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Investigation Note

Creation of agricultural regions highly specialized in the cultivation of corn Case study: Sinaloa, Sonora, Nayarit and Jalisco

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Abstract

The creation of regional areas highly specialized in the production of a staple crop is an agricultural policy mechanism that facilitates the increase in production and productivity of land, by attracting greater quantities of sellers of agricultural inputs to the region, which causes obtaining inputs at wholesale prices, incorporation of technology by incorporating improved inputs and fertilizers, which should lead to the reduction of unit costs of the product, exchange of knowledge between producers about cultivating the agricultural product and greater management power to place the product they generate on the market. The procedure to be followed to generate a highly specialized region requires to be carried out in steps in time, in this case it is proposed to enhance production in the irrigation area of the region and then, a year or an agricultural cycle later, design measures to activate the rainfed producers in the same area, with the assurance that there will be previous results that help to polish the strategy of incorporation of the owners of rainfed lands, who, even from the activation stage of the irrigation areas, will have already had some benefits and incentives given by the greater presence of sale of inputs of lower prices as an effect of what was achieved in the first stage of the project with the producers who have irrigation for the crop.

Keywords: high specialization, regions, staple crops.

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One way to significantly increase the production of an agricultural good is to promote the production of this good in greater quantities in a group of states, neighboring each other, to turn them into a region highly specialized in a specific product, without this expression meaning that it will be the only crop in the region, but with a significant area devoted to a special crop. Sinaloa can already be considered as the state highly specialized in corn without ceasing to produce other important crops such as tomatoes. But if the states of Sonora, Nayarit and Jalisco are incorporated to form one of the areas of high production, it would surely become a regional zone that contributes with significant quantities of product not only to tend to national self-sufficiency but also to generate product for export.

In the case of corn (the main good for national consumption), it would be convenient to generate another, or two other regions specialized in corn to meet the demand of the southern, southeastern and eastern states. Although these other areas will not be addressed in the present research (OXFAM, 2018). A reference goal to be obtained in a first step is that in the states of Sonora, Nayarit and Jalisco, which also have a vocation as corn producers, the sowing of this crop in their irrigated areas is promoted, until reaching at least the same percentage of irrigated area sown with this crop in Sinaloa.

Advantages that can be expected: the area is recognized as highly specialized in corn, so there will be a high demand for productive inputs for this crop, a greater number of large distributors that supply these products can arrive, and producers can obtain these inputs at wholesale prices, especially if producer associations are formed to offer and place their product on the market during the harvest. A case currently observed in Sinaloa.

One more advantage is that it facilitates the management and obtaining of government supports such as commercialization supports, agricultural insurance subsidies and management of hedges in agricultural stock exchanges, among others (CEDRSSA, 2020). Corn is the main food product in the country, the area sown with staple crops is occupied by corn in a much greater quantity than each of all other crops considered as basic. However, the import of this grain reaches quantities of up to 15 million tons per year. Although certain quantities are also exported, it is most desirable that this product be generated in sufficient quantities to cover national consumption and export quantities already agreed (CIMMYT, 2019).

Corn represents the most produced grain worldwide. It continues to be the basis of food for millions of people, as well as a fundamental raw material for various economic sectors. Currently, in Mexico grain corn has an annual *per capita* consumption of 196.4 kg, the national consumption of corn in 2020 was 19 035 000 00 t. This represents a constant challenge to ensure food security in Mexico (SADER; 2022).

The substantially significant increase in the production of an agricultural good can be achieved if this activity is carried out in large regions highly specialized in the production of the good in question. This concept leads agricultural zoning to a more optimal and innovative stage, the formation of highly specialized regions, which establishes the basis of an economically profitable and permanent agriculture. For the identification and creation of these regions, it is necessary to analyze various sociocultural, economic and technological factors, inert in each state, Olivares *et al*. (2018).

An initial stage in this study consists of seeing what would be the impact on corn production if, in the region composed of 3 more states, neighbors of Sinaloa, (Sonora, Nayarit and Jalisco), it is promoted to sow corn in irrigated areas to achieve a partial short-term goal in each of the states, subject to the fact that, in the medium term, (one or two more years), they try to increase even more than what is achieved in the first established goal, also acting on rainfed areas.

The first goal is to identify the increases in corn production that would be obtained in the four participating states if, in each of these, the area sown with irrigated corn is increased until reaching the same proportion that is currently sown with corn under irrigation with respect to the total area sown under irrigation, including all other crops with irrigation in the state of Sinaloa. A second goal of greater increase in the area sown with corn should incorporate the purpose of increasing the area sown with corn under rainfed conditions, where there is a greater number of producers but with less potential to increase the production of the grain in question and with greater requirements for financial support to achieve increases in production levels.

The reason for carrying out the procedure of promoting the production of corn in two stages is to facilitate the achievement of the process, given that the resources that could be obtained to promote the production of this grain are sufficient to cover the part with the greatest potential and ease to increase production (the irrigated area sown with corn) where the best response to the objective in question can be achieved and subsequently and once the procedure has been refined, incorporate the producers currently growing corn under rainfed conditions.

Briefly stated: apply and refine procedures to substantially increase corn production in the three neighboring states of Sinaloa in the irrigation areas and in a later stage and depending on the previous results, promote the increase of corn production in rainfed areas in the sown area of the four states.

First, identify the increase in corn production in the area formed by Sonora, Sinaloa, Nayarit and Jalisco, if it is possible to sow the same proportion of irrigated area sown with corn that the state of Sinaloa currently has. Calculate the contribution that would be made to the amount of national consumption of corn that currently exists in the country. For this purpose, the quantities of corn currently obtained under rainfed conditions in the four states will also be added.

Once the result of the production expected with this measure is known, it can be evaluated to what extent the contribution to the product necessary for national consumption would be achieved. Depending on the results and evaluation of their importance to contribute to national objectives such as increasing the product for national consumption and exports and with procedures adjusted to the conditions of agriculture in other regions of the country, the final goal can be complemented by promoting in one or two more regions of the country, with the same purpose that they are regions highly specialized in corn production.

In the same way, using this procedure it is possible, in subsequent studies, to identify producing regions highly specialized in other staple crops, such as wheat and beans, to guarantee the quantities of relevant food necessary to improve Mexico’s food systems.

The objective of the research was to develop a technical procedure to design regions highly specialized in a substantial agrifood, taking advantage of and improving experiences of government programs that have existed, such as PROCAMPO, support prices, commercialization support and others that have been designed by the Federal Government and that have had very moderate results with respect to expectations.

The proposed hypothesis was that support programs for the agricultural sector should be developed in previous stages, in areas and groups of producers currently carrying out these activities, where they must be carried out in a pilot test and in the section with the greatest potential to respond to the objective of obtaining substantially greater quantities of product. Start on the irrigation area of the region. The tests in the same area that are carried out to obtain substantial increases in the production of a specific good must be carried out first in the best conditions (those of irrigation and with greater potential of the crop to achieve the objective) and later and having accumulated practices to refine the procedures of change, continue with the rainfed producers in the same area, where different procedures are surely required.

The procedure to be followed in the present research consists of the following: identify the number of hectares sown under irrigation, the number of hectares sown with corn in that irrigated area and the corn production currently obtained from irrigated corn in each of the four states. Obtain the respective information in the three neighboring states Sonora, Nayarit and Jalisco. Achieve the state and total production levels currently obtained in the area. Calculate the areas of corn under irrigated conditions that should exist in each state to reach the same percentage of irrigated land sown with corn with respect to the total area sown with irrigation that exists in the state of Sinaloa.

Calculate the expected impact on grain production when replacing the irrigated areas sown with corn in each of the other states with areas that correspond to the same percentage of irrigated corn sown in Sinaloa. Identify the total amount of corn production by adding the production of corn under rainfed conditions to what was obtained in the previous paragraph. Calculate the contribution of corn that would be generated in the area to cover national consumption (Table 1).

Table 1. Current areas sown with corn in the highly specialized Northwest region.

State	Total area sown with irrigation (ha)	(%)	Area sown with corn with irrigation	(%)	Corn production with irrigation by state (t)	Yield (t ha^{-1})
Sinaloa	740 482.22	100	459 835.34	62.1	5 466 141.19	9.77
Sonora	404 545.68	100	67 987	16.81	785 860.3	11.56
Nayarit	46 344.55	100	2 886.5	6.23	23 467.71	8.13
Jalisco	169 542.85	100	43 980.43	25.94	339 438.93	9.08
Total	1 360 915.3	100	574 689.27	-	6 614 908.13	

Includes all crops sown under irrigation in the state. With data obtained from SIAT-SADER (2021).

The results obtained maintaining the same existing data in the state of Sinaloa, the total production that would be generated if, in the four states, the same proportions of irrigated area sown with corn in Sinaloa are sown in their respective irrigated areas, estimated data in the four states the same proportion of irrigated land, which is sown in Sinaloa, will be sown with corn, which are presented in Table 2.

Table 2. Comparison of 62% of area to be sown with irrigation to reach the (%) that Sinaloa has.

State	Total area sown with irrigation (ha)	(%)	62% of area to reach the (%) of Sinaloa	(%)	Yield (t ha^{-1})	Corn production by state (t)
Sinaloa	740 482.22	100	459 835.34	62.1	9.77	5 466 141.19
Sonora	404 545.68	100	251 222.87	62.1	11.56	2 903 879.86
Nayarit	46 344.55	100	28 773.76	62.1	8.13	233 935.3
Jalisco	169 542.85	100	105 285.17	62.1	9.08	812 586.06
Total	1 360 915.3	100	845 120.83	62.1		9 416 542.41

Including all crops sown under irrigation in the state. Original data from SIAT-SADER (2021).

First partial result

If the area sown with irrigated corn in the study region manages to sow 62.1% of the area currently irrigated in each of the states, the volume of corn production under irrigation conditions would go from 6 614 908.13 t to 9 416 542.41 t, which would mean an increase of 70.25% in the amount of corn product, only that grown under irrigated conditions in the states of Sonora, Sinaloa, Nayarit and Jalisco. If we also add the production that is currently sown with rainfed corn in the four states mentioned, which is presented by state and the total in them in Table 3. The total contribution of this grain to the objective of tending to produce what is necessary for the national consumption of corn has the following results.

Table 3. Rainfed corn sowing area in the highly specialized Northwest region.

State	Total area sown with rainfed corn (ha)	Rainfed corn production by state (t)
Sinaloa	29 621.89	65 798.01
Sonora	1 841.5	3 025.4
Nayarit	22 314.5	89 411.98
Jalisco	543 360.7	3 356 889.68
Total	597 138.59	3 515 125.07

Original data from SIAT-SADER (2021).

The result of the impact that the irrigated corn production would have with the proportions of corn cultivation in the same percentage of irrigated area sown with corn in Sinaloa, plus what is currently produced under rainfed conditions and its relative importance to reach the amount required to satisfy national consumptions (Table 4).

Table 4. Impact achieved with the creation of the highly specialized region.

Corn production in 62.1% of the irrigated area	9 416 542.41
Current production under rainfed conditions	3 515 125.07
Total, to be produced in the study area	12 931 667.48
National consumption of corn in Mexico	19 035 000
Contribution of the region to national corn consumption	67.9%

Original data from SIAT-SADER (2021).

Conclusions

Achieving the partial goal set in this paper means that the area highly specialized in corn formed by the states of Sinaloa, Sonora, Nayarit and Jalisco would produce 67% of the national corn consumption in the country. The remaining 32.1% can be achieved in one or two more regions of the country, where the other areas highly specialized in corn were established to tend to additionally cover the quantities scheduled for export and for substitution of current imports.

Promoting the production of corn in greater quantities in a group of states, neighboring each other, to make them a region highly specialized in this crop guarantees an increase in production with a single region. This guarantees the access to this agrifood for the national population. The identification and establishment of highly specialized regions also promotes optimization and productive innovation, as well as the formulation and implementation of institutional programs focused on the specific potential of these regions, which will guarantee a greater impact on national production and economy.

Recommendations

The creation of the area highly specialized in corn can be achieved with intervention measures of the state delegations of SADER and their respective Rural Development Districts with supports that have already been scheduled, redirecting part of these to the obtaining of the purpose in question. As it is the main product of food consumption in Mexico, additional resources can be processed before SADER to design and apply additional incentives to producers to achieve the aforementioned purpose. Such as aggreging with buyers before sowing, by both national and local government support institutions. Establishing agreements of quantities, places of delivery of the product and price equal to that in the harvest stage but establishing a minimum price in the agreement.

Additionally, 'hedges' can be obtained in the agricultural stock exchange, of which there is extensive history with direct support from the Federal Government through the Secretariat of Agriculture to contract hedges in the Chicago grain exchange. Collecting experiences in the DDRs of the participating states to promote increases in areas to be sown with crops of social interest.

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