also allowed the national network of organic markets and markets to flourish, as well as participatory certification.

It is concluded that Mexico is one of the world leaders in organic coffee exports. Although the results of the CMS indicate that it has gained competitiveness in the US market, it is losing it to its competitors from Indonesia and Peru. Likewise, the VRE shows a low level of competitiveness compared to the rest of the countries considered in the research. If this trend continues, it could shortly show lower performance than the industry average.

This research highlights the need for actions that allow for the integral development of the Mexican countryside and producers, implemented in countries such as Peru, where the government has allocated funds for rehabilitation and rejuvenation programmes for plantations. In addition to funds, awareness-raising and training of national producers are also required.

As mentioned in this article, there are some conditions for this crop. They focus on the need to satisfy fundamental human needs, to be ecologically sound and economically viable, but above all to be socially just and humane. In this sense, training is required in-field productivity, orientation towards sustainable production, decent work and fair trade, and skills for product marketing.

There are multiple opportunities to grow supply and demand for organic coffee. On the supply side, it can be asserted that Mexico has the right conditions in terms of climate and territory, which would allow it to increase its productive capacity. On the demand side, mainly due to the sustainable consumption trends of the millennial and centennial generations, who prefer safe, ethical and sustainable products. It is supported by Retail's 2019 study on conscious consumption, which argued that 73 per cent of millennials and centenarians take ethical and ecological aspects into account in their purchasing decisions. Similarly, Thompson (2015) stated that consumers increasingly show sustainable and toxic consumption tendencies. For example, 80 per cent of this market in the United States are willing to pay more for food products of natural or organic origin.

Therefore, the importance attributed to responsible consumption and corporate social responsibility represents latent opportunities for organic coffee producers in the country. However, communication plays a vital role in increasing the purchasing power of this type of product, so that production skills and product quality are not enough. Marketing practices must include effective communication on domestic organic coffee cultivation's ethical and ecological aspects.

Given the above, some lines of research are recommended to allow better practices in the production and marketing of organic coffee, for example, the analysis of the value chain of the industry of this product, which allows identifying the most representative actors or links in the matter; the analysis of potential markets, especially in Asia, whose consumption profile is characterised by a tendency to consume healthy food.

On the other hand, a critical evaluation of the productive and managerial competencies of national producers is also required, who, in addition to the certifications currently promoted by the government, require support in the incorporation of innovations in production, organisation and market development. The state of Chiapas, for example, is a significant pole of attraction for government programmes aimed at poverty reduction in Mexico due to its high levels of marginalisation and multidimensional poverty. However, public policies can be considered paternalistic, as they focus simply on the proportion of direct cash transfers to families.

Other opportunities area in the market for the farmers is social entrepreneurship, and ecopreneurship, because more number of people decide to purchase organic coffee beans below new Fair Trade model that produce economic and social benefits by the farmers; where the end consumers value the quality of the product, without any pesticides, and that is picked by hand (Belz; Binder, 2017).

Some studies have demonstrated that training and innovation increasing a probability of that a microenterprise gets more social profitability (Ruiz et al., 2021). Accordingly, this is an opportunity for farmers to generate social business (ecoentrepreneurship), because this sustainable innovation is

not only It can allow them to increase their income by taking advantage of the opening of the fair market, the advantage of electronic commerce and consumption increase of certified organic coffee. But it can also mean to significantly improve 'organic coffee farmers' wellbeing.

Supporting the production and commercialisation of organic coffee represents a way to counteract the social and economic problems of farming communities in Mexico. Because it would strengthen an economic activity, which represents an essential source of income for these households, it is a sustainable and sustainable way to minimise the poverty present in the national coffee-growers; through the recognition of the capacities of the producers, the incentive to agricultural innovation, effective communication practices and the agreements and institutions for the promotion of national exports.

5 AUTHORS' CONTRIBUTION

YZFA wrote the manuscript and conducted the statistical analysis; DMSR co-work the manuscript; EGV co-work the manuscript, adapted the document to the journal requirements and wrote the conclusions; RRR review and approved the final version of the work.

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