

Situation and challenges of corn production and commercialization in Tulantepec, Hidalgo

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Abstract

The municipality of Santiago Tulantepec de Lugo Guerrero, Hidalgo, is favored in the production of corn in its different varieties because the climatological conditions and the type of soil are conducive to producing this crop. The objective of this research was to analyze the relationship between the production and commercialization of corn, to know the economic benefits that result in greater utility for producers in the area. The analysis required knowing its production and commercialization and the costs from sowing to harvest, taking information in the production cycle 2017-2018. Data collection was based on a finite sample; through a simple random sampling, with an eighteen-item data collection instrument, applied to corn producers, taking as a universe the 407 producers enrolled in the ProAgro program, calculating, and resulting in the application to 198 as a sample for the study. A reliability test was applied using Crobach's Alpha, which yielded 0.702, to give reliability and validity to the research. The information collected was processed in a database of the SPSS statistical program, obtaining the measures of central tendency. Finally, based on the results, recommendations and proposals are made based on the improvement of commercialization procedures for producers, which can lead to new research for the agricultural sector in the municipality.

Keywords: corn, production and commercialization, Tulantepec.

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The importance of corn (*Zea Mays* L.) in Mexico arises through the historical structure of the food pattern since corn has a determining weight in the consumption of the population. According to data from the Food and Agriculture Organization of the United Nations, 47% of the total demand for corn in Mexico is used for direct human consumption, 32% for fodder, 5% for industrial uses and the rest in other uses (FAO, 2018).

The municipality of Santiago Tulantepec de Lugo Guerrero, located in the state of Hidalgo, is made up of 21 neighborhoods and localities, which are favored in the production of corn in its different varieties because the climatological conditions and the type of soil of the region are ideal for the cultivation of corn.

The importance of the agro-livestock sector for the state of Hidalgo lies in the contribution of the state gross domestic product (GDP), which on average is 9%, as well as the generation of employment since 23.5% of the economically active population works in some activity related to this sector and 62.8% of the population lives in rural areas (SAGARPA, 2011). In terms of competitiveness, the state ranks 22nd among the states of the Mexican Republic (IMCO, 2018). The problem addressed in this research lies in analyzing the production and commercialization of corn in the municipality of Santiago Tulantepec de Lugo Guerrero, Hidalgo, for the production cycle 2017-2018, with the purpose of knowing the economic benefit that results from the productive activity.

The objective pursued is the relationship between the production and commercialization of corn, based on the study of a production cycle, to know the economic benefit from the productive activity. With this, having an existence of a relationship between the production and commercialization of corn that affects the impulse of international trade in the municipality of Santiago Tulantepec de Lugo Guerrero, as the hypothesis of this research.

Considering the high potential that this sector has in the municipality, the need to maintain and increase its productive growth, the potential impact on economic and social benefits for the region and the opportunity that arises to become a competitive sector, it is necessary a study that can determine the parameters of profitability in the production and commercialization of corn, allowing offering the producers of the municipality the possibility of having a study that shows the benefits derived from the production and commercialization of corn, considering that the conditions required for the adaptation and development of the plant are basically those that the region has, where the production of corn could be an option of source of income for the producers.

It was sought to identify, based on the study of the production and commercialization of corn, the possibilities of taking advantage of corn as an alternative that allows guiding the development of this region, proposing viable economic and social solutions linked to the problems that affect the municipality of Santiago Tulantepec, Hidalgo.

The municipality is located 51 km from Pachuca, the capital of the state of Hidalgo. It is located at a height above sea level of 2 180 m and its extreme geographical coordinates are 20° 02' 21" north latitude with respect to the Greenwich meridian. It has a territorial extension of 90 km² and represents 0.37% of the total area of the state of Hidalgo.

The type of corn grown in this municipality is forage corn under the irrigation modality for the spring-summer (SS) season. In the case of white corn, it is irrigated and rainfed, both in the SS modality, of which, under irrigation, 252 ha were sown and harvested, while under the rainfed modality, white corn was sown and harvested in 1 653 ha with a production volume of 2 349.5 t.

Considering the high potential that this sector has in the municipality of Santiago Tulantepec de Lugo Guerrero, the need to maintain and increase its productive growth, the potential impact on economic and social benefits for the region and the opportunity that is present for it to become a competitive sector, an investigation is necessary to determine the parameters of profitability in the production and commercialization of corn that provides the possibility for the producers of the municipality to have a study that shows the benefits derived from the production and commercialization of corn, considering that the conditions required for the adaptation and development of the plant are basically those of the region, where the production of corn could be an option to examine as a source of income for producers.

The research was carried out through fieldwork or study in the plots with the corn producers in Santiago Tulantepec, Hidalgo, which allows obtaining the necessary data to know the cultural and agricultural practices that must be executed during a production cycle, as well as the activities carried out in the process of commercialization of corn, to identify the benefits obtained from the production and commercialization of this product.

The data are based on a non-experimental design, of a cross-sectional field study since the application of the survey was done at a single time through a questionnaire consisting of multiple-choice responses and the assignation of data that the producers themselves answered, such as the costs they face to produce corn in the season.

The object of study are the corn producers who are enrolled in the ProAgro Program registered by SAGARPA, only from the localities of the municipality of Santiago Tulantepec, to whom a questionnaire was applied to collect data that allow the analysis of the variables to be studied and with it the verification of the hypothesis. According to the data provided by the rural development directorate in the administrative division of the municipality, it is shown that the registered producers dedicated to the production of corn are 407 (PROAGRO, 2018).

To obtain the sample, it is desired to know how many questionnaires would have to be applied to this population of producers in the area, it was determined by the following equation:

$$N = \frac{NZ^2pq}{e^2(N-1) + (Z^2pq)}$$
 .Where: N= size of the population or universe; e =value between 1% (0.01) and 9% (0.09), 5% was chosen; p = when not known, it is generally given the value of 0.5; q =1-p; Z= constant that depends on the confidence level assigned and corresponds to a Normal or Gaussian distribution, with a confidence level of 0.95, 1.96 is used.

The data integrated into the formula are as follows: $n = \frac{(407)(1.96)^2(0.5)(0.5)}{(0.05)^2(407-1) + (1.96)^2(0.5)(0.5)} = 197.88 \rightarrow 198$ surveys. The result is 197.88 questionnaires, but for reasons of rounding and determination in the research, 198 questionnaires will be carried out.

For the collection of field information, the surveys were applied directly, for this, the producers selected in the sample of the municipality of Santiago Tulantepec were directly approached, explaining the reason for the research and the criteria to answer each of the questions that were asked.

Although there are primary and secondary sources of information, this study is based on the use of primary information sources. In addition, the research uses information technologies to obtain data and digital documents. The primary information sources to be used in the research are the application of surveys, to obtain information on costs in the production process, volumes and commercialization carried out by corn producers in Santiago Tulantepec.

The collection of the information began with a pilot test to review if the questions were well structured and posed, it was carried out in one day with 12 corn producers in the municipality of Santiago Tulantepec to determine the reliability of the instrument until obtaining the achievable level in Crombach's Alpha (0.702 reliability), correcting any errors or observations that were found. Then, the surveys were carried out within a schedule from 10 in the morning to 6 in the afternoon, where the total of the instruments with 18 items were applied.

The 198 surveys were carried out at the home of some producers and some in the field where they were working. After applying the samples, the folios of the instruments are ordered for capture and processing. A printed instrument was made, which is divided into four parts, the first section refers to the general data of the producer, the second section based on eight questions where information on the production for corn is inquired, the third section asks seven questions regarding the commercialization of the corn they perform, if this was not available, it led to the next section; and the last section asks 3 questions and ask to fill in a table of the costs they have when carrying out the different agricultural activities for corn production on their lands.

At the end of the application of the instruments for obtaining information, the SPSS Statistics© statistical software was used, where the graphs are generated for the evaluation of the results of the surveys and to facilitate the interpretation of the surveys. Among the results produced by the program, the frequencies of each answer are given, which facilitates the interpretation of the results of each question asked.

The present research allowed fulfilling the general objective, which consisted of carrying out an analysis of the production and commercialization of corn in the municipality of Santiago Tulantepec, Hidalgo, in order to identify some points to strengthen in the production and commercialization processes and thus design a proposal that promotes the generation of employment and benefits and profits for the producers of this municipality (ASERCA, 2018).

From this research, it is possible to conclude different important aspects, what the surveys show, it starts with the fact that, generally, the people who are still engaged in the cultivation of corn are of older ages, oscillating above 50 years on average. They are producers who know the work and are accustomed to field work, and it is reported that the producers as a whole have at most primary education (85.86%), which means that there is a high degree of illiteracy among them (CIMMYT, 2008; FAOSTAT, 2018).

Due to the large number of producers found in the municipality of Santiago Tulantepec de Lugo Guerrero, Hidalgo, it can be theorized that the area has fertile land, the climate is ideal and that it has the conditions to obtain this crop that is of utmost importance for human consumption. The corn that is harvested in the farms and plots of this municipality is sown in various varieties such as white corn (9.6%), yellow corn (3.03%), black corn (1.52%), hybrid corn and other native varieties (85.86%) (Latham, 2002; USDA, 2018).

Most producers (89.9%) have farms of 1 to 5 ha for cultivation, while only 1.52% have more than 15 ha (Rudiño, 2011). Regarding the time they have been sowing and harvesting their corn, in 88.38% of the producers, it is greater than 15 years carrying out this activity, in 7.07% it goes from 11 to 15 years, 2.53% have between 6 and 10 years sowing and only 2.02% have between 1 to 5 years with these corn agricultural activities.

Producers mostly sow by custom and own occupation and do not seek to obtain a profit from the sale of their crops, the only use it for self-consumption, because production expenses are very high, and profits are very few. As for the field work, of all the cultivations, only 0.51% is irrigated, while the rest is rainfed, with the spring-summer rains, as mentioned by Lesur (2005). Likewise, 42.93% carry out the fertilization of the lands with different organic materials to nourish the land.

In the occupation of personnel as a wage to carry out the different activities, most producers (79.29%) have an expense of between \$200.00 to \$300.00, 19.7% pay between \$100.00 to \$200.00 and 0.51% of the producers pay between \$300.00 to \$400.00 (INEGI, 2018). For the disbursement of these wages, the producers do it from their own income, since only 4.04% have some government support allocated to the field, while 95.96% do not have another income for these tasks.

As for agricultural machinery, equipment and implements, 49.49% carry out their agricultural activities with the tractor, while the rest continue to do so with a group of animals, of this, 40.91% have their own production machinery or equipment, 58.08% rent it and 0.51% borrow it from some person to perform their work. With these activities, 27.27% still prune and weed on their land for the care of weeds and grasses (Sampieri *et al.*, 2010).

With respect to commercialization variable, it is where there is more weakness, since the sector has little or no experience in the market and they do not know the processes to export and even ignore the processes to trade in local markets (Varela *et al.*, 2010).

The production variable also shows weakness due to the fact that producers do not have tools that could benefit them at the time of carrying out their processes and thus reduce time and costs (SAGARPA, 2018). Among these processes is the machinery of the producers, most do not have their own equipment, and this increases their costs when requesting others to carry out the work.

Conclusions

There are many producers; however, they lack a business culture, specifically in planning and organization, as well as financial culture. To increase the level of competitiveness of producers, it is advisable to organize and develop managerial skills, develop financial capacities, strengthen teamwork and the ability to adapt to changes.

It is important that government or private entities provide training so that producers can organize and develop. An association of producers can be created, where they are supported with knowledge of commercialization and application of logistics, and they can obtain greater benefit from their crops through the creation of a collection center where all the production of small corn producers is concentrated; it was also observed that most producers are elderly.

Likewise, government support can be sought to obtain the tractor and implements, giving contributions between government and producers to work the land without spending more than what they spend today.

Another aspect that would add value as a producer association is the certification of their product with quality standards and thus trade at competitive prices. As well as, to obtain an insurance for crops so that if the weather conditions affect the production, they are not lost in part or in full and the producers are not affected in their economy.

Cited literature

- ASERCA. 2018. Gobierno de México. Maíz grano cultivo representativo de México. <https://www.gob.mx/aserca/articulos/maiz-grano-cultivo-representativo-de-mexico?idiom=es>.
- CIMMYT. 2008. Centro de Investigación para Mejoramiento de Maíz y Trigo. <https://www.cimmyt.org/es/?s=maiz>.
- FAOSTAT. 2018. Food and Agriculture Organization of the United States. Top 10 de producción en México 2018. <http://www.fao.org/faostat/en/#data/QC/visualize>.
- FAO. 2018. Food and Agriculture Organization. <http://www.fao.org/home/es/>.
- IMCO. 2018. Instituto Mexicano para la Competitividad. Índice de competitividad estatal. <http://imco.org.mx/indices/el-estado-los-estados-y-la-gente/resultados/entidad/13-hidalgo>.
- INEGI. 2018. Instituto Nacional de Estadística y Geografía. Cifras de Hidalgo. <https://www.inegi.org.mx/app/areasgeograficas/?ag=13>.
- Latham, M. 2002. Nutrición humana en el mundo en desarrollo. Colección FAO: Alimentación y nutrición núm. 29. Organización de las Naciones Unidas para la Agricultura y la Alimentación. <http://www.fao.org/3/w0073s/w0073s00.htm#Contents>.
- Lesur, L. M. 2005. Manual de cultivo de maíz, una guía paso a paso. Ed. Trillas. México, DF. 18-37 pp.
- Rudiño, L. 2011. Iniciativas para elevar el rendimiento del maíz de temporal: metodología exitosa generada por campesinos. La Jornada del Campo (21).
- SAGARPA. 2011. Resultados del estudio de diagnóstico sectorial en el estado de Hidalgo 2010. <https://www.academia.edu/27442118/informe-final-diagnostico-sectorial-estado-de-hidalgo>.
- SAGARPA. 2017. Planeación agrícola nacional 2017-2030. Secretaría de Agricultura Ganadería, Desarrollo Rural, Pesca y Alimentación. <https://www.gob.mx/agricultura/acciones-y-programas/planeacion-agricola-nacional-2017-2030-126813>.
- Sampieri, R. H.; Collado, C. F. y Lucio, P. B. 2010. metodología de la investigación 5ª. (Ed.). Mc Graw Hill. México, DF. 4-10 pp.
- USDA. 2018. United States Department of Agriculture. https://www.nass.usda.gov/charts_and_maps/crops_county/cr-pr.php.
- Varela, A. G. 2010. Competitividad y ventajas comparativas de la producción de maíz en México. Rev. Mex. Cienc. Agríc. 1(3):381-396.