Article

Competitiveness of the Persian lemon in the Papaloapan region, Oaxaca

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Abstract

The area devoted to Persian lemon cultivation in the Papaloapan Basin region, Oaxaca, increased by more than 86% in the last ten years while its participation in international markets increased. This fact, together with the favorable natural conditions of the region for the production of the crop, shows a potential for growth. The objective of the research was to evaluate the competitive performance of the producers of said region, as well as to calculate its price-cost competitiveness through the application of a survey. In the first case, we used the valuation of their positioning capacity in the market and the knowledge they have of it. For the calculation of price-cost competitiveness, the Policy Analysis Matrix was taken as the basis. The results show a low competitive performance due to the fact that less than half of the surveyed population performs technological development and human resource training activities that allow them to position themselves better in the market, in addition to a lack of knowledge of the demands of national and international markets. On the other hand, the results show that the relative remuneration of the capital producer for the 2015-2016 cycle was: 88%, 89% and 92% for small, medium and large producers; respectively, which reflects the competitiveness of producers in terms of the price-cost ratio.

Keywords: competitiveness, Persian lemon, profitability.

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Introduction

The export of citrus fruits in Mexico is one of the most important economic activities for the national agricultural sector. Citrus fruits are fruits of high national consumption and one of the main export products, being the United States of America the main recipient of the product, followed by Japan (Ruiz *et al*., 2016).

The citrus industry in Mexico is an activity that generates an important part of the jobs of the national agricultural sector and an economic income of more than ten billion pesos annually (Hidroponia.mx, 2016). In addition, it contributes 2.78% of the gross domestic product (GDP) (SAGARPA, 2016) and represents an important export activity since nearly a quarter of the national citrus production is sent abroad, more than 85% of these exports correspond to Persian lemon and the main buyer is the United States of America (Hidroponia.mx, 2016).

It emphasizes the participation of three states in the cultivation of lemon. Veracruz being the main producer with 45 995 hectares harvested in 2017, followed by Michoacán with 44 320 hectares and in the third position Oaxaca with a harvest of 19 934 hectares in that year (SIAP, 2017). Although referring to the Persian lemon Oaxaca is in the second position. According to information from the SIAP (2017) the largest producer is the state of Veracruz with 655 299.64 tons (44 852.5 ha) in 2017, second Oaxaca with 195 903 t (13 804.9 ha) and third Tabasco with 83 970.88 (7 191.82 ha), which account for 77% of the volume generated in the country.

One of the attractions of lemon cultivation is its dynamic behavior. 'Mexico is among the first producing and exporting countries of limes and lemons worldwide. The value of exports increased from 63 623 to 269 918 thousand dollars, with a percentage growth rate of 324.24% during the period 2002-2011' (Pat *et al*., 2014). Another feature to highlight is the fact that in the export of the same not only large companies participate, since some medium and small have also managed to position themselves in the American and European market (El Sol de Mexico, 2018).

Likewise, the lemon competitiveness indicators stand out both nationally and internationally. According to Pat *et al*. (2014 and 2015); Caamal, *et al*. (2014) who made an analysis of them in 2014 'the indicator of the relative trade balance (BCR) on average is 0.99, which indicates that Mexico is a net lemon exporting country with a competitive advantage. The indicator of tradability is 0.33, which is greater than zero, therefore, the sector is considered a net exporter, given that there is an excess of supply and indicates that it is a competitive product in the domestic market. The coefficient of commercial dependence is zero, reflecting competitiveness in the sector or productive chain'.

On the other hand, the study of the Persian lemon becomes interesting, because it is a product that does not require major transformations for its commercialization and its main destinations are the export markets; unfortunately, there are no studies that refer to the competitive level of this crop in the state of Oaxaca, prioritizing the case of Veracruz, which is the main producer or the analysis of its exports (Caamal *et al*., 2014; Pat, *et al*., 2015; Arias and Suárez, 2016).

The above is particularly relevant considering that despite having one of the most important poles of economic development in the state, the Papaloapan region is characterized by a high level of social marginalization, since 85% of the municipalities in the region and 87% of their localities are in a situation of high and very high marginalization (CDI, 2008). Levels of marginalization are accentuated mainly in the district of Choapam, whose municipalities are considered very high marginalization, but also affect the municipalities of the district of Tuxtepec, where only the entity that gives its name to the district is considered of marginal marginalization. In these conditions, the potential of a crop like the Persian lemon stands out, which presents a very dynamic behavior since the planted area has increased by more than 448% during the period from 2003-2014, going from 2 540 to 11 402.5 ha (SIAP, 2016).

It is necessary, therefore, to have more elements to stimulate the competitiveness of the crop in the region of study, reason for which the present study was carried out with the main objective of evaluating the competitiveness of the Persian lemon producers in the Region of the Papaloapan Basin, under an agro-food chain approach (Rojas and Sepúlveda, 1999) given that it allows maintaining, expanding and improving in a sustained manner the participation in the market, looking for the ultimate benefit of society.

The main hypothesis of the research establishes that the cultivation of Persian lemon in the Papaloapan Basin is profitable but not very competitive.

Materials and methods

The present investigation used a mixed methodological approach: qualitative and quantitative. The qualitative approach is based on the collection of data without numerical mediation to discover or refine research questions in the interpretation process and the quantitative approach, using data collection to test hypotheses, based on numerical mediation and statistical analysis for establish patterns of behavior and test theories (Hernández *et al*., 2014).

For the gathering of information in the field, the municipalities with the highest production of Persian lemon in the region were selected, such as: San Juan Bautista Tuxtepec, Santiago Yaveo, San Juan Cotzocon and San Miguel Soyaltepec. The production of these four municipalities represents 99% of the regional production (SIAP, 2017).

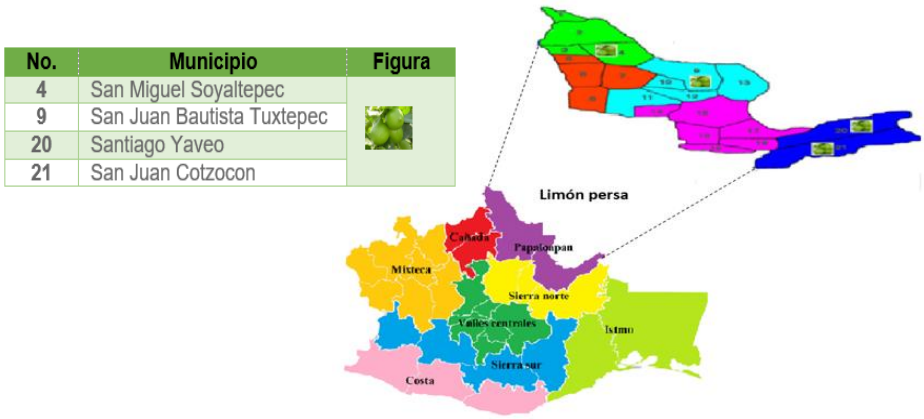

Figure 1. Location of the Persian lemon chain in the territory. Elaboration with data of INEGI (2007).

In a first stage, within the framework of the exploratory qualitative analysis, a visit was arranged with some key actors such as providers of professional services (PSP), suppliers of inputs, owners of regional packing houses and local intermediaries, as well as interviewing producers. This first visit was held in July 2016 and its purpose was to identify the production units and the actors involved in the chain to have, in this way, a broader picture of the situation of the chain in the region from the perspective of each one of the actors that participate in it. Based on the information gathered in these interviews, it was possible to observe that the producers carry out practices that, although they are not clearly oriented to the demands of the market, allow them to improve their productivity. From that information, the hypothesis of the investigation was formulated.

Regarding the specific evaluation of competitiveness, this was carried out based on the proposal FAO (1997) taken up by García *et al*. (2006), which considers a series of internal factors to measure competitive performance, of which the positioning capacity and knowledge of the market stand out, which are disaggregated into the following nine components: the application or not of a technological package, technical assistance, training received, adoption of innovations, training of personnel hired in the field, knowledge of standards (national and international), the implementation or not of good agricultural practices (BPA) and good manufacturing practices (BPM)), the commercial maturity of the fruit and the forced production during the winter period. The criterion of realization or not of such activities was established by percentage frequencies which allow to observe the extent to which the producers, individually or in groups, attend to the practices that allow them to reach competitiveness in the markets.

The gathering of information in order to assess the performance of producers in terms of competitiveness was carried out through a survey, which was submitted to a pilot test in July, which was held in October 2016, applied to 45 producers using intentional or convenience sampling, as it is considered the most appropriate, given that there was no updated list of producers and the location of the plots in the region is highly dispersed. However, the typology established in the survey corresponds to a great extent with the one that prevails throughout the studied region.

This statement is based on the knowledge of the area and Persian lemon producers, based on field work carried out in 2014 in coordination with professional service providers (PSP) assigned to provide technical assistance and training to producers' region of. These services were provided within the framework of the Extension and Capacity Development Program of the Ministry of Agriculture, Rural Development, Fisheries and Food (SAGARPA), in coordination with the Autonomous University of Chapingo and the Government of the State of Oaxaca. There is, in effect, in the state of Oaxaca a type of producers that has large areas (>100 ha) but barely represent 1% of the total (Schwentesius and Gómez, 2005).

The main methodology used to confirm the hypothesis was the policy analysis matrix (MAP), which in its first entity measures profit as the difference between income and production costs (Monke and Pearson, 1989); considering in the cost structure the internal factors, tradable inputs and indirectly tradable inputs; and for the analysis of income, intermediate consumption and added value (Monke and Pearson, 1989).

It is important to note that for research purposes only the production phase of Persian lemon was considered without considering the period of establishment of the crop because producers do not have sufficient and accurate information to assess the previous cycles.

Regarding the spill, this was calculated from the intermediate consumption and the number of hectares cultivated by the surveyed producers.

Results and discussion

The results that are presented below allow us to observe a series of factors that affect the competitiveness of the crop. The order in which they are presented initially refers to the group of producers surveyed and, subsequently, to the segments by type of producer. According to the area devoted to Persian lemon cultivation, the surveyed producers were grouped as follows: small producers (less than 4 ha), representing 44%, medium producers (4.1 to 9.9 ha), representing 36% and producers large (10 ha or more), represent 20%.

Internal factors that affect competitiveness

In line with the FAO methodology, which was previously mentioned, the positioning capacity in the market was first considered, which is valued through the technological capacity of the producers, as well as the quality of the human resource, aspects that are disaggregated by the following way: monitoring of a technological package, technical assistance and training received, adoption of innovations and training of personnel in the field.

Out of the total of surveyed producers, a total of 317.4 ha is distributed by type of producer (Table 1). Of which, 86.7% corresponds to plantations in production and 13.3% to plantations in development.

Table 1. Area dedicated to Persian lemon cultivation of the total of surveyed producers.

Type of producer	Total area (ha)	Average area/type of 1 producer (ha)
Small	43.9	2.19
Medium	103.5	6.4
Large	170	18.8
Total	317.4	

100% of the producers surveyed do not apply a technological package as such, which does not mean, necessarily, that they do not know at all the systems of establishment of the cultivation since the majority chooses by the known ones like box and rectangle that are the most adapted since they allow that the trees have greater aeration and sunlight. Likewise, the information gathered shows that the majority of producers resort to well adapted rootstocks or rootstocks which also favors crop productivity. However, the production volume of the surveyed producers is 2 509.02 t, with an average yield of 7.9 t ha^{-1} which is lower than the regional average of 9.68 t ha^{-1} and is below the national average yield of 13.8 t ha^{-1} (SIAP, 2017).

Within the recommendations of the technological package for the production of lemon is to perform the soil analysis. However, 84.4% of the surveyed producers (both small, medium and large), claim to be based solely on the observation and experience they have as producers to know the nutritional needs of their plots, only one of the respondents answered that they do analysis of soil and the rest only follow indications of houses of agrochemicals, other producers or technical advisors, without any previous analysis.

Regarding technical assistance, the results indicate that only 44.4% of the producers surveyed answered that they have it. The technical assistance service in the region, according to the producers surveyed, is provided mainly by the agrochemicals houses where they acquire their inputs and, to a lesser extent, by professional service providers (PSP), since the latter come every two, four or six months to provide technical advice. Although these forms of advice help producers to fertilize or fight pests, which allows them to maintain a certain productivity, they cannot be considered optimal for various reasons.

In the first place, the consultancies of the agrochemical companies do not necessarily consider the demands of the market, apart from the fact that they generally have a linear expression that leaves the producer as a passive recipient, ignoring their knowledge and needs regarding sustainable development. And, secondly, the eventual technical assistance -even when it could be based on an interactive and agroecological approach- cannot be consolidated due to the scarce frequency with which PSPs come as a result of the lack of permanent governmental programs of technical advice and rural extension. which according to those indicated by FAO (2016) involve 'all the different activities that are carried out to provide the information and services demanded by farmers and other actors of the innovation system, to help them develop their capacities technical, organizational and management, in such a way to improve their quality of life and well-being'.

In the case of training, in the last two years, 33.3% of respondents said they had received some type of training, among which stand out: pest and disease management, efficient use of inputs and BPA, 66.7% said not having received any training in this period.

Only the group of producers that have received technical assistance or some training claim to have made some type of innovation in their plots such as: foliar fertilization, pruning and monitoring of disease pests, which has allowed them to increase their levels of productivity. Unfortunately, those who responded to carry out these activities represent less than half of the total producers surveyed. Regunaga (2008) found that one of the main elements to achieve growth and competitiveness in agriculture is the adoption of innovations. However, in Mexico, in the case of lemon, the increase in production has been based on an increase in the area and not on innovations that improve yield, this is mainly due to the fact that the transfer and adoption of innovations have had multiple limitations , such as the reduced coverage of public technical assistance, which reaches less than 1% of productive units in Mexico, or the use of inefficient methodologies, referred to the transfer of knowledge in the form of recipes by the providers of services to the producer, without considering the particularities of the corresponding case.

Regarding the training component of field staff, the results indicate that only 50% of lemon farmers surveyed responded that they train their workers in the field, the other 50% trust the workers' experience and do not. Of the 50% that train, the following topics stand out: pruning, fertilization, harvesting and postharvest handling and control of pests and diseases.

With regard to the second internal factor established by the FAO methodology (valuation of market knowledge), the following elements were considered to measure competitiveness: knowledge of national and international standards, BPA and BPM, commercial fruit maturity and induction floral.

The investigation regarding the knowledge that the producers have of the market, gave the following results: 73% of the surveyed producers do not know the export requirements and the quality standards of the product required by the international markets. For the specific case of the study region, 90% of the producers do not know the meaning of certification, and what it means to achieve this process.

In the particular case of Persian lemon, the demands of international markets revolve around the production phase and the packaging process. Europe and Japan are the largest importers of this fruit worldwide. Both countries are very demanding markets in terms of quality and product safety. Among the certifications required by these markets are those related to field production (BPA) and those derived from the packaging process (BPM). These processes represent a novelty for producers and an expensive and complicated process for regional packers.

The commercial maturity of the fruit is another aspect of great importance since it determines the green color of the fruit (the cut should be when the fruit reaches commercial maturity, approximately three months after flowering). In this regard, 58% of producers claimed to harvest at that time, 31% said to harvest two months after flowering and 11% made the harvest 4 months after flowering, which affects the quality of the product by anticipated cuts or untimely.

Although there is a lack of knowledge of the market by most of the producers surveyed, it is necessary to recognize that the requirements of their customers have been identified, such as: the size and color of the product, the absence of defects, as well as the roughness and the thickness of the shell. The main clients of the producers are the intermediaries and the regional packers. 67% of the producers sell to regional or foreign intermediaries, 29% deliver their product to the regional packers and 4% have direct customers in the USA.

In short, the analysis of the two dimensions mentioned above (capacity for positioning and knowledge of the market) and of the elements valued to determine the competitiveness of the production units, it is concluded that, the competitiveness of the production units is low since small producers make only 28.6% of these activities, medium producers produce 39.05% and the rest, 45.7% large producers, which can be seen in Table 2, which also allows to observe the differences by type of producer.

Table 2. Percentage of activities carried out by Persian lemon producers in the Papaloapan region, to measure their competitiveness in the crop.

Segments	Performance criteria	Small (%)	Medium (%)	Large (%)
1. Positioning capacity in the market	-Track a technology package	0	0	0
	-Receive technical assistance	5	8.33	11.1
	-Receive training	3.33	7.28	7.4
	-Adoption of innovations	10.83	10.42	14.8
	-Training for personnel in the field	9.17	8.33	9.25
Total average in percentage of segment 1 (%)		28.33	34.37	42.55
2. Valuation of market knowledge	-Know the national and international standards	2	8.74	4.44
	-Make BPA or BPM	0	0	0
	-Commercial maturity of the fruit (proper harvest management)	11	15	8.88
	-Performs floral induction or forced production to increase productivity in months of high profitability.	16	20	35.54
Total percentage average of segment 2 (%)		29	43.74	48.86
General average (two dimensions)		28.67	39.05	45.71

Price-cost competitiveness of Persian lemon producers in the region

To calculate the price-cost competitiveness of the producers, the production costs provided, and the level of income obtained from the sale of the product in the 2015-2016 productive cycle were considered.

The costs were grouped into internal factors, tradable inputs and indirectly tradable inputs. The internal factors are those that do not have an international quotation such as: labor, land, water, credit, electricity and insurance, as well as administration and services. Marketable inputs are those that can be purchased in markets, both nationally and internationally, for example, fertilizers, herbicides, fungicides, diesel and part of machinery. Indirectly tradable inputs include inputs or part of them that are not traded internationally, such as: tractor parts, implements and spare parts (Omaña, 2002). Production costs were obtained by adding the costs of tradable and indirectly tradable inputs plus the costs of internal factors to private prices.

The productive units had different costs according to the type of producer surveyed. The cost for the case of small producers amounted to $ 16 899.00 pesos per hectare, the medium producers had a production cost of $20 518.12 pesos and the large producers reflected an average cost per hectare of $24 206.32 pesos, as can be seen in the Table 3.

Table 3. Cost structure per hectare including land, during the production cycle 2015-2016.

Oaxaca Cultivation: Persian lemon						
Region	Tuxtepec		Tuxtepec		Tuxtepec	
Cycle	Perennial		Perennial		Perennial	
Technology	Manual	(%)	Manual	(%)	Technified	(%)
Period	2015-2016		2015-2016		2015-2016	
Area	≤4 ha		4.1 to 9.9 ha		≥10 ha	
Marketable inputs	5 789.18	34.3	4 982.94	24.3	10 929.11	45.1
Fertilizers	2 039.7	12.1	1 966.27	9.6	3 229.83	13.3
Fungicides	179.13	1.1	265.94	1.3	231.24	1
Herbicides	273	1.6	320.06	1.6	362.72	1.5
Insecticides	281	1.7	233.54	1.1	409.58	1.7
Hormones	91.03	0.5	19.41	0.1	0	0
Diesel	2 925.32	17.3	2 177.73	10.6	6 695.74	27.7
Hired services	0	0	0	0	0	0
Internal factors	11 110.53	65.7	15 535.19	75.7	11 817.88	48.8
Manual work	9 456.65	56	11 478.75	55.9	8 090.67	33.4
Mechanized work	0	0	0	0	1 444.44	6
Avio credit (interests)	0	0	0	0	0	0
Agricultural insurance	0	0	0	0	0	0
Use of water	0	0	0	0	0	0
Electricity	0	0	0	0	0	0
Diverse materials	1 653.88	9.8	4 056.44	19.8	2 282.77	9.4
Land	0	0	0	0	0	0
Indirectly tradable inputs	0	0	0	0	1 459.33	6
Tractor and implements	0	0	0	0	1 239.58	5.1
Chapadora	0	0	0	0	105	0.4
Turbine	0	0	0	0	114.75	0.5
Administration and services	0	0	0	0	0	0
Total cost (including land)	16 899.7	100	20 518.13	100	24 206.32	100

If the costs are divided among each of the inputs used for production, it can be observed in small and medium producers that within the internal factors, labor is the one that has the highest percentage of the expenses incurred (more than 60%), while for the group of large producers it represents 48.8%, this because the large producers occupy less personnel per hectare, since their work is mostly mechanized and although the cost per day is more expensive, it does not exceed the amount of wages required by the other two types of producers.

Mendoza (2016), reaches the same conclusion in his research by showing that the item that represents the highest cost in lemon production is labor, with 51.8% of the total cost structure.

Given that the price of lemon is very variable in each production cycle, it was considered prudent to identify the maximum and minimum prices reached in the cycle analyzed (2015-2016); therefore, we proceeded to multiply the percentage of the average volume produced in each of the seasons marked according to the type of producer by the respective prices reached. Prices are per box of approximately 26 kg (Table 4).

Table 4. Price paid to the producer according to the production season.

Price	Production season			
	High production		Low production	
	70%		30%	
	Quality 1ª (50%)	Quality 2ª (50%)	Quality 1ª (30%)	Quality 2ª (70%)
($/grate of 26 kg)	$50.00	$17.00	$620.00	$178.00

The income for each type of producer, as well as the costs, are different. According to the results obtained, for each hectare cultivated, small producers receive an average income of $31 889.28 pesos, medium producers average a total of $38 977.49 pesos and large producers reflect an average income of $46 550.49 pesos per hectare. The value of production (total income) for a deeper explanation can be disaggregated into its two main components: intermediate consumption and added value.

The net added value of small, medium and large producers corresponds to $24 446.22, $29 938.22 and $31 879.28 pesos respectively, which provides an absolute compensation to the capital of $14 989.58, $18 459.36 and $22 344.17 pesos per hectare, according to each type of producer (Table 5). This represents what land, capital, labor and administrative work used by producers contribute to the national product.

Table 5. Analysis of the income/ha of the Persian lemon producers of the Papaloapan Basin.

Oaxaca Cultivation: Persian lemon			
Region	Tuxtepec	Tuxtepec	Tuxtepec
Cycle	Perennial	Perennial	Perennial
Technology	Manual	Manual	Technified
Period	2015-2016	2015-2016	2015-2016
Area	≤4 ha	4.1 to 9.9 ha	≥10 ha
(1) Total income	31 889.28	38 977.49	46 550.49
-(2) Marketable inputs	5 789.18	4 982.94	10 929.11
-(3) Agricultural insurance	0	0	0
-(4) Electricity	0	0	0
-(5) Miscellaneous materials	1 653.88	4 056.44	2 282.77

Oaxaca Cultivation: Persian lemon			
-(6) Indirectly tradable inputs	0	0	1 459.33
= (7) Net added value	24 446.22	29 938.11	31 879.28
-(8) manual tasks	9 456.65	11 478.75	8 090.67
-(9) mechanized work	0	0	1 444.44
-(10) land and water	0	0	0
-(11) administration and services	0	0	0
= (12) Compensation to capital			
(13) absolute	14 989.58	18 459.36	22 344.17
(14) relative 1(%)	88.70	89.97	92.31
-(15) avio credit	0	0	0
= (16) Compensation to the producer capital			
-(17) absolute	14 989.58	18 459.36	22 344.17
-(18) relative 2(%)	88.7	89.97	92.31

1/ (14) = ((13)/(2+3+4+5+6+8+9+10+11))∗100
2/ (18) = ((17)/(2+3+4+5+6+8+9+10+11+15))∗100

Table 6 shows the percentages corresponding to each component of income: intermediate consumption and net added value. For each case, a breakdown was made based on 100% of the value of each component.

Table 6. Income structure of Persian lemon producers in the Papaloapan Basin region, 2015-2016 production cycle.

Oaxaca Cultivation: Persian lemon			
Region	Tuxtepec	Tuxtepec	Tuxtepec
Cycle	Perennial	Perennial	Perennial
Technology	Manual	Manual	Tecnified
Period	2015-2016	2015-2016	2015-2016
Area	≤4 ha	4.1 to 9.9 ha	≥10 ha
Total income	100%	100%	100%
Intermediate consumption	23.3%	23.2%	31.5%
Value added	76.7%	76.8%	68.5%
Intermediate consumption	100%	100%	100%
Marketable inputs	77.8%	55.1%	74.5%
Agricultural insurance	0%	0%	0%
Electricity	0%	0%	0%

Oaxaca Cultivation: Persian lemon			
Diverse materials	22.2%	44.9%	15.6%
Indirectly tradable inputs	0%	0%	9.9%
Net added value	100%	100%	100%
Compensation for labor	38.7%	38.3%	29.9%
Compensation to land and water	0%	0%	0%
Compensation to capital	61.3%	61.7%	70.1%
Administration and services	0%	0%	0%

As can be seen, within intermediate consumption the most important payment is represented by tradable inputs followed by the payment of diverse materials. For the added value, the highest remuneration is received by the capital, followed by the payment of labor.

Profit is defined as the difference between total sales (or per unit) income and the market costs of marketable and indirectly tradable inputs plus internal factors. The calculation of private profitability shows the competitiveness of the production system, given the current technologies and the prices of the product and the factors that are prevailing at that time in the market (COLPOS, 2003). The summary of the difference between income and production costs is presented in Table 7.

Table 7. Gain per hectare in the 2015-2016 production cycle according to the type of producer.

Characteristics	Type of producer		
	Small	Medium	Large
Average total income	31 889.28	38 977.49	46 50.49
Average total cost	17 874.81	20 518.12	24 289.9
Net income	14 024.47	18 459.36	22 260.58
Abs remuneration producer capital $ (including land)	14 024.47	18 459.36	22 260.58
Relative remuneration capital producer (%) (including land)	88.7	89.9	92.3

The relative remuneration capital producer, allows to demonstrate that for each peso that is destined to the production in a hectare of Persian lemon in the region of the Papaloapan it is gained, depending on the type of producer (small, medium or large), 88, 89 or 92 cents respectively, which means that the activity is profitable for producers in the region.

Conclusions

The results of the research show the low positioning capacity of the Persian lemon producers in the Oaxaca region of the Papaloapan Basin, which together with their limited knowledge of the market demands and the limited response to their demands, provide the basis for the affirmation that the crop is not very competitive.

Regarding the price-cost competitiveness of the producers; the relative remuneration of producer capital for small, medium and large, corresponds to 88%, 89% and 92% respectively. This means that for each peso that is destined to the production of one hectare of Persian lemon in the region, 88, 89 and 92 cents are earned according to the type of producer; which reflects its price-cost competitiveness derived from this activity in the period 2015-2016.

The previous statements obtained through the application of two different methodologies confirm the hypothesis that the crop is profitable, but the result of the performance analysis of the producers shows a series of internal factors that limit the competitive positioning of the product.

The public interest to promote competitiveness finds in the case of the Persian lemon a potential that must be exploited. Unlike other crops that have low competitiveness and low profitability, the case of the Persian lemon in the Papaloapan Basin region shows a different behavior. It is a product located in an area that presents favorable conditions for its cultivation and in which small and medium producers prevail that maintain cultivation practices that allow them to reach positive profitability indicators that can be increased by developing the technological capabilities of the producers and the competencies for identify market requirements.

Cited literature

Arias, V. F. J. y Suárez, E. 2016. Comportamiento de las exportaciones de limón persa (*Citrus latifolia tanaka*) al mercado de los Estados Unidos. J. Agric. Animal Sc. 5(2):22-33.

Caamal, C. I.; Pat,f. V. G.; Jerónimo, A. F.; Santoyo, R. L. E. y Ramos, G. J. G. 2014. Análisis de los costos de producción del limón persa en el municipio de Tlapacoyan, Veracruz. México. Revista Biológico Agropecuaria Tuxpan (México). 2 (3):192-200.

COLPOS-FUNPROVER (Colegio de Postgraduados y Fundación Produce Veracruz). 2003. Necesidades de Investigación y Transferencia de Tecnología de la Cadena Productiva de Limón Persa en Veracruz. Ed. COLPOS y FUNPROVER. Tepetates, Veracruz, México. 105 p. https://www.cofupro.org.mx/cofupro/Publicacion/Archivos/ penit20.pdf.

CDI (Comisión Nacional para el Desarrollo de los Pueblos Indígenas). 2008. Región Sur. Tomo 1. Oaxaca. Condiciones Socioeconómicas y Demográficas de la Población Indígena. Comisión Nacional para el Desarrollo de los Pueblos Indígenas-Programa de las Naciones Unidas para el Desarrollo. México. 199 p.

El Sol de México. 2018. El limón persa ocupa el segundo lugar como producto de exportación en México. 9 de enero de 2018. Ciudad de México, México. https://www.elsoldemexico. com.mx/finanzas/el-limon-persa-ocupa-el-segundo-lugar-como-un-producto-de-exportacion-en-mexico-556913.html.

FAO (Food and Agriculture Organization). 1997. Competitividad de algunas cadenas agroindustriales en el MERCOSUR. Análisis de ocho casos. Resumen de los resultados del TCP/RLA/4452. Políticas agrícolas e integración agropecuaria en el MERCOSUR. Oficina Regional de la FAO para América Latina y el Caribe. Santiago, Chile. 1997. http://chapingo.mx/revistas/phpscript/download.pjp?file=completo&id=MTM=.

FAO (Food and Agriculture Organization). 2016. Asistencia técnica y extensión rural participativa en América Latina. Lima, Perú.

García, B. J. J.; Lozano, T. R. y Orjuela, Ch. J. A. 2006. Estudio de medición de factores de competitividad de la cadena láctea del municipio de San Vicente del Caguán. Universidad del Tolima. Línea de Investigación en Seguridad Alimentaría y Cadenas Productivas. Universidad de la Amazonia. Florencia, Caqueta, Colombia. 22 p.

Hernández, S. R.; Fernández, C. C. y Baptista, L. M. P. 2014. Metodología de la investigación. McGraw-Hill Companies, Inc. Quinta edición. México, DF. 4-23 pp.

Hidroponia.mx 2016. Límón uno de los principales cítricos de México. Noticias sobre hidroponía, invernaderos y campo. México. http://hidroponia.mx/?s=lim%C3%B3n&x=10&y=9

INEGI (Instituto de Estadística, Geografía e Informática). 2007. Censo Agrícola, Ganadero y Forestal 2007. México. 350 p.

Mendoza, T. R. 2016. Análisis de la red de valor de la industria empacadora de limón persa en Martínez de la Torre, Veracruz. Tesis de maestría. Universidad Autónoma Chapingo. Centro de Investigaciones Económicas, Sociales y Tecnológicas de la Agroindustria y la Agricultura Mundial. Chapingo, Estado de México. 108 p.

Monke, E. A. and Pearson, S. R. 1989. The Policy Analysis Matrix for Agricultural Development. Cornell University Press. Ithaca and London, NY, USA.

Omaña, S. J. M. 2002. Notas del curso Análisis Económico en microcomputadoras. Colegio de Postgraduados, México.

Pat, F. V. G.; Caamal, C. I.; Caamal, P. Z. H. 2014. Análisis de los indicadores de competitividad del comercio internacional del limón de México. En: Anales de Economía Aplicada. Núm. XXVIII. Antonio García Lizana Antonio Fernández Morales Pablo Podadera Rivera (Coordinadores) Delta Publicaciones. Asepelt Asociación Internacional de Economía aplicada. s/p.

Pat, F. V.; Caamal, C. I.; Jerónimo, A. F. y Mendoza, T. R. 2015. Costos y competitividad de la producción del limón persa en el municipio de Martínez de la Torre, Veracruz. F. Pérez, E. Figueroa, L. Godínez (eds.). Ciencias Sociales: Economía y Humanidades. Handbook T-I. ©ECORFAN, Texcoco de Mora, México. 295-308 pp.

Regúnaga, M. 2008. La estrategia tecnológica de largo plazo para promover el crecimiento sustentable del sector agroalimentario argentino. *In* Regúnaga, M. (coord.), Baez, G., Ganduglia, F., Massot, J. M. Diagnóstico y estrategias para la mejora de la competitividad de la agricultura Argentina. 1ª ed. Ed. CARI-FAO-IICA, Buenos Aires: Consejo Argentino para las Relaciones Internacionales-CARI, Buenos Aires, Argentina. 17-128 pp. http://www.cari.org.ar/pdf/agricultura-competitividad.pdf.

Rojas, P. y Sepúlveda, S. 1999. El reto de la competitividad en la agricultura. Instituto interamericano de cooperación para la agricultura (IICA). San José, Costa Rica. 8 p. (Serie Cuadernos Técnicos/IICA; No. 8).

Ruiz, R. R.; Vela, H. G. V. y Moreno, L. R. G. 2016. Exportación de cítricos mexicanos, alternativas para el mercado de exportación. Horizontes de la Contaduría en las Ciencias Sociales (México). 3(6):77-85.

Schwentesius, R. R. y Gómez, M. A. 2005. Limón persa tendencias en el mercado mexicano. Ed. CIESTAAM-UACh y Banco Mundial. México, DF. 158 p.

SAGARPA (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación). 2016. Planeación Agrícola Nacional 2017-2030. Parte 3. 65 p. https://www.gob.mx/cms/uploads/attachment/file/255626/Planeaci_n_Agr_cola_Nacional_2017-2030-parte_tres.pdf.

SIAP. 2017. Servicio de Información Agroalimentaria y Pesquera https://nube.siap.gob.mx/cierreagricola/.