Journal of Business and Economics, ISSN 2155-7950, USA
March 2024, Volume 15, No. 3, pp. 142-153
DOI: 10.15341/jbe(2155-7950)/03.15.2024/002

http://www.academicstar.us

Environmental History and Agricultural Policies in Latin America: Transformations in the Northern Region of Jalisco

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Abstract: In the 1990s, agricultural policies were implemented, leading to a gradual liberalization of agricultural markets. This sector in Latin America became part of the dynamics of globalization, causing these countries to seek increased productivity to enhance their international competitiveness, regardless of the social and environmental costs. The vision of these policies has mainly conceived short-term benefits for local populations. Since this period, rural regions have been shaped by different forms of production, such as agro-industrial complexes controlled by transnational companies and local farmers, most of whom practice traditional peasant agriculture. This type of agriculture may have lower agricultural and livestock yields but tends to be less resource-depleting and therefore more environmentally friendly. The objective of this work is to present the agricultural transformations in northern Jalisco from the implementation of liberal policies in the 1990s until 2020. This period is considered due to the increase in productive intensification, leading to serious environmental imbalances and the degradation of regional ecosystems. The study is based on a space-time comparative analysis of changes in agricultural land use. In the northern region of Jalisco, the advance of capitalist agriculture is evident through a shift in production. The expansion of livestock farming in the region has led to a decrease in the cultivation of native maize in favor of hybrid grain cultivation primarily for cattle fattening. This has impacted ecosystems, as hybrid seeds require more inorganic fertilizers and intensive use of pesticides, which contaminate the soil, aquifers, and air. Additionally, it affects the population's diet, as the consumption of native maize has decreased, and now the population relies on forage maize.

Key words: environmental history, agricultural policy, and Northern Region of Jalisco

JEL codes: Q, Q5

1. Introduction

It is difficult to talk about sustainable agriculture in Latin America when the traditional agricultural sector, which used fewer polluting inputs (fertilizers, pesticides, herbicides, heavy machinery, etc.), has transformed into

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an industrial agricultural sector that contaminates to a greater extent. This transformation aims to compete in international markets due to trade liberalization (Pérez, 2012). In the same vein, agricultural policies have been implemented in the countries of this region without any environmental questioning. There has been no legislation regulating the use of natural resources, and at the same time, technological packages that developed countries no longer use due to their legislation prohibiting them have been imported. These technologies are highly contaminating, such as glyphosate, which is currently used in the northern region of Jalisco.

The implementation of agricultural policies for Latin America has modified productive patterns, with intensive use of natural resources. From a regional perspective, the changes that have occurred since the new neoliberal development model implemented by international organizations for all of Latin America in the 1990s can be understood. This model has transformed the agricultural sector into an industrial and export-oriented production, changing the human-nature relationship in local production systems.

The work is divided into four sections. The first section provides a theoretical review of the human-nature relationship based on agricultural production. The second section addresses a historiography of agricultural policies since World War II for the rural territorial development of Latin America, with the aim of observing the paradigm shift. The third section shows the socio- economic and environmental impact of globalized agricultural production in northern Jalisco. Finally, a fourth section presents the conclusions.

2. The Relationship Between Humans and Nature and Agricultural Production

Worster (2008) points out that throughout history, humanity has faced crises related to the natural world. The first of these occurred with the mastery of fire, the second with the invention of agriculture and the sedentarization of societies, leading to the emergence of great civilizations. These processes resulted in the development of crises at the local level, where human involvement exceeded the capacity of ecosystems to sustain. However, these challenges were somewhat overcome through technology and new mechanisms of natural dominance. Nevertheless, the author notes that the current crisis, which has a global character, is the result of the industrial revolution, where societies intensified the exploitation of nature.

Worster (2008) asserts that environmental history begins with humanity's primary satisfaction, that of satisfying hunger through the transformation of the environment. With the rise of industrial economy, agriculture also undergoes changes in its process, which have been critically scrutinized. Claims argue that such agro-industrial development threatens human civilization itself.

William Cronon (1993) emphasizes that transformations in nature are generated by the relationship with humans. The author explains that environmental history leads to an explanation of current cultural developments historically in each region. In the same vein, he emphasizes that there is no humanity outside of nature, and the destruction of nature would be detrimental to humans themselves. Therefore, he concludes that environmental history is simultaneously related to spiritual history, human consciousness, and the socio-economic history of human society.

With the onset of the industrial revolution, researchers became concerned with analyzing capitalist socio-productive relations that impact the natural environment. Foster (2000) explains that Marx developed the dialectic of human society with nature. In his research, he criticizes Malthusian ideas, leading to the concept of "metabolic rift". To understand this concept, a historical debate on soil degradation that emerged in the mid-19th century is reconstructed.

Industrial civilization shows a rupture in the relationship between humans and nature, with the former considering themselves superior to the latter and commodifying nature, which inherently has a use value and exchange value. Industrial growth has not narrowed the gap between poor and rich countries; on the contrary, it has increased social inequalities (González & Toledo, 2011).

Environmental history is a hybrid discipline that arises from the limitations of other knowledge disciplines to analyze current complexity. Economic science has focused solely on studying the agricultural sector, maximizing production, productivity, competitiveness, and other macroeconomic aspects but lacks objectivity toward ecological damage. For a study that addresses all important aspects of both humans and nature, it must relate to other knowledge disciplines, making an original synthesis of earth and life sciences.

González and Toledo (2011) emphasize that the goal of environmental history is the study of human beings with the environment, i.e., the relationships between society and nature. Environmental history is more than the history of environmental damage; it is also the history of ecological rationality in a broad sense. In every human society, the cycles of regeneration and reproduction of materials and energy, as well as the productive capacity of ecosystems, are determined in the long term. According to the human perspective, always in the presence of certain conditions of stability. The authors also point out that large physical-biological cycles impose conditions on the development of societies, such as climatological fluctuations, which have significantly influenced the evolution of agricultural activities.

Humans interfere with ecosystems, causing abrupt changes in a short time compared to the evolutionary trends of nature, which take many years. An example is the accelerated expansion of African deserts that has been favored since World War II. After the war, changes in agricultural production led to deforestation erosion and overgrazing of animals. Nature’s recovery does not occur simultaneously with social development, so historical times must be combined to avoid continuing this civilization crisis (González & Toledo, 2011).

Capitalism as a mode of production interacts with other modes of production to dominate them. In this sense, industrial agriculture engages in a power struggle with subsistence agriculture or traditional agriculture in regions worldwide, especially in Latin America. The capital’s objective is to expand the frontier for greater accumulation.

3. Agricultural Policies for Latin America

The capitalist production system is based on the disarticulation of humans from nature, which can unleash repercussions compromising human life on the planet as we know it. This system is rooted in economic development, and international organizations governing global decisions have implemented initiatives for the rural territorial development of Latin America, favoring their own interests and those of financial capital within a World System, where central economies control the decisions of what and how peripheral countries should produce (Moore, 2003).

Since World War II, Kay (2001) identifies five paradigms that occurred for the development of rural territories in Latin America, recognized by the implementation of agricultural policies: structuralism (1950-1970), modernization (1960-1970), dependence (1970-1980), neoliberalism (1980-1990), and finally, neostructuralism in the 1990s. These policy changes favored the modernization of rural communities, involving the updating of technology and the promotion of industrialization within agricultural production systems with technological packages from the so-called Green Revolution. The goal was to replace the traditional sector with low productivity and little integration into international trade (Fernández, 2016).

According to Carson (2002), technological packages from the Green Revolution wage a war of man against nature. They consist of herbicides, pesticides, petroleum-derived inorganic fertilizers, capable of killing every insect, good or bad, silencing all birds, immobilizing fish leaps in rivers, with the aim of generating good harvests.

In 1950, International Organizations (World Bank, International Monetary Fund, World Trade Organization, etc.) promoted an agricultural policy for less developed economies in Latin America, Africa, and Asia, called Community Development. Its aim was to counteract poverty in rural regions by increasing agricultural production and consequently raising the incomes of rural families. This involved acquiring skills and using agricultural technologies developed from the Green Revolution (Seibane, 2013).

By the mid-1960s, programs driven by Community Development policy began to disappear because the United States ceased funding them, citing their poor coordination, low resource allocation, and impact (Fernández, 2016). In 1965, agricultural production in Latin America increased by 9.5%, transforming territories towards modernization. However, not all productive agents opted for these practices, leading to a sociocultural change in rural family production units, which underwent a transformation in their production systems to integrate into a global economy (Fernández, 2016).

During the period called stabilizing development in Latin America, there were tariff barriers, price fixing protecting internal markets from external competition in the agricultural sector. By 1966, agricultural exports lost ground as the main source of financing for capital goods imports. In the 1970s and 1976, Latin American agriculture entered a period of stagnation, where crops for internal and export consumption lost dynamism, and basic grain crops were most affected. The agricultural development model called Import Substitution Industrialization (ISI) initiated in this period began to exhaust. Consequently, the importation of basic grains began, leading to the introduction of the new development model (Vargas, 2005; Bonfanti, 2015).

In the 1980s, neoliberal policies began to be implemented by the World Bank and the International Monetary Fund as the only economic and social corpus possible in the current agricultural territorial development (García, 2003). However, it is from the 1990s that Latin America sees a paradigm shift with the implementation of neoliberal-oriented agricultural policies. In these new scenarios, the commercial opening process characterized by tariff reductions, free trade agreements, and multilateral commitments acquired in the World Trade Organization (WTO) began. These measures have imposed restrictions on decision-making in agriculture and rural life. The liberalization of markets has reduced state intervention in search of equity, with sectorial and territorial initiatives to benefit macroeconomic balances (Delgadillo, 2006).

Structural adjustment policies sought to benefit capital ultimately, contributing to globalization and uneven geographical development, generating selective vulnerability. Wealth and opportunities concentrate in a few regions, causing socio-economic implications for rural inhabitants, such as unemployment, degradation of living standards, loss of natural resources, and their production systems (Garay et al., 2017; Hernández, 2021).

Intensive agricultural activity, due to its costs, cannot be harnessed by societies and individuals in general; only those with greater investment capacity can carry it out. This explains that it also causes inequality in territories and is often carried out in developing countries with lax legislation on environmental restrictions. It is characterized by intensive use of agrochemicals and deforestation of primary forests for new cultivation areas or pastoral activities, leading to soil degradation, loss of traditional agricultural habitats, nitrogen pollution, and climate change.

Another characteristic of this production model is that, regarding land tenure in peripheral countries, they do not even acquire or pay a fair price for the land, as they only rent it for agricultural cycles, depleting all its

resources and returning it to its owners when its productive capacity decreases (Reyes, 2022).

Agricultural policies in Latin America have been implemented under the premise of the territorial development of rural regions, transforming the organization of factors within their geographical spaces, directly or indirectly modifying social, cultural, environmental, and economic aspects in the inhabitants of rural territories (Preda, 2015). The application of neoliberal policies in agricultural spaces has generated dependence on the importation of these products. They have been based on the division of labor, causing countries to specialize in only a few products, affecting productive variety. This, among many other causes, has led to an unprecedented rise in food prices, making it impossible for poor families in the region to access a healthy and balanced diet (FAO, 2019).

Agricultural policies were established as a mechanism for rural territorial development, in a global context of open economies. In this sense, the concept of policy is understood as the instrumental action that pursues certain goals in the construction of a social order (Lechner, 1986). The way in which States act, represented in their actions, determines the government-society relationship. Social policy interactions have been identified as the interaction between a state and society (Palermo & Melamed, 2013).

The heterogeneity of Latin America makes it challenging to study it collectively. Therefore, one must observe the rural territorial development policies affecting family production systems in each country. Similarly, the agricultural policies applied in Mexico have not yielded the same results locally due to differences in its regions. Therefore, this study analyzes how these agricultural policies have impacted the case of northern Jalisco, Mexico.

In Mexico, during the period of Salinas de Gortari (1988-1994), changes were made, such as deregulation and administrative simplification in rural territories, eliminating price guarantees and rationalizing subsidy schemes. It promoted a free trade scheme towards the production and marketing of agricultural products. This new development paradigm needed to conclude the agrarian reform, as it represented an obstacle to the beginning of negotiations for the North American Free Trade Agreement (NAFTA). To achieve this, amendments were made to the constitutional Article 27, allowing the celebration of sales, lease, or mortgage contracts and transferring ejidal property rights to private initiative in rural areas. The president at that time argued that this would attract the necessary capital to rural territories, improving living standards (Vargas, 2005; Hernández, 2021).

Luis Téllez, Undersecretary of Planning at the Ministry of Agriculture, Livestock, and Rural Development during the same period, published that Mexico should stop producing grains and cereals. The United States and Canada have better conditions for their production, and Mexico should focus its agricultural production on vegetables and tropical fruits, as it has a comparative advantage (Téllez, 1994). However, within the policy application, it was not mentioned that small family production units would be severely affected, and the proposed new processes in agricultural production were detrimental to local ecosystems. Therefore, the next section of the research analyzes the socio-economic and environmental impact of agricultural production in northern Jalisco, Mexico.

4. The Socioeconomic and Environmental Impact of Agricultural Production in Northern Jalisco, Mexico

The northern region of Jalisco comprised different spaces and ecosystems compared to those in the central and southern parts of Mexico. The dry climate favored the existence of nomadic indigenous groups in Mezquitic, relying on hunting and gathering for sustenance. With the arrival of the Spanish, there was a transformation of the

landscape and changes in cultural and economic activities (Salas, 2020). Currently, the northern region of Jalisco includes 10 municipalities, but this study focuses on five due to their proximity and biogeographical and climatological similarities: Colotlán, Huejúcar, Santa María de los Ángeles, Totatiche, and Villa Guerrero, covering an area of 2975.18 km². Since colonial times, it has been known as a producer of corn and beef cattle, characterized by some authors as a rancher's area (Fábregas, 2020; Ultreras, 2007; Shadow, 2002).

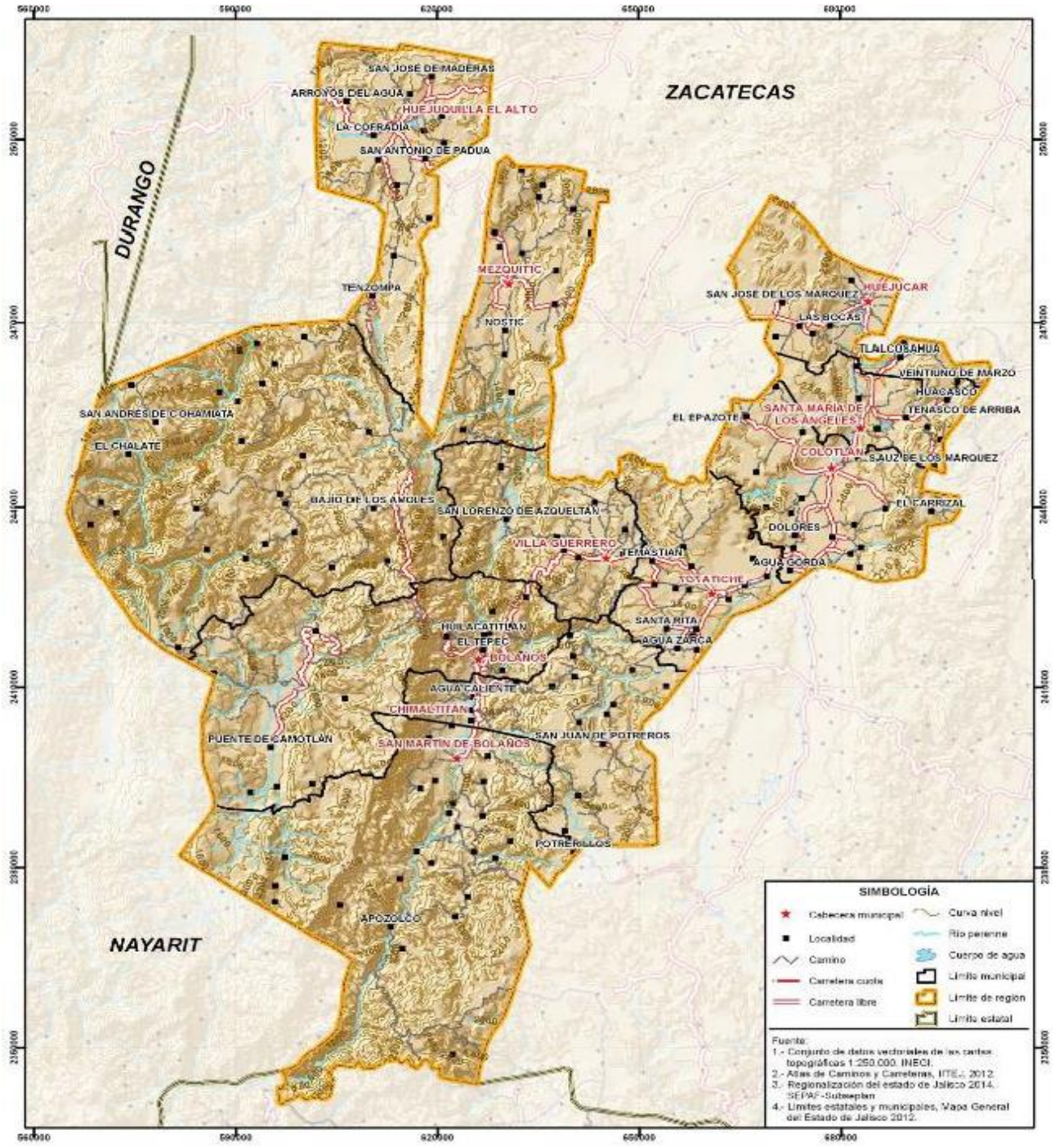

Figure 1 Map of the Northern Region of Jalisco

Source: IIEG, Jalisco State Institute of Statistics and Geographic Information (2019).

Due to its biogeographical and climatological conditions, a mixed system has been favored under rainfed conditions and extensive farming. The region is located to the north of the Sierra Madre Occidental, bordered to the south by the Neovolcanic Axis province, with the Pacific coastal plain to the west and the Central Plateau to the east. Dry climates predominate, although depending on elevation, warm climates are also present, typical of deep canyons, with an annual precipitation of 653 mm (CEAJ, 2020).

There are alluvial and volcanic residual soils that, depending on topography and climate, are utilized for agricultural and livestock activities. The conditions of marginalization led to weak integration within interregional economic spheres, and local production was oriented towards self-sufficiency before the 1990s (Escobedo, Pérez, & Escobedo, 2022; Shadow, 2002).

The northern region of Jalisco has shifted from traditional corn cultivation to intensive forms of exploitation, incorporating practices such as the use of improved seeds, pesticides, herbicides (glyphosate), and petroleum-derived inorganic fertilizers for the production of forage corn used in livestock feed. There is also a growth in the cultivation of crops such as agave and the establishment of agro-industries such as the Tajín company and El Petacal (Partida, 2022).

"This has caused changes in the territory, the abandonment of rural areas, depopulation of the zone, as well as problems of water stress, especially from March to June, variations in the diet of the inhabitants, which has affected the quality of nutrition and their health. Significant impacts on ecosystems have also been observed" (Shadow, 2002).

In the case of northern Jalisco, the persistence of ranchers, who are part of a family production system where labor and production financing come from family resources, has ensured the preservation of existing relationships and the practice of unique activities. For example, the migration of livestock over long distances to the canyons has become a form of resistance that contributes to the subsistence of the inhabitants. However, these systems have been in constant conflict with the policies implemented for territorial development since the 1990s, which aim to redirect them towards other types of food production.

By the year 2020, these five municipalities in northern Jalisco had a total population of 38,829 inhabitants. The average education level of the population is 7.96 years of study, indicating that most of the population barely completes secondary education. This, in turn, means that the residents are not well-prepared to observe the environmental effects resulting from anthropogenic pollution derived from intensive agriculture and livestock farming. About 83% of the production is dedicated to corn, with an exponential growth in forage corn. Monetary transfers through the PROAGRO program amounted to $5,762,000, benefiting 1,236 farmers. Regarding the corn cultivation, the planted area represented 24,304 hectares, while the harvested area was 24,154 hectares, resulting in 150 hectares lost. The total production amounted to 296,628.13 tons, with a total productivity of 12.15 tons per hectare (INEGI, 2020; SIACON, 2020).

According to Rubio (2008) and Otero (2013), Mexican regions, in the face of trade liberalization, have had to compete disadvantageously with agro-food giants such as the United States and Canada. Therefore, the northern region of Jalisco, as a result of agricultural policies, is currently facing issues of food scarcity and modifications in its environmental and socio-productive structure.

Table 1 Food Poverty in Northern Jalisco

Northern Region of Jalisco	Total population experiencing food deficiency	Percentage of the population experiencing food deficiency
2020	4,098	11.18
2015	3,844	12.18
2010	5,318	12.11

Source: Escobedo, Pérez y Escobedo (2022).

The results are shown from 2010 onward because that's where available information was found. The consequences of agricultural policies are depicted in the table above. The distribution of agricultural production, resulting from the modification of Article 27, has favored a food crisis. Family production systems that persist in resisting a shift toward basic grain production, in this case, maize, have had to transition to intensive production methods to remain competitive in this system. Examples of this are illustrated in the following graphs.

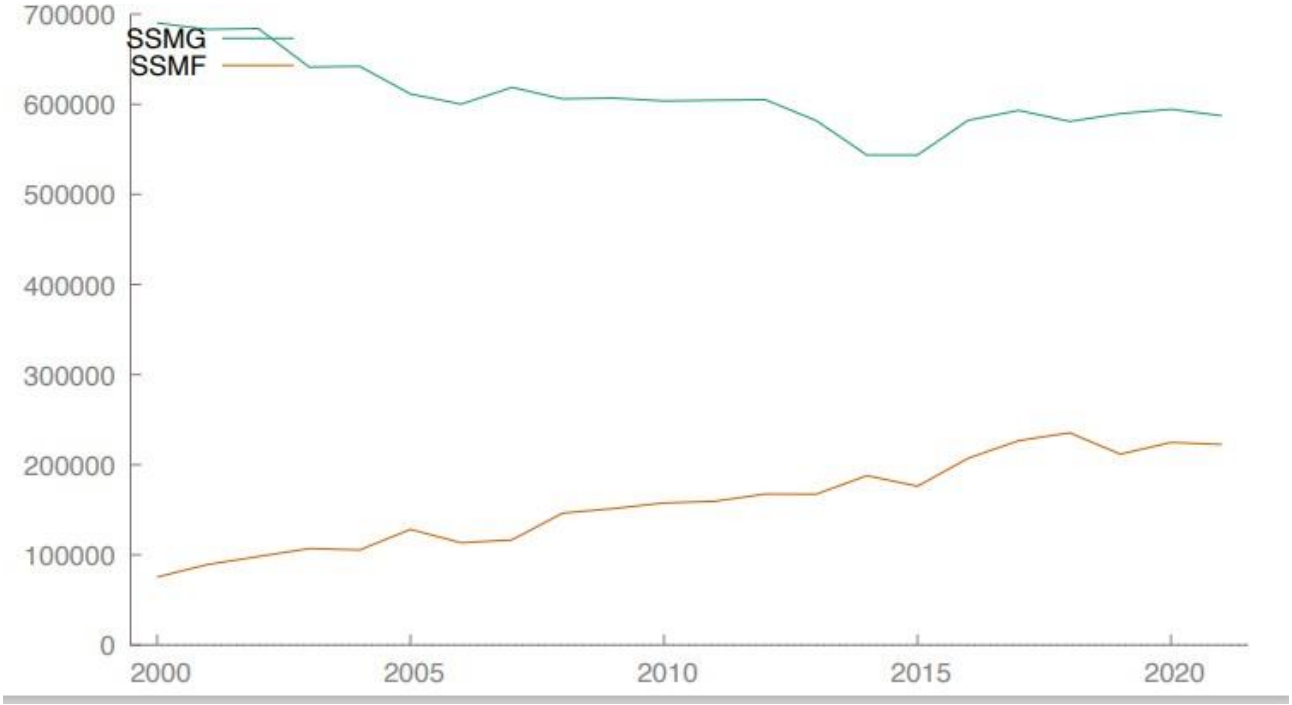

Figure 2 Cultivated Area of Grain and Forage Corn in Northern Jalisco, Mexico.

It is observed that, since the implementation of agricultural policies, this region has undergone changes in production, leading to transformations in land use. The grain corn traditionally planted in this region is native and, during its cultivation, does not involve large amounts of pesticides and herbicides. However, in order to remain within this activity and align with capitalist agricultural systems, agricultural production in the region has shifted towards forage corn for the feeding of a growing livestock industry. Forage corn is mostly composed of hybrid corns produced by large multinational industries such as Monsanto, Bayer, among others. Its cultivation requires significant amounts of herbicides and pesticides, as well as the adoption of technological packages.

Another factor influencing changes in land use from grain to forage corn is climate change. The previous graph illustrates how climate and environment impact agricultural production. Native corn tends to be more affected by climatic events, and the sharp drop in 2010 is attributed to the drought that occurred in 2010-2011

worldwide. However, agriculture and livestock are part of a virtuous circle where they are affected by environmental changes, but at the same time, they represent anthropogenic activities that significantly influence climate change due to their impact on local ecosystems, such as increased deforestation and habitat reduction for flora and fauna, among other factors.

Furthermore, the use of hybrid seeds manufactured by transnational companies signifies the subjugation of the economies of Latin American regions to the dictates of the capitalist production model. This model has led to producers no longer selecting their own seeds but purchasing them from large transnational companies. It is important to note that hybrid seeds cannot be used for a second agricultural cycle, requiring farmers to buy them in the agro-input market. This way, capital appropriates natural resources to capitalize on them through monopolization (Segrelles, 2001).

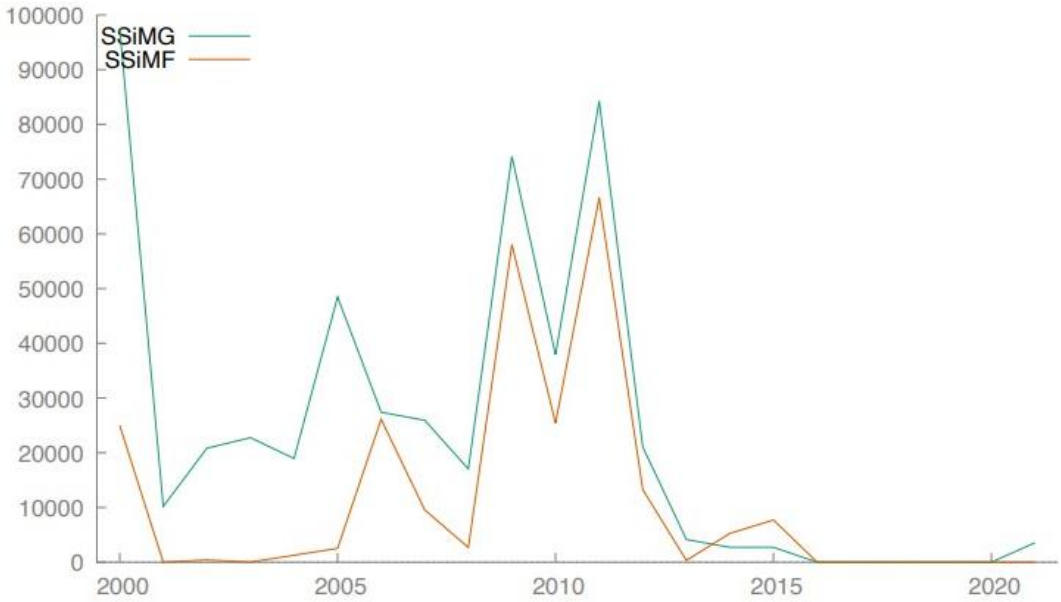

Figure 3 Damaged Area of Corn (Grain and Forage) in Northern Jalisco, Mexico.

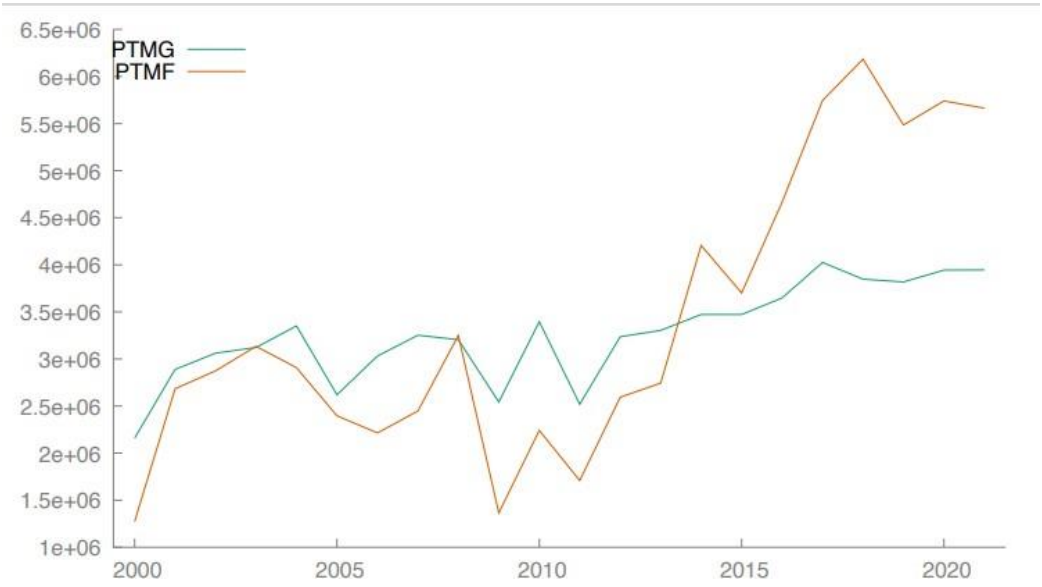

Figure 4 Price per ton of grain corn and forage corn in northern Jalisco, Mexico.

As observed in the previous graph, forage corn has a higher price than grain corn. This has also influenced production systems to shift towards intensive and industrial forms of farming, driven by the implementation of agricultural policies and the pursuit of greater profitability. Unfortunately, this shift is occurring without regard to the environmental damage suffered by ecosystems and humans, as previously highlighted by Rachel Carson (2002).

5. Conclusions

Since the implementation of agricultural policies in 1990, the development paradigm has shifted, and the human-nature relationship has changed, leading to increased commodification of natural resources. In the northern region of Jalisco, Mexico, agriculture and livestock production have intensified since the onset of neoliberal policies. This is evidenced by the greater use of technological packages, such as hybrid seeds and increased use of pesticides and herbicides, including glyphosate. The shift from planting native corn to hybrid corn is a reflection of this trend, as the latter requires the expansion of agricultural frontiers and higher input requirements for production. Consequently, there has been increased soil erosion and deforestation due to the ongoing agricultural conversion and land use change, driven by integration into international markets and the need for production systems to remain competitive with central countries.

Additionally, due to rising production costs, landowners are no longer the ones primarily engaged in cultivation in the region. Instead, small and medium-sized entrepreneurs often carry out maize cultivation in a capitalist manner, leading to a socio-productive transformation in the northern region of Jalisco. From an ecological perspective, this transformation is causing the following environmental problems.

- Loss of biodiversity.
- Transformations in human capital, economic structures, and social relationships.
- Reduction in the productive capacity of the ecosystem in northern Jalisco, jeopardizing its ability to continue providing historically given ecosystem services in the medium term.
- Risks associated with declining soil fertility.

These points, in turn, generate conflicts within this territory. The advancement of industrial and intensive agriculture and livestock farming has triggered social conflicts as this new model promotes wealth concentration, causing a significant social and environmental impact on communities of small-scale producers who traditionally employ peasant strategies and have historically occupied this territory.

The discourse of the State has induced a shift in production systems towards one based on the agro-industrial model. This shift has been progressively eliminating other non-capitalist systems oriented towards traditional production. Instead of preserving local ecosystems, agricultural policies favor their degradation and the indiscriminate use of natural resources.

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