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Circular economy production models as an alternative for economic growth in the Municipality of Vega de Alatorre, Veracruz, Mexico

Modelos de producción de economía circular como alternativa de crecimiento económico en el Municipio de Vega de Alatorre, Veracruz, México

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Abstract

The agricultural sector in Mexico is by far, the most vulnerable sector in social and economic terms, given the low technification that the sector has for the realization of their economic activities, coupled with the above, the loss of land available for cultivation or livestock in the country, it is imperative to find solutions that allow the optimization of resources that this sector has, this from a production model based on industrial symbiosis, in order to generate a circular economy model that industry level becomes a watershed for the improvement of the economic conditions of the aforementioned sector. The objective of this article is to exemplify the alternatives observed in these sectors as a methodology applicable to the sector.

Agricultural sector, Industrial symbiosis, Circular economy model, Methodology

Resumen

El sector agrícola en México es por mucho, el sector más vulnerable en términos sociales y económicos, dado a la baja tecnificación que el sector tiene para la realización de sus actividades económicas, aunado a lo anterior, la perdida de terrenos disponibles para el cultivo o la ganadería en el país, resulta imperante encontrar soluciones que permitan la optimización de los recursos con los cuales cuenta este sector, esto a partir de un modelo de producción basado en la simbiosis industrial, con el fin de generar un modelo de economía circular que a nivel industria se convierta en un parteaguas para la mejora de las condiciones económicas del sector antes señalado. El presente artículo, tiene como objetivo ejemplificar las alternativas observadas en estos sectores como una metodología aplicable al sector.

Sector agrícola, Simbiosis industrial, Economía Circular, Metodología

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Introduction

The rural sector in Mexico, as in the rest of Latin America, has a very low technological and scientific development in relation to other countries that have bet heavily on their agricultural production by developing technology, bringing with it a limited use of the land available for cultivation.

According to the FAO of the total hectares available for cultivation in Latin America, only 19.04% is being used, when in regions such as East Asia 63.38% is used and in South Asia 94.04%, which demonstrates the inability to through technology to take advantage of the orographic conditions in which the Latin American countries are found.

Mexico as a member of these countries is not the exception, in April 2019 there are 3,520,332 hectares of different crops planted, of which 1,010,551 hectares were actually harvested, resulting in a productivity of just 28.7%, that is, 71.3 The remaining % represents a waste or loss, because it was either damaged or was unproductive. It is worth mentioning that these data correspond to the sum of irrigation and rainfed producers added according to the Agrifood and Fisheries Information Service (SIAP)

In addition to the above, food security in Mexico is one of the most important problems to address, since as stated (Urquía-Fernandez, 2014) Food and nutritional security in Mexico presents a panorama of great contrasts. Although the supply of food energy available in Mexico exceeds the requirements to cover the demand, the strong deficiencies in access originate a heterogeneous panorama of great deficiencies that require targeted interventions in certain population groups and in certain regions.

The municipality of Vega de Alatorre Veracruz is no exception in terms of the precarious technological condition dedicated to the production of the primary sector, this being one of the municipalities that, according to the migration office of the H. City Council of Vega de Alatorre, has suffered a decrease in the productive force of the agricultural sector derived from the decrease in the production of areas dedicated to agriculture, being forced to emigrate from the country in search of better economic opportunities.

This type of phenomenon such as migration is largely due to the low productivity of the municipality's fields, given the technological conditions where it is only cultivated under rainfed irrigation conditions, with no technification in terms of irrigation systems.

Economic structure of the primary sector in Vega de Alatorre

To talk about the economy and the primary sector of our country, it is important to return to the aforementioned concept of the hectares of crops planted and the areas actually harvested, since this brings with it at least two problems that we can directly observe; the first is the issue of food safety, since what the market is requiring is not produced; secondly, and as a consequence of the first, a negative economic impact, that is, a food and economic deficit within the trade balance.

In the productive field, despite the dynamism of agri-food exports, the agri-food trade balance deficit doubled between 2000 and 2011 to reach 5 billion dollars and imports in volume of several strategic products (rice, yellow corn, wheat, soya) have increased to exceed their national production. This is directly related to low productivity in the sector. The growth of the agricultural GDP –which includes livestock, forestry, hunting and fishing– remained at average values of around 1.1% per year between 2000 and 2011 (Urquía-Fernandez, 2014).

There is also a great concentration of production. 50% of the total value of agricultural production and the production of food of animal origin is concentrated in seven states: Jalisco, Veracruz, Sinaloa, Michoacán, Sonora, Chiapas and Puebla. Of the 5.3 million rural economic units (UER) in the country, “thriving” and “dynamic” business units represent 8.7% of the total and generate 74.2% of the sector's sales. 50% of these EBUs are also concentrated in seven states: Sinaloa, Sonora, Chihuahua, Jalisco, Guanajuato, Tamaulipas and Baja California (Urquía-Fernandez, 2014)

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The municipality of Vega de Alatorre, has 3 primary economic activities, livestock, especially cattle, which is divided into fattening and milk production, in turn the latter gives rise to the most important transformation activity in the municipality such as dairy production, mainly cheese. On the other hand, agricultural production is given as a second sector in importance, where its products with greater volume are bananas, corn and watermelon, the latter only once a year, obtaining some other products that in quantity do not represent a significant amount.

Finally, the fishing sector is the third in importance within the economic activities of the municipality, given its geographical position close to the sea, in addition to the lagoons and rivers of the sector.

However, even with the different economic activities and favorable geographical conditions that are available in the municipality, there is a lack of a great economic affluence in the area in terms of per capita income, since the salaries of the agricultural, fishing and livestock are really low compared to what is available in other municipalities, this is because the prices under which the different products in the area are marketed are not enough to be able to provide a better salary in the area or , as in the case of watermelon production, this lasts a short period between the preparation of the land, planting and cutting it, in addition to that it is only carried out once a year.

Derived from the above, it is important to recognize that in the municipality there are no companies dedicated to the production and transformation of raw materials, being only some of the dairy sector mainly, those that carry out said activity, being in its majority, a production almost in its entirely in an artisanal way, which in terms of production reduces its volumes and maintains high costs that do not allow mass production at low cost.

Method: the circular economy as an alternative for economic growth

A circular economy is restorative and regenerative by design, aiming to always keep products, components and materials at their highest usage levels. The concept distinguishes between biological cycles and technical cycles. (Cerdá & Khalilova)

The concept of circular economy as such may seem modern to us, however, it is nothing more than retaking some practices that were already used in the past, such as the reuse or maximum use of the resources produced.

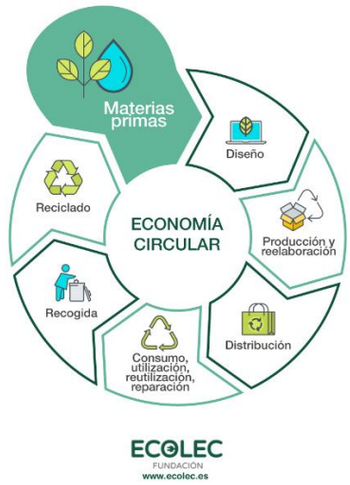

Figure 1 Circular economy
Source: www.ecolec.es

According to Cerdá and Khalilova (s/d) there are 4 factors that make up the circular economy cycle, which are briefly described as follows:

a) Innovative business models: within the models the following can be identified.

Product-service systems: it consists of the mixture of tangible products and intangible services, which, combined and designed together, are capable of satisfying the final needs of the consumer. This concept is supported by two pillars: 1 functionality or satisfaction that the user wants to achieve and 2 the business system that is proposed from the first.

Second life of materials and products: it works when products can be efficiently recovered and re-conditioned after their primary use, so that once they are discarded, they can start a cycle of new use of their life.

Product transformation: corresponds to the reconfiguration or arrangement of the components of a product for a new use and in turn satisfaction of a new need, different from the original one in which said product was conceived.

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Recycling 2.0. innovation in recycling technology (recycling 2.0) is rapidly evolving and makes it possible to produce high-quality goods with fantastic results in terms of sustainability (Id.)

Collaborative consumption: in simple terms it is understood as the shared use that is given to a product of the same nature by different consumers who are interrelated, whether through digital media or not.

b) Eco – design and design for sustainability: which refers to the environmental improvement of the product or service in all stages of the life cycle, from creation to becoming waste.

c) Prolong the useful life of products: which implies eliminating programmed obsolescence as much as possible in order to prolong the useful life of products, this implies durable manufacturing, conditioning, renovation, updating, replacement and repair.

d) waste prevention programs: seeks through planning to minimize the entry of raw materials and waste through process improvement.

As it is pointed out, there are 3 the most important economic sectors of the municipality in which this research is focused, it is important in the first place to establish alternatives for the production and use of the resources that are produced here and likewise to innovate in the production of the products.

One of the examples that arises as a proposal for production from the first production cycle within a circular economy for the municipality of Vega de Alatorre, is presented in the production of Corn, which according to what was presented by the Office of Agriculture of the H. City Council of Vega de Alatorre (2021) 40% of the territory destined for the agricultural production of the municipality is dedicated to the sowing of said product.

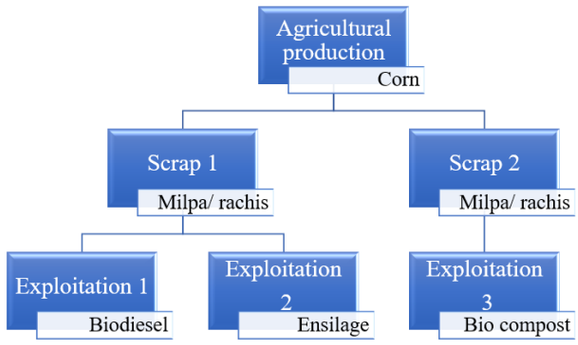

Figure 2 Circular economy of corn
Source: Own elaboration

As we can see in illustration 2 Circular economy of corn, there are at least 2 types of waste that represent at least 3 by-products that could serve to boost the economy of the municipality at a given time, it is worth mentioning that in this production cycle the elaboration of biocompost, which closes a virtuous circle in agricultural production, since it retakes production waste to reach an organic production cycle at a given moment.

This production of biocompost would not only be used in the production of the corn that is mentioned above, but also for many of the crops that are currently grown in the area, which, as indicated at the beginning of this document, the banana and watermelon are two of the main crops in the area, in addition to different types of pastures that are planted with the aim of feeding the cattle in the area, which, as has also been pointed out, represents the other most important industry in the municipality.

Given the importance of the livestock sector in the municipality, it should not be excluded from a circular economy model since, given the close relationship between the sectors of the economy, the development of both agriculture and livestock is inherent. in a proposal like this.

The municipality to which reference is made, is undoubtedly the production of milk and its derivatives one of the main activities of the economy, therefore, this sector, although it is true, is the most developed economically, it is also the one that represents a greater environmental impact in the area, derived from the waste that is produced.

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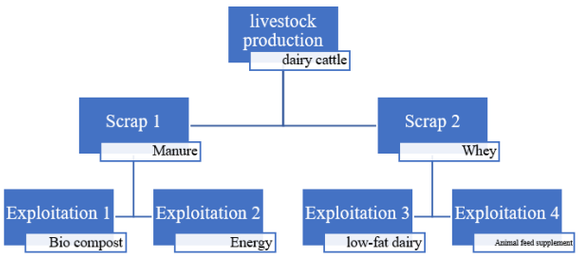

Figure 3 Circular economy of dairy cattle
Source: Own elaboration

As we can see in illustration 3, there are at least four uses that can be obtained in the proper management of waste from the production of the dairy cattle industry.

We cannot fail to notice that this is just one example of the possibilities of turning 2 industries into mutual suppliers, but that this also poses an improvement in the sense of environmental impact, food security and economic development of the area, however they are not the only 2 that have such a relationship, because as mentioned, fishing, another primary industry, is one of the 3 main activities in the area, which has ample possibilities of benefiting from and at the same time being a provider of the others two previously mentioned industries.

Agricultural circular economy as the engine of organic production

As we can see in the previously proposed schemes, the waste generated is of animal origin, which at a given moment represents an opportunity to produce organic products.

As noted on its website (FAO, 2021) Organic agriculture takes an active approach rather than dealing with problems as they arise.

It directly seeks to improve the sustainability conditions of the ecosystem, but it also has an impact on other factors such as food security and the economic impact, both of the products and of the consumer, derived from the production costs and the prices at which it is achieved. be marketed.

We know that the marketing prices of organic products and agricultural products in general are usually governed by the law of supply and demand, however, it is known that the price of organic products far exceeds the price of non-organic products.

To cite an example, the price of a kilogram of non-organic white corn, according to what is reported by the National Market Integration Information System (SNIIM, 2021), is a maximum of $8.50 in the State of Veracruz.

On the other hand, according to the quiminet website (Quiminet, 2021) a site where suppliers and buyers of different agricultural products interact, the price of organic corn is 3.75 USD (at the exchange rate of $20.96). sale of $78.60 MXN.

As we can see, only in the matter of the price of corn results in a considerable increase of more than 900%.

The circular economy: a necessity to guarantee food security

All those involved in a production chain in the agricultural sector are immersed in a global revolution that urgently needs to replace the traditional model of linear production (exploitation of resources-use-dispose) with a circular system that guarantees to be sustainable and competitive in search to guarantee that all the people of the municipality of Vega de Alatorre at all times have sufficient physical and economic access to nutritious and safe food.

Taking into consideration what is stated in the previous paragraph and in contrast, it is said that there is food insecurity, when people are malnourished due to the material unavailability of food, their lack of social or economic access and/or insufficient food consumption (Guevara , 2013) situation that undoubtedly exists among the population of the municipality, the people exposed to it, are those whose food intake is below their minimum caloric needs, as well as those who show physical symptoms caused by lack of energy and of nutrients as a result of insufficient nutrition.El grado de vulnerabilidad de una persona, un hogar, un grupo de personas está determinado por su exposición a los factores de riesgo y su capacidad para afrontar o resistir situaciones problemáticas (Molina,1995)

There are basically two types of food insecurity, chronic and transitory. In the first, the duration is long-term and occurs due to long periods of poverty, lack of assets and access to productive or financial resources.

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The second is temporary in nature and occurs when short-term shocks and fluctuations occur in food availability and access. It is not enough just to know the duration of the problem, it is also necessary to know how intense or severe its impact is on the nutritional status of people, in addition to providing improvements in the public policies of the municipality that lead to effective actions both for the improvement of the economy as well as the quality of life of the population.

Predictions according to the Future's Center website (Future's Centre, 2021) by 2050 show that the world population will reach 10 billion, the middle class in emerging markets is expected to double their share of global consumption from one-third to two thirds, and the global economy is expected to quadruple.

Conclusions

The circular economy as a worldwide trend in highly developed countries is not only a possibility for countries with highly developed industries, but also represents a window of opportunity for the agricultural sectors of developing countries such as Mexico.

Especially the state of Veracruz, a state with wealth at the agricultural level, has been a state that is believed not to have had a development according to its natural wealth, however, the growth of the industry from an agricultural scheme such as that of the circular economy is perhaps the most viable way to achieve the economic success that is required. Just to cite an example, in 2020, 200 thousand tons were produced, which, at 2021 prices, reach a price of up to $11,000.00 per ton.

According to data, the municipality of Vega de Alatorre produces 6% of the state's production, that is, approximately 12,000 tons per year, which represents $132,000.00 per year for the producers, which if it were possible to produce under a circular economy scheme would give As a result, an organic production once the proper soil certification processes have been carried out, increasing from $11.00 per kilogram to $19.90, that is, an 80% increase in its final sale price.

The methods used to estimate the state of food insecurity generally do not consider vulnerability and risk factors together.

According to (FAO, 2014) Food Security objectives are met when all its dimensions are developed simultaneously; therefore, the circular economy production model is a simple and efficient alternative for joint implementation in the region.

Finally, we can see that the circular economy has the results that, on the one hand, the environmental impact is reduced; The value of the products is increased if we carry out a certification process for organic products and, in turn, the possibilities of growing the industry through complementary economies or those derived from a primary industry are increased, that is, it is a win-win process.

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