Article

Competitiveness and economic efficiency of guava production systems in Calvillo, Aguascalientes

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Abstract

The production of guava (*Psidium guajava*) in Calvillo, Aguascalientes, has socioeconomic importance for the entity and requires the application of efficient public policies to maintain or encourage its growth. The objective was to determine the competitiveness, policy effects and economic efficiency of guava production systems in the municipality of Calvillo, Aguascalientes. The policy analysis matrix (MAP) was applied to the technical-productive information that was obtained from 28 surveys carried out on producers, these were classified as traditional, intermediate and business. The analysis of the results showed that the three production systems are profitable, but the private cost ratio (RCP) for intermediate producers had higher profitability (1.73) than business (1.64) and traditional (1.38). The cost ratio of internal resources (RCRI) was 0.55 for traditional producers, 0.45 for intermediate and 0.49 for business, this indicated that they are economically efficient and, consequently, have a comparative advantage. In the three groups of producers the existence of lack of protection of the economic policies was evidenced to the production systems to the detriment of their competitiveness. The production of guava in Calvillo, Aguascalientes generates wealth and contributes to saving foreign currency for the country, which makes it a productive alternative for the region.

Keywords: consumables, internal factors, profitability, taxes.

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Introduction

Guava (*Psidium guajava*) is one of the fruits with great acceptance in the agro-food sector of Mexico, due to its high content of vitamin C and phenolic compounds. In the period from 2012 to 2015, the area planted with guava in the country was 21.15 thousand hectares (ha), with a production of 297.65 thousand tons (t). The regions with the highest production were located in the states of Michoacan with 46.4% of the fruit nationwide and had a yield of 14.75 t ha^{-1}, those of Aguascalientes and Zacatecas contributed 30.6 and 16.5% of the production and showed yields of 15.31 and 15.42 t ha^{-1}, respectively (SIAP, 2015).

The production of Aguascalientes is developed in the Calvillo, listed as one of the most important regions of the country in the commercial production of guava. Data from the SIAP (2015), indicate that from 2012 to 2015, this fruit tree occupied 6 256 ha in Aguascalientes, which was 29.6% of the national area planted. In the same period, there were on average 94.87 thousand tons guavas with a commercial value of 361.82 million pesos, equivalent to 27.9% of the value of the national production of guava, and 15.16% of the value of the production of the agricultural sector of the entity.

During the period from 2005 to 2015, the area planted and production of guava in Calvillo observed an annual average decrease of -0.86% and -1.2%, respectively. This situation denotes the loss of dynamism of the productive activity caused by: a) the reduction of the level of the aquifers that has generated scarcity and increased cost in the extraction of irrigation water; b) natural phenomena such as frost, hailstorms and droughts that affect the region; c) presence of pests and diseases; and d) lack of adequate technological packages for the agronomic management of guava (De Luna, 2003).

In addition to the above, Sangerman-Jarquin *et al*. (2013) pointed out that the increase in production costs and the fall in real fruit prices have had an impact on the profitability of guava producers. For Borja *et al*. (2016a) the previous aspects, added to the little planning in the allocation of public and private resources, have caused the loss of profitability, competitiveness and sustainability of the economic activity of guava in the producing region. This problem is noted with the abandonment of orchards and productive reconversion by other species such as nopal vegetables, tomatoes and grasses.

In spite of the previous problem, due to its size, specialization, the amount of jobs it generates and the number of producers that are engaged in this activity, the guava chain is positioned as the one of greatest socioeconomic importance in the state (Borja *et al*., 2016b), which fully justifies the search for opportunities to maintain or encourage the productive activity of guava in Aguascalientes.

For producers to find alternatives that allow them to increase their crop profits, it is necessary to perform a detailed analysis on the profitability and competitiveness of the production systems in Calvillo; as well as, determine the economic efficiency or competitive advantage of the activity. To do this, one must start from understanding that competitiveness is the dynamic capacity of a spatially located agri-food chain to maintain, expand and continuously improve and sustain its participation in the market (Romero and Sepulveda, 1999); while, the comparative advantage refers to the efficiency with which a country can make a profit in trade with the production of goods, and this because prices relative to the interior of the country are not the same as regulating the relative value of products at the time of marketing them with other countries (Romo and Abdel, 2005).

The MAP is a tool that allows measuring the competitiveness of guava production systems based on private and economic profitability, as well as evaluating economic efficiency or comparative advantage based on a comparison of private and economic costs, to measure results of the commercial opening in the producers and the economy of the country (Barrera-Rodríguez *et al*., 2011). This type of analysis has been carried out for the production of guava in Michoacán, Mexico (Zamora and Kido, 2008), for vanilla production systems (*Vanilla planifolia* J.) in the region of Totonacapan, Mexico (Barrera-Rodríguez *et al*., 2011); as well as, in livestock production systems (Barrón-Aguilar *et al*., 2000; Lara-Covarrubias *et al*., 2003; Rebollar-Rebollar *et al*., 2011).

The foregoing would provide first-hand information to those responsible for formulating the policies of the subsector and thereby designing strategies focused on maintaining or increasing the competitiveness of the activity in the region and related to the allocation of resources. Based on the foregoing and considering the importance of guava in the state, this work aimed to determine the competitiveness, policy effects and economic efficiency of guava production systems in the municipality of Calvillo, Aguascalientes.

Materials and methods

The investigation was conducted in the municipality of Calvillo, Aguascalientes, which is located in the southwestern part of the state between 21° 42’ 54.00’’ and 22° 06’ 25.20’’ north latitude and between 102° 31’ 26.40’’ and 102° 52’ 30.00’’ west longitude, at an average height of 1 630 meters above sea level, with an area of 908.23 km^2 and represents 16% of the state territory, in 2015 it had 56 thousand inhabitants (INEGI, 2015).

In the research, the policy analysis matrix (MAP) developed by Monke and Pearson (1989) was used, with which a detailed analysis of the cost structure with private and economic prices was carried out. The MAP allows to evaluate the profitability for the producer and the economic efficiency of the systems; one of the objectives of the methodology is to measure the impact of government policies and market distortions on private profitability and efficiency in the use of resources.

The MAP is a product of two accounting indicators, one on profitability that defines the difference between income and expenses and the other is the measurement of the effects of divergences (policies and market failures) considered as the difference between the observed parameters and those that would exist if divergences were eliminated (Table 1).

Table 1. The policy analysis matrix (MAP).

Concept	Income	Costs		Gain
		Tradable goods	Internal factors	
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergences	I	J	K	L

A= gross income at private prices; E= gross income at private economic prices; B= production costs of tradable inputs valued at private prices; F= production costs of tradable inputs valued at economic prices; C= internal factor costs at private prices; G= costs of internal factors at economic prices; D= A-B-C is the gain at private prices; H= E-F-G is the profit at economic prices; I= A-E, J = B-F and K= C-G measure transfers through the product, marketable inputs and production factors; L= I-J-K= D-H measure net transfers. Information obtained from Monke and Pearson (1989).

Based on the MAP analysis, the indicator of the private cost ratio (RCP) that measures the capacity of the production system to pay domestic resources and the return to capital that represents the producer's profit (Barrón-Aguilar *et al.*, 2000) and was the competitiveness indicator, which results from dividing the cost of the factors of production by the value added (difference between gross income and the costs of tradable inputs). If RCP< 1 means that the producer is efficient and has a private gain; if RCP= 1 no profits are generated and if RCP> 1, there will be no private efficiency (González and Alferes, 2010).

The following indicators were used to determine the effect of economic policies: The nominal protection coefficient (NPC), which is the ratio of the price between the product at private prices and the price at economic prices. This indicator analyzes the pricing policies and lets you know if they encourage domestic production; establishes the degree of protection that production has due to policies.

The nominal input protection coefficient (CPNI) measures the degree of transfer in commercial inputs by trade policies and the exchange rate through prices (González and Alferes, 2010); it is calculated using the quotient of the cost of marketable inputs at private prices and its corresponding at economic prices. If CPNI> 1 there is a subsidy and if CPNI< 1 there is an implicit tax on the internal price of inputs.

The effective protection coefficient (CPE) expresses the combined effect of transfers and tradable inputs derived from trade and exchange rate policies and is estimated by dividing the value added at private prices by economic prices.

The producer subsidy equivalent (ESP) measures the level of net transfer from or to producers in relation to other sectors of the economy (L). The positive value of the ESP indicates a global transfer from the company to the producer; while, a negative value means the global transfer of the producer to society and taxpayers (Adeoye and Oni, 2014).

The cost ratio of internal resources (RCRI) is the ratio of dividing the cost of internal factors (G) valued at efficiency prices (without distortions) and value added at social prices (Monke and Pearson, 1989). If RCRI< 1 the value of the internal resources used in production is less than the value of the currencies saved, so the country is economically efficient in the production of guava, otherwise if RCRI> 1 the country is inefficient in production (González and Alferes, 2010).

To prepare the MAP, information was collected on technical coefficients (performance, and input requirements) and prices through 28 surveys applied to guava producers in the municipality of Calvillo, during October and November 2015. The producers surveyed were those who had the willingness to provide detailed information on cost records, harvests and fruit sales. From the information collected in the surveys, producers were classified into three groups based on the characteristics determined by Borja *et al*. (2018) (Table 2).

Table 2. Classification of guava producers in Calvillo, Aguascalientes.

Type of producer	Characteristic	(%) of respondents
Traditional	Planted area not exceeding 2.5 ha High quality fruit production margin¶ between 30 and 60%. They do not export.	36
Intermediate	Planted area greater than 2.5 and less than 9 ha High quality fruit production margin¶ between 39 and 86%. Low export volume	43
Business	Planted area greater than 9 ha High quality fruit production margin¶ between 41 and 79%. Higher export volume	21

Information obtained from Borja *et al.* (2015). ¶= it refers to the fruit of extra and first size, whose classification is based on the standard NMX-FF-040-SCFI-2002 (SE, 2002).

The technical coefficients of tradable goods were identified for each producer: chemical and organic fertilizers, pesticides, nematicides, herbicides, fungicides, biological control of pests and diseases, agricultural tools, fuel (occupied in the transfer of personnel to orchards, production and for the operation of equipment), containers and boxes for cutting and the factors of production: technical assistance, wages, certifications of the garden, water payment quotas (which included the fee for water and the consumption of electricity for the pumping of water), irrigation system, agricultural equipment (manual and motor sprayer, brush cutter and sorter), vehicle, warehouses, fences, fruit irradiation and administrative services.

The market prices of marketable goods and equipment came from the survey and inquiries made to the companies Agricenter SA of CV; Agricolas Guayaberos, SA of CV; Servi Agro de Calvillo and Ferquiagro, SA of CV and Tractores de Aguascalientes, SA of CV, the daily price and cost of irrigation water were provided by the producers. The survey asked about the quantity and price of family and hired labor; the information was used to estimate the total cost per labor force.

The cost of capital goods was determined as the cost of capital recovery considering its useful life, 20% of the acquisition cost as redemption value at a nominal interest rate of 3.34% which was the interbank equilibrium interest rate (TIIE) average at 91 days for 2015 (BANXICO, 2015). The analysis did not include the rent of the garden, since only 7% of the producers made it; this activity is uncommon because it is a perennial crop that requires investment and the profits are reflected in the long term.

Based on the methodology proposed by Salcedo (2007), import parity prices were calculated mainly for fertilizers (ammonium sulfate, calcium nitrate, potassium nitrate, superphosphate and triple 17), pesticides, herbicides, fungicides and agricultural equipment. Import parity prices were calculated with the Free On Board (FOB) prices reported by the International Trade Commission of the United States of America (USITC, 2015) and the Via Internet Commercial Information

System (SIAVI) (SE, 2017) , then the CIF (Cost, Insurance and Freight) price was calculated, where the cost of maritime transport of the fertilizers that was obtained from quotes made to the international shipping company Containers with exit points in Florida and Miami and point was considered upon arrival at the port of Veracruz; the cost of rail transport from Veracruz to Aguascalientes was also calculated, for this the rates and distances of Mexican Railroad, SA of CV (FERROMEX) were consulted.

In the case of irrigation equipment and system, the cost per recovery was estimated at market and economic prices. For the conversion to national currency, the equilibrium exchange rate (TCE) was used, which was calculated for the period 2010 to 2015, taking as the base year 2013, the TCE was estimated using the purchasing power parity method (PPP) (Lara-Covarrubias *et al*., 2003), for which the nominal exchange rate (BANXICO, 2015) and the consumer price index of Mexico and the United States of America (INEGI, 2016) were used.

The equilibrium exchange rate was $13.16 USD, with an overvaluation margin of 3.77% from January 2010 to December 2015. The economic price of the guava was estimated with the export parity price (Salcedo, 2007) For this purpose, the CIF price reported by the International Trade Commission of the United States (USITC, 2015) placed in McAllen Texas, United States, was deducted from the cost of transportation, insurance and costs generated by the irradiation of the fruit and local transportation from the orchards to the packaging, the information was provided by the guava packing companies that are located in the municipality of Calvillo and that are responsible for the commercialization of the fruit for the US market.

The subsidy granted by the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) within the Special Program of Energy for the Field in the field of electric energy for agricultural use (SAGARPA, 2016) was increased.

With the matrices of technical coefficients and prices, the private and economic budgets of guava producers were calculated. Since guava was a perennial crop, private and economic budgets were projected at 25 years on already established plantations and the base year was 2015. The evaluation period was determined when considering the experience of the producers, who mention that the trees with 25 years of age still maintain their vigor and high performance.

Subsequently, the net present value (NPV) for each budget was estimated; the average TIIE at 91 days (3.34%) and the Libor rate at 3 months (0.32%) for 2015 (BANXICO, 2015) were used to update the budgets. The analysis was made with the information corresponding to an area of 1 ha of guavas for each type of producer.

Results and discussion

Private profitability and competitive advantages

The differences between the total costs according to the characteristics of the producers are evident. The business producers showed to have higher production costs than the traditional and intermediate ones (Table 3), the difference is explained because the companies use a greater amount of chemical fertilizers and organic fertilizers (compost), export their product so they allocate a greater investment to the chemical and biological control of pests and diseases; in addition, they have a larger orchard area and require a butler to coordinate the activities of the plantation, which raises the cost of labor.

Table 3. Indicators of private profitability of the cultivation of guava according to characteristics of the producer in Calvillo, Aguascalientes.

Competitive advantage	Producers		
	Traditional	Intermediates	Business
Gross income ($ ha^{-1})	48 744	59 702	79 378
Total cost ($ ha^{-1})	35 196	34 468	48 303
Net income ($ ha^{-1})	13 548	25 234	31 075
Private profitability	1.38	1.73	1.64
Nominal return to capital (%)	38.5	73.2	64.3
Cost of domestic factors ($ ha^{-1})	17 931	17 035	32 571
Net added value ($ ha^{-1})	31 479	42 269	63 646
Private Cost Ratio (RCP)	0.57	0.4	0.51

Prepared based on field information.

Traditional and intermediate producers observe similar production costs, due to the similarity in plantation management, the highest costs in tradable goods were in fuel (34.2 and 32.6%, respectively), since this input is used for transfers from the populations to the garden of the producers and day laborers, for the operation of equipment and the transport of the production of the garden to the sales centers.

The workforce showed a great participation in the cost structure, for traditional producers it was 37.5% and for the intermediate of 29.3%, this high cost is explained by the intensive use of labor in works such as pruning, weeding and fruit harvest. The costs in tradable inputs were 49.1, 50.5 and 32.6% for traditional, intermediate and business; and the production factors were 50.9, 49.4 and 67.4%, respectively.

The income of the producers is determined by the volume of production they obtain from the different sizes of guava since this depends on the market to which the fruit is directed and the sale price. The 'extra' guava is characterized by a superior quality and measures 5 to more centimeters (cm) in equatorial diameter (SE, 2002), it is marketed as fresh fruit in the national market and its average price in 2015 was $7.50 per kilogram (kg).

The fruit of 'first' measures between 4 and 4.9 cm in diameter (SE, 2002), has the characteristic of being commercialized in the national and export market, since it is the one that meets the characteristics in size that the US market prefers. In 2015, the sale price of producers in the domestic market ranged between 5.6 and 3.3 $ kg^{-1} and in the export price between 10 to 14 $ kg^{-1}. Fruit of 'extra' and 'first'size is considered to be of good quality. Finally, the 'second' or 'marble' guava is less than 4 cm in diameter (SE, 2002), the market where it is marketed is the pulp, typical sweets and desserts industry; the sales price in 2015 fluctuated between 2.4 and 1.6 $ kg^{-1}.

The business producers are those who obtained the best gross income, the difference in income by type of producer ranges between 11 and 31 thousand pesos per ha. According to the results obtained in the survey, intermediate producers obtained 20% of extra production and 59% of first; while, traditional producers obtained 20 and 46% and business 20 and 57%. However, a notable difference between intermediate and business producers is that the latter are exporters, so that on average 18% of total production, which represents 31.6% of the first production, is the one that leads to this market where the price is higher and they get higher income and profit margin.

The intermediate and traditional producers' market in the national market as fresh fruit and for the processing industry. As can be seen in Table 3, the three production systems are profitable, but the intermediate producers are the ones with the highest profitability (1.73), followed by the business (1.64) and the traditional (1.38). According to González and Alferes (2010) private profitability is a necessary but not sufficient condition to determine private competitiveness, for this reason the other indicators should be analyzed.

The net added value indicated that after liquidating the marketable inputs of production there was a remainder in the income from the sale of a ton of guava. The added value varied between 64.6 and 80.2%, these values mean that the production of guava has an important participation in the generation of direct jobs; that is to say, that of the costs of production, the payment of labor represented 30.9% and according to what was expressed by Hernández-Martínez *et al*. (2008) the net added value is the amount of the total income used to pay for labor, the payment of the producer's work and the profit obtained by the activity; in the case of the production of guava in Calvillo, more than 60% of the income goes to the payment of these resources.

For business producers, labor is hired and in traditional and intermediate it is mixed, since it implies the occupation of family and hired labor. This indicator reflects the effect of production within the agricultural sector (Morales-Hernández *et al*., 2011). Competitiveness was estimated with the RCP and in the production systems it was greater than zero, but less than 1, which indicates that the three systems were competitive. Guava production systems showed the ability to pay for internal production factors, in addition to making a profit from their economic activity.

In the case of traditional producers, the cost of the internal factors represented 57% of the added value and 43% of the profit, in the intermediate and business the factor costs were 40.3 and 51.2% of the total value added and profit of 59.7 and 48.8%. These results are similar to those reported by Zamora and Kido (2008) for guava production systems in Michoacán, where they point out that, under different agronomic management, guava cultivation is efficient when obtaining an RCP lower than one and private gain positive.

Based on what was expressed by Rebollar-Rebollar *et al*. (2011), intermediate production systems had greater competitiveness and greater degree of private efficiency, since they are those that obtained an RCP closer to zero; the lower the RCP, the private profit increases.

Effects of economic policy on competitiveness

The effect of economic policy on competitiveness is the difference between the private and economic budget, which reflects policy distortions, subsidies and taxes or the existence of imperfect markets (Monke and Pearson, 1989). The CPNI in guava production systems found that for fertilizers, fungicides and herbicides it was lower than the unit, indicating that market prices were lower than economic prices, therefore, there is an implicit tax on the price of the inputs (Table 4) that producers pay at the time of purchase.

Table 4. Price protection indicators in guava production in Calvillo, Aguascalientes, Mexico.

Price protection	Producers		
	Traditional	Intermediates	Business
CPN of the guava	0.27	0.39	0.42
CPN of fertilizers	0.42	0.57	0.78
CPN of pesticides	1.75	1.53	1.53
CPN of fungicides	0.63	0.63	0.94
CPN of herbicides	0.62	0.57	0.61
CPN of the tools	1.23	1.18	1.26
CPN of the fuel	1.36	1.36	1.36
Effective protection coefficient (CPE)	0.62	0.64	0.61
Total transfer ($ ha^{-1})	-38 654	-47 627	-70 688
Producer subsidy equivalent (ESP)	-0.79	-0.8	-0.89

Prepared based on field information.

Pesticides, tools and fuel had a CPNI greater than 1 and denotes that the domestic price exceeds the social price, so these inputs showed a subsidy; this result is congruent, as some producers receive state and federal government support for the purchase of pesticides, fuel, tools and equipment at a lower price.

Regarding the CPN of guava, the results indicate that, in 2015, revenues at private prices were lower than at economic prices, this was due to the fact that the national price of the fruit was lower than the parity price; that is, in a market without distortions, traditional producers would obtain a higher price 73%, intermediate 61% and business 58%, therefore, guava is a product that is unprotected.

The explanation of why the price of the national guava is lower compared to the international one focuses on the following points: a) the temporary excess supply of the fruit, mainly in the months of November to January, which causes the price to fall selling; b) the production of a high percentage of ‘second’ fruit, which causes it to be directed to markets where the sale price is low, such is the case of agribusiness for the production of pulps, sweets, jams and desserts, where the price in the national market is less 57.5% with respect to the 'first' size and 78.1% to the 'extra' size; and 3) weak policies to allow access to new markets.

In this regard, Zamora and Kido (2008) pointed out that after more than ten years of the first exports of guava, it is a fruit that has not been able to consolidate internationally and the main cause has been non-tariff restrictions of phytosanitary type that prevent marketing the product and producers stop receiving the corresponding profit at social prices.

Table 4 shows the values of the effective protection coefficient for guava producers. In all three groups the CPE was less than one, indicating that there is a lack of protection in economic policies, according to Barrera-Rodríguez *et al*. (2011) producers could have received higher remuneration for capital and labor if there were no market distortions and if they received international prices.

In percentage terms, traditional, intermediate and business producers had to receive 38, 36 and 39% more value added, respectively; this loss of value was due to negative transfers via commercial inputs and internal factors (Table 4); one of the causes of this result was the increase in the nominal exchange rate during 2015, which remained at an average of $15.9 per dollar during that year; that is, 19.13% higher than the equilibrium exchange rate (BANXICO, 2015); in addition to the high internal interest rate.

The ESP for traditional and intermediate producers was -0.8 and -0.9 for businessmen; the negative value of the ESP indicates that the producers are subject to an implicit tax in the production of the fruit and that there is a decrease in the gross income, as a result of the transfers originated by the distortions of commercial policy of the product and inputs and by the market imperfections of internal factors. The ESP value of the three production systems was less than one and indicates the existence of transfer of resources from producers to society.

Similar results were found by Zamora and Kido (2008) for guava production systems in Michoacán, who also argued that if policy distortions were eliminated, producers would increase their level of private gain.

Economic profitability and comparative advantage

The purpose of estimating the economic budget is to analyze the comparative advantage of guava production systems and determine if it is cheaper for the country to import the fruit or produce it internally. The data revealed that the production costs at economic prices of the guava systems increased, compared to the costs at private prices, this as an effect of the presence of subsidies in the light areas for water pumping (SAGARPA, 2016), acquisition of some commercial inputs (fertilizers) and equipment (DOF, 2015).

In an economy without distortions, revenues would increase because the international sale price of the fruit is higher than the national one, this causes the value added in economic terms to increase in the three production systems (Table 5).

Table 5. Indicators of economic efficiency of the cultivation of guava according to the type of producer in Aguascalientes, México.

Comparative advantage	Producers		
	Traditional	Traditional	Traditional
Gross income ($ ha^{-1})	72 126	88 698	124 622
Total cost of production ($ ha^{-1})	49 259	52 128	71 864
Cost of internal factors ($ ha^{-1})	27 693	29 918	51 522
Economic profitability	1.46	1.7	1.73
Net added value ($ ha^{-1})	50 561	66 488	104 280
Net income ($ ha^{-1})	22 867	36 571	52 758
Economic return of capital (%)	46.4	70.2	73.4
Cost ratio of internal resources (RCRI)	0.55	0.45	0.49

Prepared based on field information.

In order to determine the comparative advantage of guava production, the indicator of the ratio of internal resource costs (RCRI) was estimated. The indicator stood at a value between zero and one for guava producers, indicating that the three production systems are economically efficient and therefore have a comparative advantage.

Traditional producers have a cost of 55 cents to produce a value-added weight, intermediate 45 cents and entrepreneurs 49 cents; In addition, the country should produce guava because it saves 45, 55 and 51% of the currencies it would use if it decided to import guava.

Conclusions

At private prices, guava producers in Calvillo, Aguascalientes, are profitable and competitive. In all three systems, value added covers the costs of internal factors and there is an extraordinary profit surplus, but intermediate producers are more efficient in production, followed by business and traditional ones. Producers can improve the profitability and competitiveness of their system by reducing costs in tradable inputs, through a more efficient and rational use of fertilizers and products for the control of pests and diseases; likewise, business producers must optimize the use of internal factors as labor.

At economic prices, the producers are profitable and obtain profits with respect to the private ones, which implies that the production of guava in Calvillo presents a comparative advantage with the outside and it is determined that the resources are well used because this activity generates wealth and contributes to saving foreign exchange for the country, which makes it a productive alternative for the region.

Guava producers are affected by economic policy through negative transfers translated into implicit taxes on some marketable inputs such as fertilizers, pesticides and fungicides, which are not compensated with the subsidies they receive in the purchase of other inputs and in the item of factors. internal there is a lack of protection in the production systems of guava in Calvillo, this effect results from the overvaluation of the exchange rate and its constant increase from 2015 and the high interest rates present in the national economy with respect to the interest rate international, factors that increase the prices of inputs and equipment used in production. Therefore, it is desirable that macroeconomic policy be managed in a consistent manner to contribute to the profitability and competitiveness of the guava production systems and the agricultural sector in general.

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