

POLICY REPORT

SEMBRANDO VIDA IN MUNICIPALITIES WITH HISTORIES OF ILLICIT CROP CULTIVATION

Noria Mexico and Central America Program

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'SEMBRANDO VIDA' IN MUNICIPALITIES WITH HISTORIES OF ILLICIT CROP CULTIVATION

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O. EXECUTIVE SUMMARY

In February 2019, the Mexican federal government began implementing Sembrando Vida (Sowing Life). Considered one of the priority programs of the six-year term of Andrés Manuel López Obrador (AMLO), this policy sought to address two problems detected in rural areas of the country: poverty and environmental degradation.

Sembrando Vida consists of the distribution of a direct monthly support of 5,000 pesos to people who comply with a series of requirements, including a commitment, signed in writing, not to engage in “illicit productive or commercial activities”.

This last requirement points to the fact that, in certain regions of Mexico, Sembrando Vida, in addition to fighting poverty and preserving the environment, follows another unspoken objective: the voluntary substitution of illicit crops - mainly poppy and marijuana - for legal crops and tree planting.

By December 2021, 10% of Sembrando Vida's beneficiaries were located in 46 municipalities with a history of illicit crops distributed among Chihuahua, Sinaloa, Durango, Nayarit, Guerrero and Oaxaca.

In Mexico, the generation of legal economic alternatives and subsidies by the federal government, with a commitment not to get involved in illicit activities, is an unprecedented undertaking. After more than a century in which state policy focused exclusively on the forced eradication of crops - through aerial spraying or manual destruction - Sembrando Vida was intended as a departure from the traditional coercive policy to reduce the supply of illegal drugs.

However, three years after the program's launch, illicit crop destruction campaigns - also operated by the federal government - are far from over. Between 2019 and 2021, the armed forces report having destroyed 35,419

hectares (ha) of poppy and 6,709 of marijuana as part of their “operations to combat drug trafficking,” which involve the deployment of around 3,500 elements throughout the year. Although these areas represent approximately half of what was destroyed during the previous three years - 74,511 ha of poppy and 12,371 of marijuana between 2016 and 2018 -, it should be noted that the proportion of the area destroyed increased after spraying with Paraquat, a non-selective herbicide banned in several countries for its potential harmfulness to health - from 15% between 2016 and 2018 to 20% between 2019 and 2021.

Since the start of program implementation in these municipalities, we observed an overall reduction in the area planted with legal crops at the same time as an increase in production value. Depending on the contexts, this trend reflects an increase in producer prices and/or an improvement in yields, but no substantial change in the types of legal crops planted is observed. On the other hand, the areas of illicit crops destroyed by the authorities decreased, as a result of a possible reduction in the areas cultivated with poppy and marijuana and/or a reduction in the efforts of the Armed Forces to destroy them. There was also a decrease in homicides in most municipalities, but an increase in the use of firearms to perpetrate them.

However, the research conducted for this report allowed us to identify information gaps that continue to hinder the understanding of the cultivation of plants declared illicit in Mexico, as well as the possible relationship of this phenomenon with the implementation of Sembrando Vida. First, the absence of open data at the municipal level on the cultivation - and not the destruction - of poppy and marijuana prevents us from monitoring the areas planted and harvested, yields or producer prices.

These are basic variables for monitoring any type of crop and are collected by SIAP in the case of legal crops in Mexico. In other countries, they are also generated for declared illicit crops from satellite images and field work. In Colombia, for example, the Ministry of Justice and Law publishes annual data at the municipal level on the areas under cocaine cultivation and even the cartographic files with which it measures crop density are detected by the “Integrated Illicit Crop Monitoring System” (SIMCI) since 1999 and with the support of UNODC (UNODC). Similarly, the project “Monitoring Opium Production in Afghanistan”, also promoted by UNODC, publishes data since 1994 on poppy production at the district level in that country. In Mexico, although there is a similar program - the project “MEXK54 Monitoring System of Illicit Cultivation in the Mexican Territory” - UNODC and the Mexican government only publish an annual report with aggregate estimates by region and no open data at the local level.

Second, it should be noted that, although the Mexican federal government presents Sembrando Vida as a program that encourages voluntary substitution of illicit crops and that beneficiaries commit in writing not to engage in “illicit activities,” the truth is that, since its launch in 2019, this component is not formally mentioned in the program’s rules of operation. Its inclusion is essential for external monitoring and evaluation of Sembrando Vida against previously established objectives and goals in the matter.

Finally, our report shows that it is essential for the Mexican federal government to be more open in accessing program data, so that external monitoring and evaluation of Sembrando Vida against previously established objectives and goals can be carried out.



10 KEY IDEAS FROM THE SEMBRANDO VIDA POLICY REPORT

- 1.** In 2021, the Sembrando Vida program closed the year with around 449,939 beneficiaries, and by 2022, its budget amounted to 29.4 billion pesos, the fourth highest among the federal government's 30 priority programs.
- 2.** In certain regions of Mexico, Sembrando Vida, in addition to the fight against poverty and the preservation of the environment, follows another unspoken objective: the voluntary substitution of illicit crops for legal crops and the planting of trees.
- 3.** Of 995 municipalities benefiting from Sembrando Vida, 46 have a history of illicit crops (our municipalities of interest), and these are located in Guerrero (15), Durango (9), Chihuahua (8), Sinaloa (6), Nayarit (4) and Oaxaca (4).
- 4.** Since the beginning of Sembrando Vida in municipalities with a history of illicit crops, the average legal area planted has been reduced and the types of legal crops planted have not changed substantially. This suggests that the program does not significantly encourage the introduction of new crops and the substitution of old legal or illegal crops.
- 5.** The Armed Forces, in turn, registered a reduction in the destruction of poppy and marijuana, although a proportionally greater use of aerial spraying since the beginning of the program in our municipalities of interest. However, this trend seems to be linked to factors unrelated to the program (fall in opium gum prices in particular).
- 6.** The implementation of Sembrando Vida coincided with an overall reduction in homicide rates in our municipalities of interest. The annual homicide rate went from an average of 58 homicides per 100,000 inhabitants during the five years prior to the start of Sembrando Vida to 37 per 100,000 inhabitants.
- 7.** There is a possible increase in the availability of firearms and development of incentives and capacities to use firearms, since the implementation of the program also coincides with an increase in the proportion of homicides that are committed with a firearm, which went from 75% during the five years prior to Sembrando Vida to 77%, in our municipalities of interest.
- 8.** Unlike Colombia or Afghanistan, in Mexico, we still lack data at the local level on the production of illicit crops, which forces us to approximate the phenomenon based on destruction records.
- 9.** It is so far impossible to monitor and evaluate the voluntary substitution of illicit crops with the program, because although the official governmental communication presents Sembrando Vida as a program of voluntary substitution of illicit crops since 2019, specific goals and objectives have not yet been contemplated.
- 10.** It is essential for the Mexican federal government to be more open in accessing program data, so that external monitoring and evaluation of Sembrando Vida against previously established objectives and goals can be carried out.

I. INTRODUCTION

Context

In February 2019, the Mexican federal government began the implementation of Sembrando Vida. Considered one of the priority programs of the six-year presidential term¹ of Andrés Manuel López Obrador (popularly known as AMLO), this policy aims to solve two key problems in rural areas of the country: poverty and environmental degradation.

In 2021, the program finished the year with around 449,939 individual beneficiaries, in 21 Mexican states and 983 different municipalities,² and in 2022, its budget rose to 29.4 billion pesos, the fourth highest among the 30 priority programs of the federal government.³

Sembrando Vida revolves around the distribution of a monthly support payment of 5,000 pesos directly to individuals who sign up to:

1. A work program that includes the implementation of agroforestry production systems;
2. A permanent training plan via participation in “Peasant Learning Com-

munities” (Comunidades de Aprendizaje Campesino, or CAC);

3. A written commitment not to carry out any “illicit productive or commercial activity”.⁴

This latter requirement signals that in certain regions of Mexico, **Sembrando Vida**, as well as combatting poverty and preserving the environment, **has another tacit objective;⁵ the voluntary substitution of illicit crops with legal crops and with the planting of trees**, in a country known to be the third largest grower of illegal opium poppy in the world, and which also continues to produce a significant amount of illegal marijuana (UNODC, 2021)⁶.

In fact, this was made explicit in a press release issued by the Presidency of the Republic on 10 October 2019: “the expansion of the program for 2020 includes Chihuahua and Sinaloa, entities that, together with Durango, constitute the Golden Triangle, where the cultivation of drug crops will be reduced”.⁷ This aim was reiterated by President Lopez

1. The list of the federal government’s priority projects and programs can be found on the following page: <https://www.gob.mx/proyectosyprogramasprioritarios>.

2. Data from the program’s registry of beneficiaries as of December 2021, published by the Secretariat of Welfare.

3. Proceeded only by the Pensions for Senior Adult Welfare, and the Benito Juárez Scholarships, for primary, high school and further, degree-level education, according to México Evalúa, 2021, “Programas de subsidios en el PEF 2022: la persistente opacidad”, <https://www.mexicoevalua.org/programas-de-subsidios-en-el-pef-2022-la-persistente-opacidad>.

4. See Annex 5 of the Sembrando Vida Program Operating Guidelines for the 2021 fiscal year.

5. This objective is considered tacit in that it does not figure among the objectives defined in the program’s official documents.

6. Although the UNODC has a program that estimates the total area of opium cultivation in Mexico – rather than just the area destroyed – there are no similar figures available for marijuana. It is therefore impossible to compare the illegal production of marijuana in Mexico with that of other countries.

7. See the announcement published on 10 October 2019 by the Secretariat of Welfare, accessible at <https://www.gob.mx/presidencia/prensa/229-mil-campesinos-participan-en-sembrando-vida-el-programa-de-creacion-de-empleos-mas-grande-del-pais-informa-presidente?idiom=es-MX>

Obrador himself in a public conference on 16 July 2021: “If we provide options (...) we will be able to substitute crops, if the people don’t find themselves needing to grow marihuana and opium poppy (...) because if they’re growing poppy, if they’re growing marihuana, it’s out of necessity”⁸.

Indeed, in the municipalities of Durango that form part of the so-called “Golden Triangle” – a zone of opium and marihuana production that extends to Chihuahua and Sinaloa – Sembrando Vida has had beneficiaries registered since the start of the program in 2019. Subsequently, in 2022, the federal government announced the incorporation of 10,000 additional beneficiaries in the Montaña region of Guerrero, one of the country’s other main centres of illicit poppy cultivation⁹.

In Mexico, the federal government’s creation of alternative legal economies, and provision of subsidies for those who commit to not involve themselves in illicit activities, is an unprecedented step (Ospina et al., 2018: 10). After more than a century of state policies that have focused exclusively on the forced eradication of drug crops – using both manual destruction and aerial fumigation – Sembrando Vida is an attempt to foment a shift away from traditional coercive policies aimed at reducing the supply of illicit drugs.

However, three years after the launch of the program, illicit crop destruction campaigns – also run by the federal government – have far from ceased operation. Between 2019 and 2021, the armed forces reported having

destroyed 35,419 hectares (ha) of poppy and 6,709 of marihuana¹⁰ as part of their “combat operations against narcotrafficking”, which involved the deployment of around 3,500 soldiers over the course of each year¹¹. Although these areas represent approximately half of that destroyed during the three previous years – that is, 74,511 ha of poppy and 12,371 of marihuana between 2016 y 2018 – it’s worth pointing out that the proportion of illicit crops destroyed using aerial fumigation with Paraquat, a non-selective herbicide¹² banned in many counties for its potentially damaging effects on health¹³, increased from 15% between 2016 and 2018 to 20% between 2019 and 2021 (*see image 1*).

8. Quote taken from interview transcribed in <https://www.eluniversal.com.mx/nacion/amlo-llama-extender-sembrando-vida-mas-zonas-de-guerrero-para-sustituir-cultivos-de-droga>.

9. See the Mexican Opium Project, published by Noria Research and available at <https://noria-research.com/mxac/proyecto-amapola-mexico/>.

10. Surface areas calculated on the basis of the replies to Freedom Of Information Requests file numbers 330026422003143 and 330026622000987, directed to the Secretariat of National Defence (SEDENA) and the Secretariat of the Navy (SEMAR).

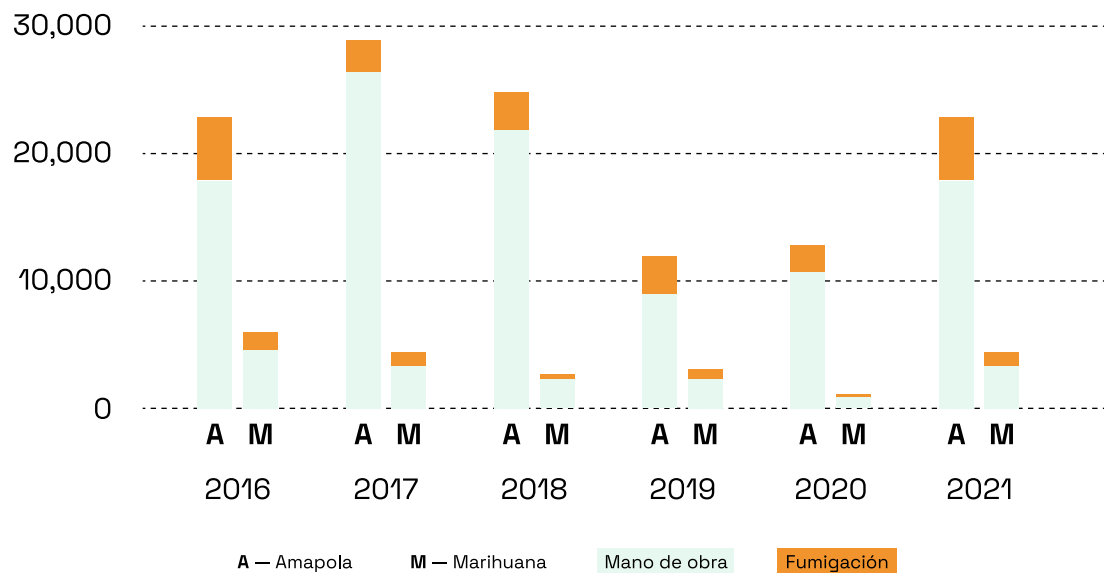
11. Figures taken from the monthly security reports presented by the Secretariats of Security and Citizen Protection, of the Navy, of National Defence, and of the National Guard.

12. That is to say, a herbicide that kills the majority of the plants with which it comes into contact..

13. Court of Justice of the European Union (CJEU), Press release n° 45/07, “THE COURT OF FIRST INSTANCE ANNULS THE DIRECTIVE AUTHORISING PARAQUAT AS AN ACTIVE PLANT PROTECTION SUBSTANCE”, 11 Julio 2007.

14. Proportion calculated on the basis of the replies to Freedom Of Information Requests file numbers 330026422003143 and 330026622000987, directed to the Secretariat of National Defence (SEDENA) and the Secretariat of the Navy (SEMAR).

Graph 1. Hectares of illicit crops destroyed in Mexico between 2016 and 2021, according to destruction method



SOURCE: AUTHOR'S OWN GRAPH, BASED ON ILLICIT CROP DESTRUCTION STATISTICS RECORDED BY THE SECRETARIAT OF NATIONAL DEFENCE (SEDENA) AND THE SECRETARIAT OF THE NAVY (SEMAR).

Review of other cases of crop substitution and of studies on Sembrando Vida

The literature concerning **illicit crop substitution programs around the world documents contrasting experiences**. For example, in Thailand since the 1980s, or in Colombia since the inauguration of the National Integrated Program of Illicit Crop Substitution (Programa Nacional Integral de Sustitución de Cultivos Ilícitos, or PNIS), the strategy of ‘carrot and stick’ has been applied in order to reduce the total area dedicated to illicit crop production. On the one hand, in Thailand, the amount of land illegally sown with poppies went from nearly 9,000 ha in 1983/1984 to 128.53 ha only twenty years later (Rojas & Parra, 2018). On the other hand,

in Colombia, Mejía Hidalgo (2021) found that a lack of coordination between the anti narcotics authorities, and those charged with implementing the PNIS, resulted in communities affiliated with the substitution program also suffering the forced eradication of illicit crops, which generated tensions and confrontations between them and the authorities.

Meanwhile, the studies of and journalistic investigations into Sembrando Vida published in Mexico up to this point have focused, above all, on analyzing the management of public funds (Rincón, 2021; Estrada, 2022), and on the effects of the program on the environment (Warman et al., 2021), as well as on evaluating the program’s design and the processes involved (CONEVAL, 2020; Bernabe Inés, 2021; CONEVAL, 2022). Despite this, as far as we know, **there has been no explicit attention paid to those municipalities with histories of illicit crop cultivation in which Sembrando Vida is active.**¹⁵

15. Con la notable excepción de Álvarez (2021), que advertía que, para competir con la producción de amapola en la Sierra de Guerrero, Sembrando Vida tendría que lograr introducir cultivos legales de alta rentabilidad y ciclos cortos, así como asegurar vías estables de transporte y comercialización de los productos.

In this context, it is important to ask **what changes have been observed since Sembrando Vida began operating** in these rather particular circumstances. If the program encourages illicit crop substitution, this should be reflected in a modification of the dynamics of legal agricultural production and of the destruction of illicit crop plantations. At the same time, one would also expect to see changes in terms of rates of lethal violence, high levels of which are commonly associated with the cultivation of illicit crops (although conflicting evidence exists for this point (Frissard et al., 2021)).

Objectives and scope

This investigation has three objectives:

1. To identify **which of the municipalities in which Sembrando Vida operates have histories of illicit crop cultivation**, based on two criteria: that of (i) being home to registered beneficiaries of Sembrando Vida, whether continuously or discontinuously, between February 2019 and December 2021; and (ii) appearing in the

official records of destruction of poppy and/or marijuana plantations, prior to the launch of Sembrando Vida in its jurisdiction;

2. To characterize these municipalities in terms of their **poverty and rurality** – which are priority socioeconomic aspects for the program¹⁶ – as well as the characteristics of their **legal agricultural production**, and the levels of **lethal violence** they experienced prior to the start of the program;

3. To analyze the **evolution of legal agricultural production, destruction of illicit crops, and lethal violence**, in all of these municipalities since the program's launch.

The results of this investigation are intended to bolster our understanding of Sembrando Vida's potential to bring about changes in agricultural production – both legal and illegal¹⁷ – and to shift the dynamics of lethal violence in territories with a history of illicit crop cultivation. In addition, this report aims to shed light on the degree of coordination between the two key aspects of the federal government's current strategy to reduce illicit crop production in Mexico: that is, crop substitution and forced eradication.

^{16.} According to the Sembrando Vida Program Operating Guidelines for 2019, the specific objective of the program is to “Enable agrarian subjects in rural localities, with incomes below the rural poverty line, to earn enough of an income to make the land productive.”

^{17.} This report will not assess changes in the amount of land cultivated with illicit crops – eg. poppy and marijuana – because of the lack of publicly accessible municipal- or state-level data on this matter.

2. MUNICIPALITIES IN THE PROGRAM WITH A HISTORY OF ILLICIT CROP CULTIVATION

In Mexico, historians estimate that marijuana cultivation dates back to the 16th century (Olvera-Hernández & Schievenini-Stefanoni, 2017), while poppy cultivation began in the late 19th century (Astorga, 2015). In turn, operations to destroy such crops by the authorities began in the 1930s (Astorga, 2015), at first under the direction of the Narcotics Police and the Office of Drug Addiction and Mental Hygiene, before in 1943 becoming the responsibility of the Secretariat of Health and Assistance, and then in 1947 that of the Attorney General's Office (Carvente, 2014). The Secretariat of National Defense (then known as the SDN, and today as SEDENA) played a subsidiary role in the matter until the 1980s, when it began to take on more responsibility for illicit crop eradication operations, of which it has carried out 99% since 2007 (Frissard, 2021). In this context, SEDENA is the agency that currently generates the most statistical information on illicit crops in Mexico.

According to a report published by SEDENA in 2018¹⁸, poppy and marijuana cultivation in Mexico is concentrated in four states classed as 'high incidence' states – from north to south, Chihuahua, Sinaloa, Durango and Guerrero – as well as in another five 'medium incidence' states – from north to south, Sonora, Nayarit, Jalisco, Michoacán and Oaxaca.

The rest of the country has a 'low incidence' of such illicit cultivation. Meanwhile, with regards to poppy cultivation more specifically, between July 2019 and June 2020 the United Nations Office on Drugs and Crime (UNODC) identified six states as harbouring the majority of the country's poppy plantations: from north to south, these were Chihuahua, Sinaloa, Durango, Nayarit, Guerrero and Oaxaca (*see map 1*)¹⁹.

Given that neither the Mexican authorities nor the UNODC publish data on the cultivation of illicit crops at the municipal level – which is the unit of observation adopted in this research – the identification of our municipalities of interest (ie. those that are home to beneficiaries of Sembrando Vida and have a history of illicit crop cultivation within their jurisdictions) was approximated from official reports concerning the destruction of illicit crops. In this context, it is worth noting the possibility that some municipalities with both beneficiaries of the program, and a history of illicit cultivation, do not appear in these reports and have thus been left out of our analysis.

Initially, we used the lists of beneficiaries of social programs, as published monthly by the Secretariat of Welfare, to identify the municipalities in which beneficiaries of Sem-

18. SEDENA, 2018, Memoria Documental. Erradicación de cultivos ilícitos (marihuana y amapola) (MD-09), p.27.

19. UNODC, 2021, México, Monitoreo de Plantíos de Amapola 2018-2019 (MEXK54, 2021), p.3.

Map 1. Total area of opium poppy cultivation interpreted by segment



brando Vida were registered²⁰. However, due to variations in the number of beneficiaries found from one month to another for several municipalities²¹, we looked for a way of producing more stable data and eventually opted to calculate the number of beneficiaries per municipality as an annual average (that is, the number of beneficiaries that were registered per month, on average, during the same year). Finally, we considered a municipality as being part of the program if it registered an annual average of at least three beneficiaries during one or more of the first three years of program implementation – from 2019 to 2021 – which resulted in a group of 955 municipalities.

Then, to identify which of these municipalities had a history of illicit crop cultivation, we assumed that municipalities that appeared in official reports for several years in a row as places where illicit crops had been destroyed, indicated the presence of such crops. To this effect we collected data on the destruction of poppy and marijuana crops at municipal level through freedom of information requests submitted to SEDENA and the Secretariat of the Navy (SEMAR),²² and then searched for those municipalities in which the authorities recorded having destroyed at least 2.5 ha per year (an area equal to that of a plot supported by Sembrando Vida), during the five-year period preceding the local launch of the program.

On the basis of these two criteria, we identified a total of **46 municipalities that had obtained support from Sembrando Vida between 2019 and 2021 and that also had a history of illicit crop cultivation during the five years prior to the launch of the program in their jurisdictions.** These 46

municipalities, out of the 2,471 municipalities in the country in 2021, will henceforth be referred to as **municipalities of interest**. But it should also be noted that, at the close of 2021, 33 other municipalities with a significant history of illicit crop cultivation had not been included in the Sembrando Vida program (among them Culiacán and San Ignacio (Sinaloa), Tequila (Jalisco), and Alcozauca de Guerrero and Copanatoyac (Guerrero), each with more than 400 ha of illicit crops destroyed between 2014 and 2018).

In geographic terms, we can group our **46 municipalities of interest** into three regions (*see map 2*):

1. Sierra Madre Occidental region – a group of 27 municipalities that extends from the Sierra Tarahumara in Chihuahua, through Durango and Sinaloa, to the south of Gran Nayar in Nayarit.

2. Sierra Madre del Sur region of Guerrero – a group of 15 municipalities that extends from the Guerrero's Tierra Caliente zone to the area of the state known as the Montaña.

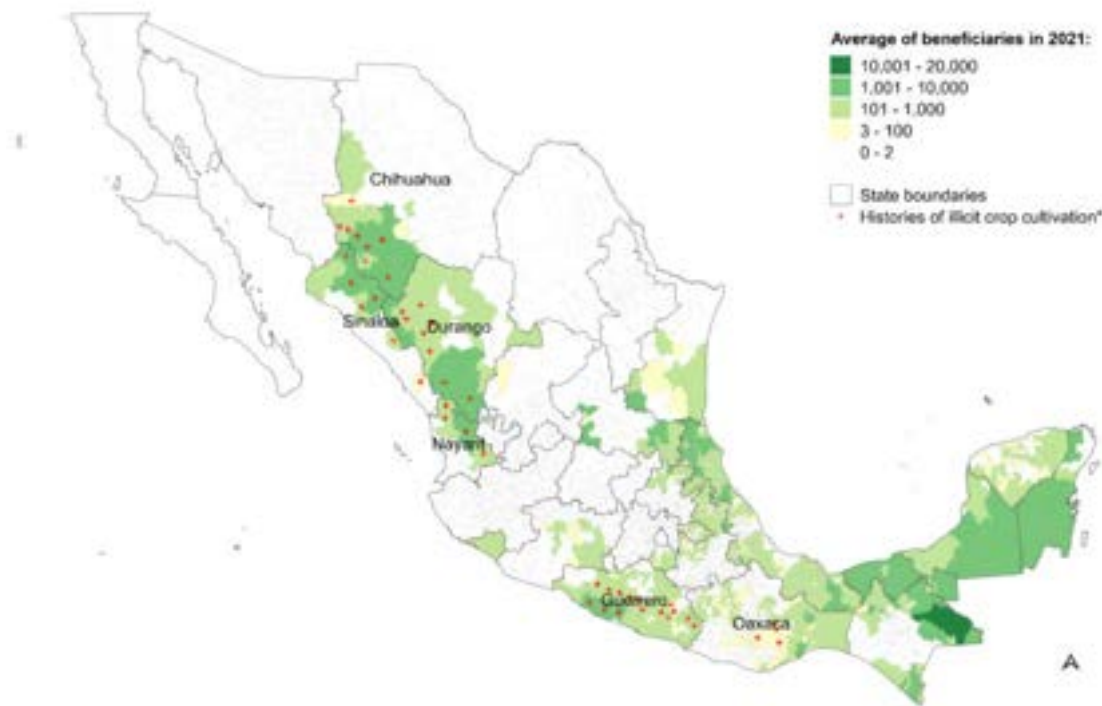
3. Region of the Oaxacan sierras and valleys – a group of four municipalities located in Oaxaca's Central Valleys and the Northern Sierra and Southern Sierra of the same state.

20. It should be noted that, as of 10 August 2022, the lists of beneficiaries for March 2019 and April and May 2021 were not available on the website <https://pub.bienestar.gob.mx/pub/programasIntegrales>. In response to a freedom of information request with file number 330025822001723, the Secretariat of Welfare stated that the program did not operate in March 2019. Therefore, we recoded the values for that month to zero beneficiaries for all municipalities. Regarding the absence of the April and May 2021 rolls, the guidelines of the Electoral Security Plan 2021, issued by the same Secretariat, stated at the time that the registration of social programs would be suspended in those months. In this context, we recoded the number of beneficiaries for the remaining months of 2021 to be equal to those of March 2021 in all municipalities.

21. For example, in Guadalupe y Calvo (Chihuahua) no beneficiaries were registered until May 2020, and then 1,664 were recorded in June of the same year, 75 in July, 3,943 in August, 78 in September, 90 in October, 3,937 in November and 3,813 in December.

22. Freedom Of Information Requests file numbers 330026422003143 and 330026622000987.

Map 2. Distribution of Sembrando Vida and historic illicit cultivation in Mexico's 2,471 municipalities.



SOURCE: AUTHOR'S OWN MAP, BASED ON BENEFICIARY LISTS OF THE MINISTRY OF WELFARE, CROP DESTRUCTION RECORDS OF SEDENA AND SEMAR, AND INEGI'S 2021 GEOSTATISTICAL FRAMEWORK.

The states with the most municipalities of interest are Guerrero (15), Durango (9), Chihuahua (8), Sinaloa (6), Nayarit (4) and Oaxaca (4). While in Durango Sembrando Vida started operating as far back as 2019, the other states had to wait until 2020 for the arrival of the program. In terms of beneficiaries in our municipalities of interest during 2021, Durango registered the highest annual average number (10,814 beneficiaries), followed by Chihuahua (10,559), Guerrero (8,085), Sinaloa (7,612), Nayarit (3,431), and, finally, Oaxaca (314), where the number of beneficiaries is marginal compared to the other states (see Table 1).

In January 2021, the program began with a total of 392,915 beneficiaries nationwide, and closed the year with 449,939 in December, which means that Sembrando Vida reached an average of 422,870 beneficiaries over the course of the year. By way of comparison, our municipalities of interest were together home to an annual average of 40,815 beneficiaries in 2021: that is, almost 10% of the total national number of Sembrando Vida's beneficiaries lived in municipalities with a history of illicit crop cultivation.

Table 1. Scale of past illicit cultivation and annual average numbers of Sembrando Vida beneficiaries in municipalities of interest

Federal State	Municipality	Area of illicit crops destroyed during the 5 years prior to SV	Average annual number of SV beneficiaries		
			2019	2020	2021
Chihuahua	Batopilas de Manuel Gómez Morín	363		627	1566
	Chínipas	279		273	610
	Guachochi	1,900		1495	2679
	Guadalupe y Calvo	23,359		1133	3038
	Guazapares	1,256		201	529
	Morelos	787		268	704
	Ocampo	257		14	34
	Urique	473		602	1400
Durango	Canelas	1,596	108	218	228
	Mezquital	3,031	1750	3739	4863
	Otáez	2,764	120	325	395
	Pueblo Nuevo	2,003	583	1118	1266
	San Dimas	2,279		572	984
	Santiago Papasquiaro	1,241	4	243	363
	Tamazula	15,126	937	1781	1933
	Tepehuanes	386	140	328	388
	Topia	1,628	125	330	396
Guerrero	Ajuchitlán del Progreso	855		113	238
	Atlixnac	956			87
	Atoyac de Álvarez	656		584	1012
	Coyuca de Catalán	4,714		42	171
	Chilpancingo de los Bravo	3,496		150	533
	General Heliodoro Castillo	9,300		160	762
	Leonardo Bravo	1,722		565	919
	Metlatónoc	464		481	905
	Petatlán	153		632	1069
	Quechultenango	166		209	397

Federal State	Municipality	Area of illicit crops destroyed during the 5 years prior to SV	Average annual number of SV beneficiaries		
			2019	2020	2021
Guerrero	San Miguel Totolapan	2,938		25	241
	Técpan de Galeana	1,037		452	1020
	Tlacoachistlahuaca	135		282	497
	Zapotitlán Tablas	928			55
	Acatepec	2,089			180
Nayarit	Acaponeta	102		232	371
	Huajicori	382		266	477
	Del Nayar	5,096		1190	2077
	La Yesca	787		243	506
Oaxaca	San Carlos Yautepec	1,076		7	19
	San Juan Lachigalla	279			73
	San Pedro Quiatoni	541			26
	Santo Domingo Tepuxtepec	433		118	195
Sinaloa	Badiraguato	13,523		1041	1819
	Concordia	757		44	85
	Cosalá	994		592	931
	Choix	3,050		1242	1957
	Mocorito	1,001		493	832
	Sinaloa	1,278		1229	1988
TOTAL		117,633	3,766	23,656	40,815

SOURCE: PREPARED BY THE AUTHORS BASED ON THE SECRETARIAT OF WELFARE'S SEMBRANDO VIDA BENEFICIARY REGISTER, AND THE CROP DESTRUCTION RECORDS OF SEDENA AND SEMAR.

3. A HETEROGENEOUS PICTURE IN TERMS OF POVERTY AND RURA- LITY, AGRICULTURAL PRODUCTION AND LETHAL VIOLENCE

Beyond the political-administrative dimension, our municipalities of interest can also be categorized according to their socioeconomic characteristics, prevailing types of agricultural production, and conditions of lethal violence prior to the local arrival of Sembrando Vida. By taking these variables into account, we can provide valuable context to our subsequent analysis, in section 4, of the evolution of legal crop production, destruction of illicit crops and lethal violence since the implementation of Sembrando Vida.

Levels of poverty and rurality

First, let us focus on two aspects that seem to be fundamental for the federal government when it comes to selecting the territories in which Sembrando Vida is to be implemented: poverty and rurality. Indeed, the Sembrando Vida Program Operating Guidelines issued by the Secretariat of Welfare in January 2019 establish that target populations should consist of “agrarian subjects of legal age who live in rural localities, whose income is below

the rural poverty line and who are owners or possessors of 2.5 ha available to be worked as part of an agroforestry project”²³.

Based on the National Population and Housing Census, conducted by the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, or INEGI) in 2020, and the poverty indicators calculated by the National Council for the Evaluation of Social Development Policy (Consejo Nacional de Evaluación de la Política de Desarrollo Social, or CONEVAL), we analyzed the distribution of our municipalities of interest according to two variables:

1. Rural households²⁴

23. In 2020 and 2021, the definition of the target population became “agrarian subjects of legal age, who live in rural localities in municipalities presenting levels of social backwardness, and who are owners or possessors of 2.5 hectares available to be worked as part of an agroforestry project”. Thus, the individual poverty criterion was replaced by one that considers the social deprivation of all the inhabitants of the municipality. In this context, among the indicators estimated by the CONEVAL, we considered it appropriate to contemplate both dimensions using the percentage of people in poverty, which is calculated at the municipal level, based on the income and social deprivation of the inhabitants. On the other hand, although weighing the number of beneficiaries by the number of owners or holders of agricultural land would also have been desirable, the latest data available at the municipal level, and with nationwide coverage, is too outdated to be used in this analysis, since it comes from the 2007 Agricultural, Livestock and Forestry Census.

24. The percentage of rural households was used instead of the percentage of rural adults, based on the assumption that Sembrando Vida only registers one adult per household (see Sembrando Vida Program Operating Guidelines, published in the Official Gazette of the Federation on 24 January 2019, “5.1 Dispersion of resources and savings mechanics”).

2. Population living in poverty

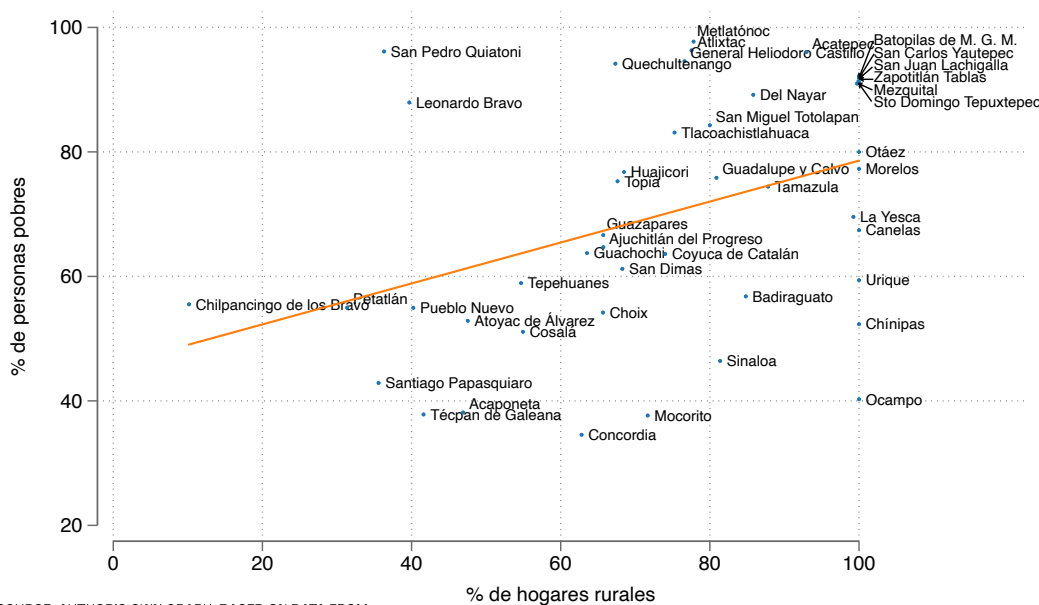
These variables are considered separately, as it was not possible to obtain a direct estimate of the number of rural householders in poverty in each municipality, due to the fact that the CONEVAL does not give estimates of the population in poverty at the intra-municipal level – that is, within each municipality’s rural localities. This means that the CONEVAL indicator – the percentage of people in poverty in each municipality – also covers urban localities. Meanwhile, our figures for the percentage of rural householders in each municipality – taken from the INEGI’s 2020 census data, which considers every locality in a given municipality – do not take into account household poverty.

That said, it turns out that at the time of the 2020 Census, our municipalities of interest had average rates of **70% of their populations living in poverty, and 74% of their households classed as ‘rural’** – compared to rates of 71% and 63%, respectively, if all Sembrando Vida beneficiary municipalities are taken together, or 62% and 57%, if all of the municipalities in the entire country are considered.

We can also observe that, although both variables have a statistically significant positive correlation in our group of municipalities, it is still only a moderate one ($\rho = 0.3938$; $P = 0.0068$)²⁵. This means that, although the municipalities with the highest percentages of poor people also tend to have the highest percentages of rural households – and vice-versa – the relationship between both variables is not very strong, which allows us to appreciate the diversity of the 46 municipalities that make up our group of interest.

For example, both Santiago Papasquiari (Durango) and San Pedro Quiatoni (Oaxaca) have relatively low percentages of rural households – less than 40%. However, while 42.9% of the population of Santiago Papasquiari lives in poverty, this proportion rises to 96.1% in San Pedro Quiatoni. On the other side of the rurality spectrum, two municipalities in the same state of Chihuahua offer stark contrasts: in Ocampo, for example, 100% of households are rural but only 40.3% of the population is poor; whereas in Batopilas de Manuel Gómez Morín, 100% of households are also rural, but a total of 92.2% of the population is poor (see Graph 2).

Graph 2. Correlation between the proportion of poor people and the proportion of rural households in municipalities of interest, in 2020



SOURCE: AUTHOR'S OWN GRAPH, BASED ON DATA FROM INEGI'S NATIONAL POPULATION AND HOUSING CENSUS 2020, AND FROM CONEVAL'S POVERTY INDICATORS.

— Valores ajustados

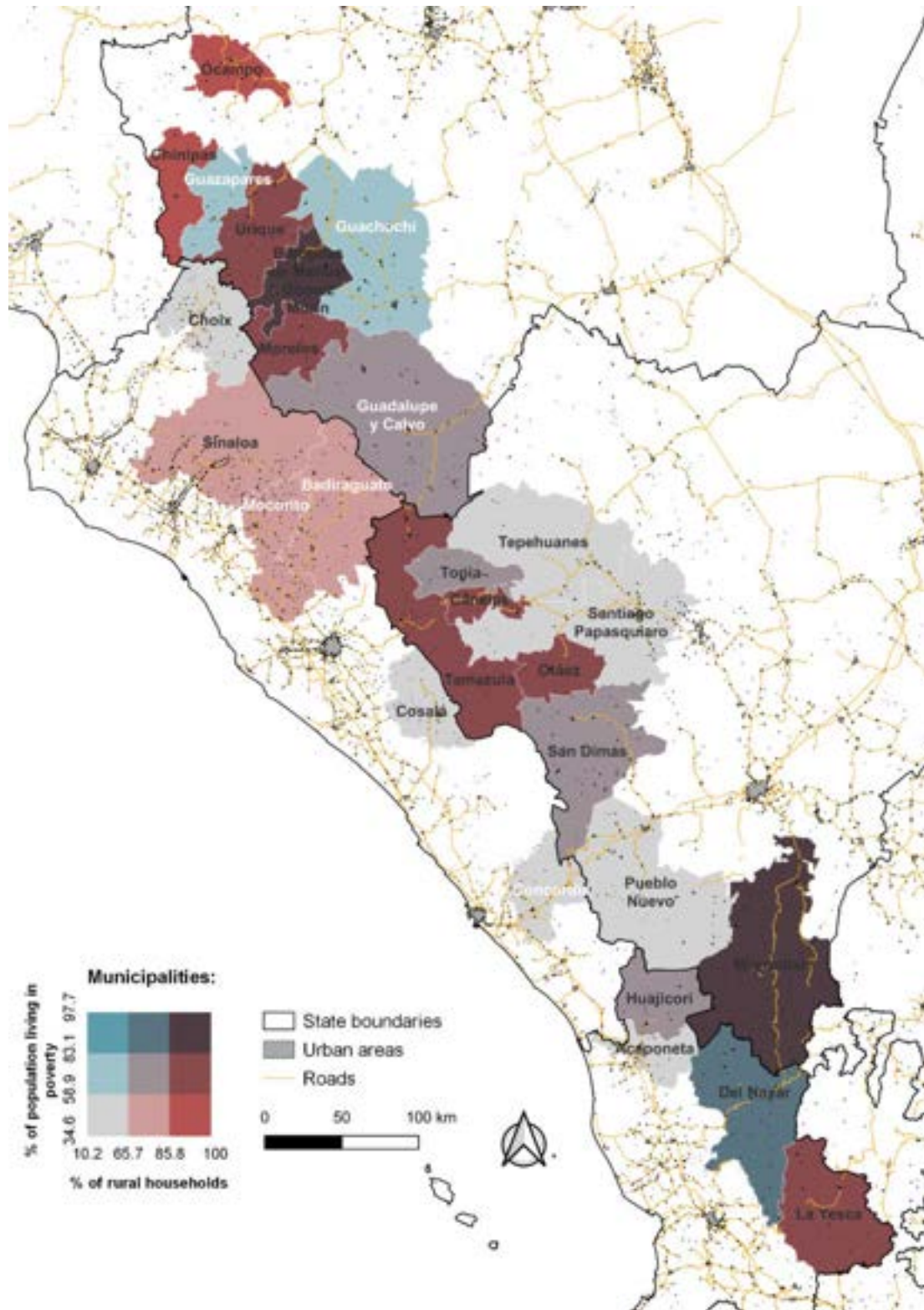
We can also observe some patterns emerging at state level. For example, the four Oaxacan municipalities are in the tertile with the highest percentages of the population living in poverty (see map 3), while the six municipalities of Sinaloa are in the lowest poverty tertile (see map 4). However, other states show very heterogeneous scenarios even among adjacent municipalities – as in the cases of Chihuahua, Durango and Nayarit (see map 4) – while, except in Oaxaca, there are no distinguishable trends at the regional level.

Map 3. Poverty and rurality in municipalities of interest in Oaxaca’s sierras and valleys, in 2020



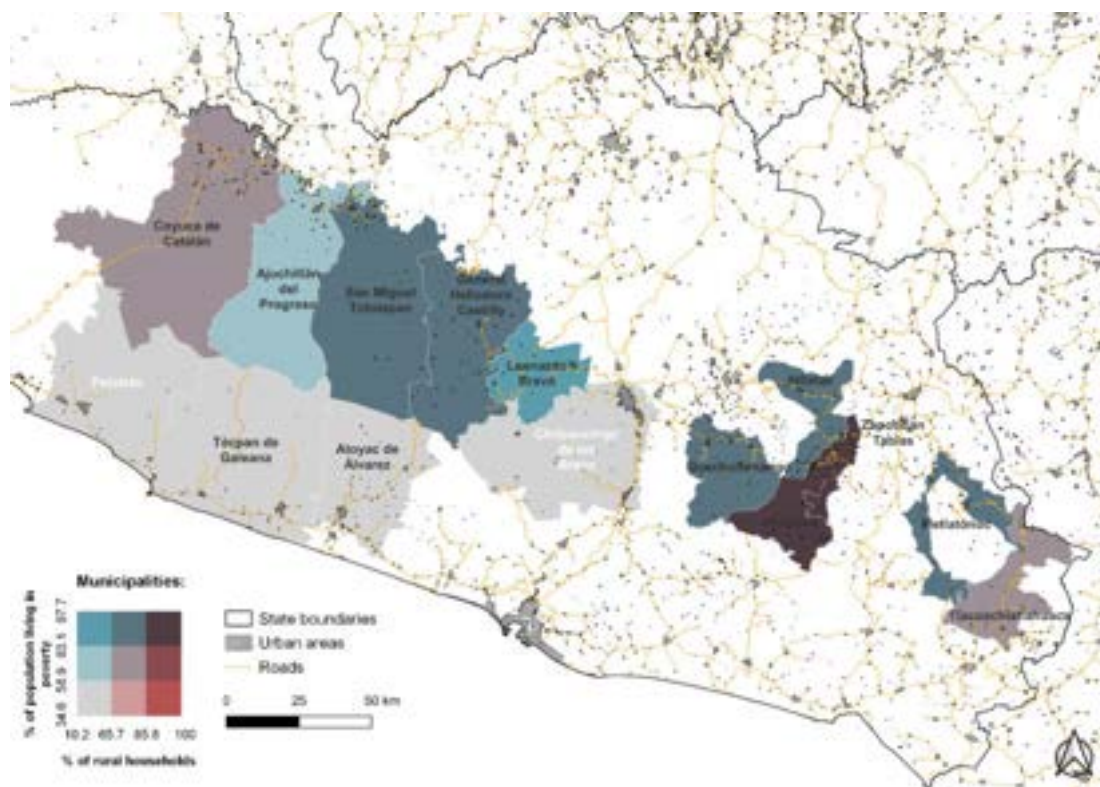
SOURCE: AUTHOR'S OWN MAP, BASED ON DATA FROM INEGI'S 2020 NATIONAL POPULATION AND HOUSING CENSUS, CONEVAL'S 2020 POVERTY INDICATORS, AND INEGI'S 2020 GEOSTATISTICAL FRAMEWORK.

Map 4. Poverty and rurality in municipalities of interest in the Sierra Madre Occidental, in 2020



SOURCE: AUTHOR'S OWN MAP, BASED ON DATA FROM INEGI'S 2020 NATIONAL POPULATION AND HOUSING CENSUS, CONEVAL'S 2020 POVERTY INDICATORS, AND INEGI'S 2020 GEOSTATISTICAL FRAMEWORK.

Map 5. Poverty and rurality in municipalities of interest in the Sierra Madre del Sur in Guerrero, in 2020



SOURCE: AUTHOR'S OWN MAP, BASED ON DATA FROM INEGI'S 2020 NATIONAL POPULATION AND HOUSING CENSUS, CONEVAL'S 2020 POVERTY INDICATORS, AND INEGI'S 2020 GEOSTATISTICAL FRAMEWORK.

Legal agricultural panorama

With regards to the legal agricultural production of our municipalities of interest, we analyzed the end-of-year Agricultural Production Statistics published by the Agrifood and Fisheries Information Service (Servicio de Información Agroalimentaria y Pesquera, or SIAP), a division of the Ministry of Agriculture and Rural Development (Secretaría de Agricultura y Desarrollo Rural, or SADER). We focused on the following variables:

1. Cultivated surface area (distinguishing whether dependent on irrigation, or watered by rains only)
2. Total value of production (in current pesos)

3. Varieties of crops grown

Agricultural production can vary from year to year depending on weather conditions, the availability of water resources, producer costs and prices, and other factors that affect farmers' planting decisions. We therefore decided to calculate average values for the three variables based on the annual values that the SIAP recorded during the five years preceding the implementation of Sembrando Vida in each municipality of interest.

First, in terms of **cultivated surface area**, we can observe **strong disparities** between different municipalities (see Table 2). For example, in San Juan Lachigalla (Oaxaca), 642 ha were planted on average per year²⁶, during the five years prior to the launch of Sembrando Vida in the municipality. At the opposite end of the scale, the municipality of Sinaloa (Sinaloa) averaged 131,174

26. Value of an average year, considering spring-summer and autumn-winter cultivation cycles, as well as perennial crops.

ha planted per year during the same period. Unsurprisingly, we found a very strong and statistically significant positive correlation between the total surface area cultivated and the total value of agricultural production per municipality ($\rho = 0.9605$; $P = 0.0000$). That is, the municipalities with the highest area sown with crops also tend to be those that generated the highest value in terms of agricultural production.

At the same time, access to an irrigation system is also revealed to be a determining factor in crop valuation, since municipalities with higher production values tended to have larger areas of crops grown on irrigated land (see Table 2). This is because irrigation allows for better yields of crops such as corn, while also allowing the planting of other crops with higher water requirements that command

higher producer prices than rainfed crops (INEGI, 2003: 115).

Among our municipalities of interest, however, **irrigated agriculture** was only important in a few: Sinaloa, Mocorito and Concordia (Sinaloa), Ajuchitlán del Progreso, Técuapan de Galeana, Petatlán and San Miguel Totolapan (Guerrero), Acaponeta y Huajicori (Nayarit), and Santiago Papasquiaro (Durango)²⁷. It was largely **anecdotal** in the others (see Table 2).

Table 2. Cultivated surface area and value of agricultural production in municipalities of interest during the five years prior to Sembrando Vida

Federal State	Municipality	Average over the 5 years prior to the start of Sembrando Vida			
		Area planted per calendar year			Production value per calendar year (thousands of current MXN pesos)
		Total (ha)	With irrigation (ha)	With irrigation (%)	
Chihuahua	Batopilas de Manuel Gómez Morín	3,045	-	0%	8,877
	Chinipas	1,743	-	0%	4,978
	Guachochi	11,642	6	0%	40,375
	Guadalupe y Calvo	6,108	-	0%	20,836
	Guazapares	2,276	-	0%	6,734
	Morelos	1,713	-	0%	5,335
	Ocampo	2,542	-	0%	10,158
	Urique	3,654	-	0%	12,744

Federal State	Municipality	Average over the 5 years prior to the start of Sembrando Vida			
		Area planted per calendar year			Production value per calendar year (thousands of current MXN pesos)
		Total (ha)	With irrigation (ha)	With irrigation (%)	
Durango	Canelas	3,431	252	7%	33,543
	Mezquital	15,697	998	6%	64,333
	Otáez	2,599	5	0%	22,110
	Pueblo Nuevo	9,520	-	0%	69,998
	San Dimas	8,494	-	0%	64,056
	Santiago Papatzi	35,111	5,116	15%	290,083
	Tamazula	11,724	-	0%	77,722
	Tepehuanes	9,083	525	6%	74,588
	Topia	3,005	301	10%	25,941
Guerrero	Ajuchitlán del Progreso	19,711	7,351	37%	353,148
	Atlixac	4,138	94	2%	24,445
	Atoyac de Álvarez	47,157	3,607	8%	630,288
	Coyuca de Catalán	18,971	1,581	8%	186,175
	Chilpancingo de los Bravo	9,564	938	10%	152,037
	General Heliodoro Castillo	16,811	1,766	11%	266,570
	Leonardo Bravo	8,215	444	5%	123,288
	Metlatónoc	3,444	262	8%	20,315
	Petatlán	25,004	5,523	22%	530,672
	Quechultenango	9,796	372	4%	125,707

Federal State	Municipality	Average over the 5 years prior to the start of Sembrando Vida			
		Area planted per calendar year			Production value per calendar year (thousands of current MXN pesos)
		Total (ha)	With irrigation (ha)	With irrigation (%)	
Guerrero	San Miguel Totolapan	13,274	2,616	20%	124,416
	Técpan de Galeana	38,643	13,141	34%	1,383,406
	Tlacoachistlahuaca	10,012	654	7%	118,848
	Zapotitlán Tablas	2,262	77	3%	15,133
	Acatepec	4,145	84	2%	23,934
Nayarit	Acaponeta	14,901	3,409	23%	270,997
	Huajicori	2,000	208	10%	13,663
	Del Nayar	5,633	-	0%	20,259
	La Yesca	3,285	-	0%	60,585
Oaxaca	San Carlos Yautepec	5,274	94	2%	27,029
	San Juan Lachigalla	642	4	1%	5,496
	San Pedro Quiatoni	2,449	26	1%	29,582
	Santo Domingo Tepuxtepec	860	1	0%	7,178
Sinaloa	Badiraguato	8,828	-	0%	43,942
	Concordia	7,993	2,373	30%	410,763
	Cosalá	4,087	270	7%	29,711
	Choix	10,622	-	0%	129,783
	Mocorito	46,427	21,384	46%	1,158,561
	Sinaloa	131,174	92,365	70%	3,661,898

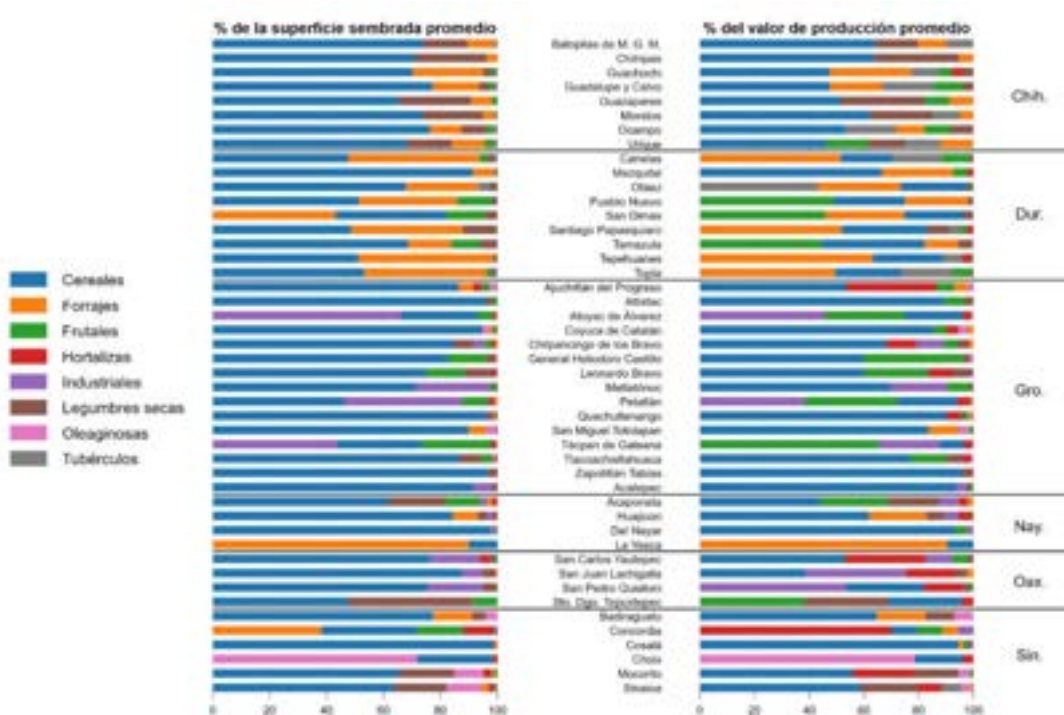
NOTE: VALUES INCLUDE THE 64 CROPS MONITORED BY THE SIAP (DUE TO THEIR "ACCOUNT[ING] FOR MORE THAN 90 PERCENT OF THE VALUE OF NATIONAL AGRICULTURAL PRODUCTION"), AS WELL AS SUGARCANE, FRUIT, AND MANDARINS, WHICH WERE ALSO INCLUDED IN THE STATISTICS FOR THE ENTIRE 2003-2021 PERIOD.

SOURCE: AUTHOR'S OWN TABLE, BASED ON DATA FROM THE AGRICULTURAL PRODUCTION STATISTICS OF THE SIAP.

Of the **types of legal crops grown** in our municipalities of interest prior to the start of Sembrando Vida, it is worth noting that **cereals** – and above all corn grain – occupied most of the cultivated surface area (in 40 of the 46 municipalities), and generated **most of the value of agricultural production** (in 30 of the 46), reaching proportions above 90% in Cosalá (Sinaloa), Del Nayar (Nayarit), as well as in Zapotitlán Tablas, Acatepec and Quechultenango (in Guerrero's Central and Montaña regions). All of these are contexts in which the vast majority of agricultural production revolves around cereals, and which do not have access to irrigation to cope with droughts (see Table 2).

However, we also found **some more diversified agricultural scenarios**. For example, **forage and dry legumes** are important crops in the state of Chihuahua, likewise **forage and fruit crops** in Durango, **fruit and industrial crops**²⁸ in Guerrero's Tierra Caliente and Costa Grande regions, **industrial and vegetables** in Oaxaca, or **vegetables and oilseeds** in Sinaloa (see Figure 3).

Graph 3. Types of crops cultivated and the value of agricultural production in municipalities of interest, during the five years prior to Sembrando Vida.



NOTE: VALUES INCLUDE THE 64 CROPS MONITORED BY THE SIAP (DUE TO THEIR "ACCOUNT[ING] FOR MORE THAN 90 PERCENT OF THE VALUE OF NATIONAL AGRICULTURAL PRODUCTION"), AS WELL AS SUGARCANE, FRUIT, AND MANDARINS, WHICH WERE ALSO INCLUDED IN THE STATISTICS FOR THE ENTIRE 2003-2021 PERIOD.

SOURCE: AUTHOR'S OWN TABLE, BASED ON DATA FROM THE AGRICULTURAL PRODUCTION STATISTICS OF THE SIAP.

28. According to the SIAP, "[t]he industrial crops (...) are: olives, agave, cottonseed, cacao, cherry coffee, sugar cane, copra, henequen, fig, rubber, jatropha, linseed, African palm or oil palm, aloe, broom sorghum, tobacco, grapes, vanilla, chiclero sapote and zapupe [ixtle fibre]", <https://www.gob.mx/siap/articulos/cultivos-industriales?idiom=es>.

Levels of lethal violence

To analyze the levels of lethal violence that characterized our municipalities of interest prior to the start of Sembrando Vida's operations, we turned to INEGI's death statistics and, in particular, to those deaths registered as homicides²⁹.

In 2018, the year before Sembrando Vida's national launch, a total of **793 homicides took place in our 46 municipalities of interest, representing just 2.2%** of the 36,485 homicides committed that same year across the country as a whole. **However, the average homicide rate per 100,000 inhabitants in our municipalities of interest was much higher than the national average**, at 59 per 100,000 inhabitants, versus 29 per 100,000 at the national level.

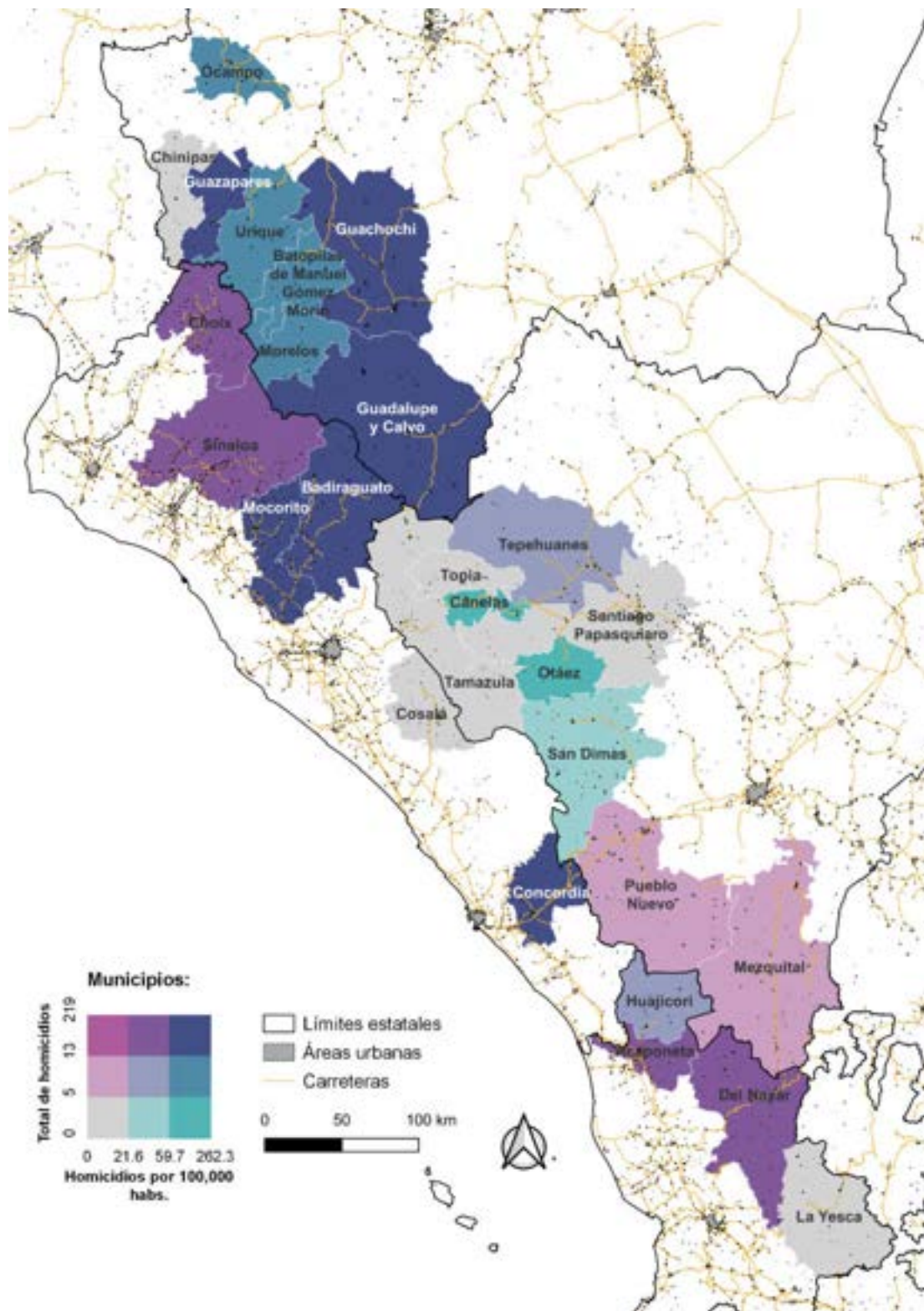
These rather dramatic overall figures belie **strong disparities** within the group of municipalities of interest itself. While 26 of the 46 had a homicide rate per inhabitant higher than the national rate – with San Juan Lachigalla (Oaxaca) being the most extreme case, with a rate of 262 homicides per 100,000 inhabitants³⁰ – the remaining 20 municipalities had rates lower than the national average, including four that did not suffer any homicides at all during 2018: namely La Yesca (Nayarit), San Pedro Quiatoni, Santo Domingo Tepuxtepec (Oaxaca) and Topia (Durango).

In regional terms, we can observe that the **largest total numbers of homicides and the highest homicide rates were registered in the Sierra Tarahumara of Chihuahua, the Sierra and South of Sinaloa (see map 6), and in Chilpancingo de los Bravo and Petatlán, Guerrero (see map 7)**. In contrast, municipalities located in Oaxaca (see map 8) – except San Juan Lachigalla – and in Guerrero's Montaña region (see map 7), presented **low or average rates of lethal violence** in 2018.

29. This category includes the criminal categories of both "intentional homicide" and "femicide".

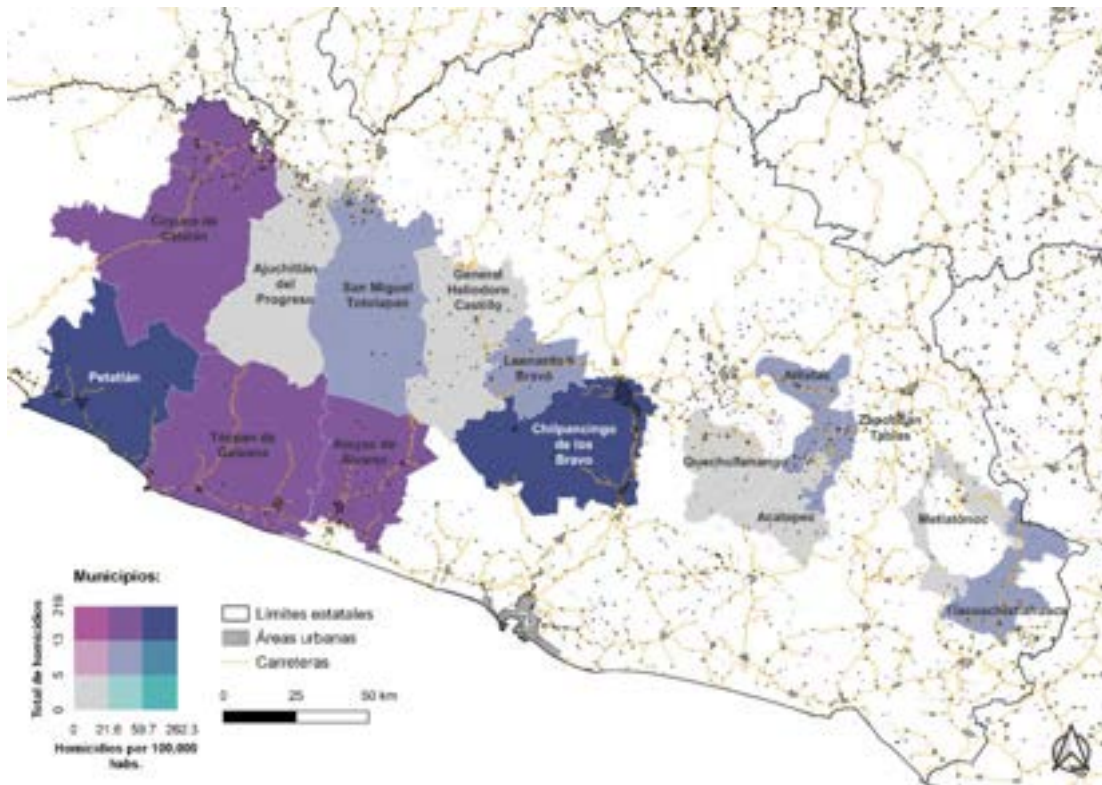
30. That is, nine homicides in the context of an estimated total municipal population of 3,449 in 2018.

Map 6. Total numbers of and average rates of homicides in 2018, in municipalities of interest in the Sierra Madre Occidental

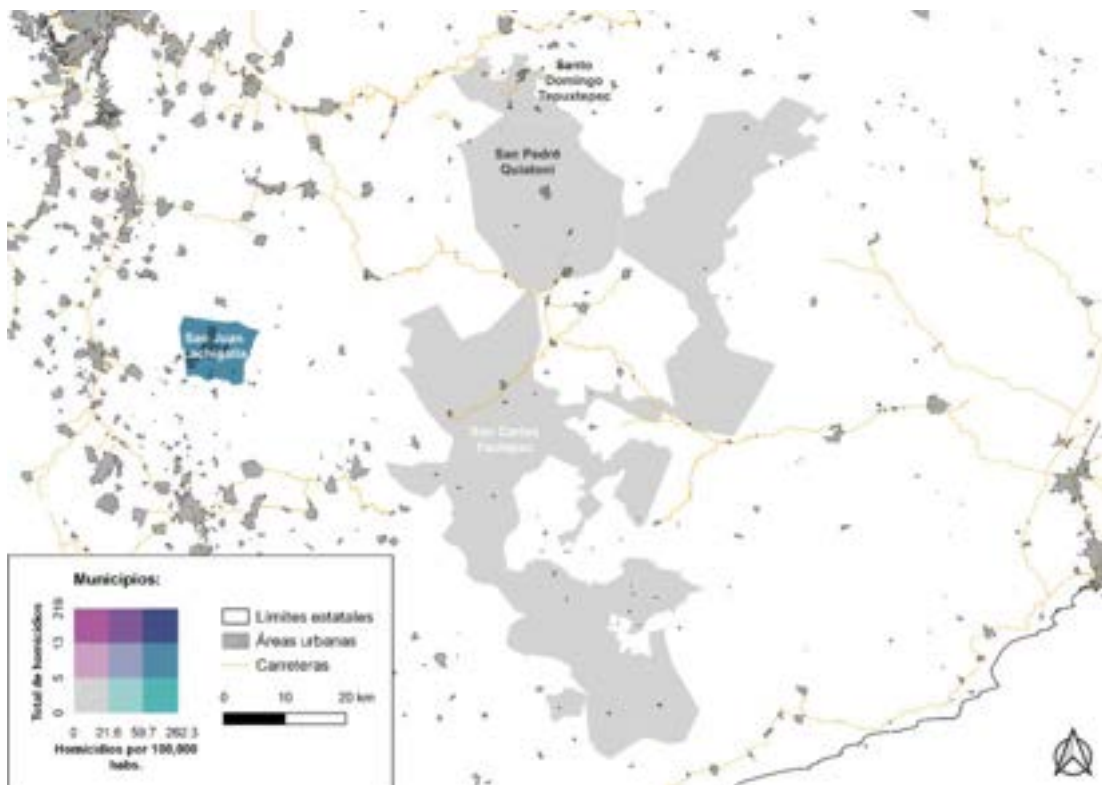


SOURCE: AUTHOR'S OWN MAP, BASED ON MICRODATA FROM INEGI'S REGISTERED DEATH STATISTICS (UPDATED ON OCTOBER 26, 2022), AND POPULATION ESTIMATES CALCULATED FROM THE 2015 INTERCENSAL SURVEY, THE 2020 NATIONAL POPULATION AND HOUSING CENSUS, AND INEGI'S 2018 GEOSTATISTICAL FRAMEWORK.

Map 7. Total numbers of and average rates of homicides in 2018, in municipalities of interest in the Sierra Madre del Sur guerrerense.



Map 8. Total numbers of and average rates of homicides in 2018, in municipalities of interest in the Oaxacan highlands and valleys.



SOURCE: AUTHOR'S OWN MAP, BASED ON MICRODATA FROM INEGI'S REGISTERED DEATH STATISTICS (UPDATED ON OCTOBER 26, 2022), AND POPULATION ESTIMATES CALCULATED FROM THE 2015 INTERCENSAL SURVEY, THE 2020 NATIONAL POPULATION AND HOUSING CENSUS, AND INEGI'S 2018 GEOSTATISTICAL FRAMEWORK.

In our municipalities of interest, **75% of the homicides occurring in 2018 were perpetrated with some kind of firearm**, as against 70% of homicides at national level. This rate rose to 90% in those municipalities of interest located in Oaxaca, 87% in those of Durango, 86% in those of Nayarit, 83% in those of Sinaloa, and 77% in those of Guerrero. But this rate fell to 60% in those municipalities of interest located in Chihuahua, where 21% of the assaults were committed with some kind of sharp object.

Another interesting variable in the context of lethal violence in our municipalities of interest relates to the occupations of the victims, of whom an average of 24% were agricultural workers – a proportion that rises to 45% in the municipalities of Durango and 90% in those of Oaxaca – which suggests that lethal violence at the municipal level was an important phenomenon among the rural population.

However, INEGI's general death statistics also indicate that more than half of the homicides took place in our municipalities of interest were perpetrated in their municipal capitals: that is, in urban localities that are not officially eligible for inclusion within the Sembrando Vida program, nor tend to be centres of illicit crop cultivation, which is usually concentrated in rural areas that are more difficult to access (Ospina et al., 2018).

Given that the social dynamics prevailing within municipal capitals are often rather different to those in more remote rural areas (Frissard et al., 2021), it should be noted that **the levels of lethal violence observed at the municipal level did not necessarily reflect the social dynamics in the areas that were candidates for Sembrando Vida and/or had a history of illicit crop cultivation.**

4. LITTLE CHANGE IN LEGAL CULTIVATION, LESS DESTRUCTION OF ILLICIT CROPS, AND FEWER HOMICIDES

In order to investigate the extent to which agricultural production, the destruction of illicit crops and lethal violence have changed since Sembrando Vida began operating, we analyzed the evolution of the following variables in our municipalities of interest:

1. Cultivated surface area and value of legal crop production by calendar year (SIAP data)
2. Area of illicit crops destroyed per calendar year (SEDENA and SEMAR data)
3. Homicides per calendar year (INEGI data)

Evolution of legal agricultural production in the municipalities of interest

According to SIAP's Agricultural Statistics, the area planted with legal crops increased in 29 of our 46 municipalities of interest during the first year of Sembrando Vida's operation, while it decreased in the remaining 17 municipalities³¹. In Chihuahua, the increases were particularly important, with an additional 141% in ha planted on average, while in the other states the variations were milder: an additional 6% in Sinaloa, 4% in Nayarit, 2% in Guerrero, and 1% in Oaxaca, while in Durango, a small reduction of -1% was recorded. Meanwhile, with regards to the value of legal agricultural production during the first year of the program, this increased in 22 of our municipalities of interest, and actually decreased in the other 24.

Thus while these two variables tend to be positively correlated³², **an increase in legally cultivated surface area does not always guarantee a rise in the value of legal agricultural production – let alone**

an increase in the profits earned by growers. In those municipalities of interest located in Chihuahua, for example, despite an increase in cultivated areas in 2020 compared to 2019, the actual value of agricultural production decreased by an average of 71% – particularly in Morelos, Guazapares, Batopilas de Manuel Gómez Morín and Urique – due to the loss, caused by severe drought³³, of 86% of the rainfed crops (essentially corn, beans and forage oats) that had been sown during the 2020 spring-summer cultivation cycle. The following year, less land was planted, with the total area going back to levels similar to those of 2019, before these municipalities began receiving the support of Sembrando Vida.

This massive loss of planted crops, which occurred during the first year of Sembrando Vida's operation in Chihuahua, illustrates the vulnerability to drought of agricultural production systems that lack access to irrigation, and therefore rely exclusively on rainfall to grow crops with high water requirements. In such contexts, the cultivation of a more drought-resistant plant, such as opium poppy, may be particularly attractive to local farmers (Rubiano-Lizarazo, 2021: 14).

However, given that both the area planted and the value of production may vary from year to year depending on factors external to the Sembrando Vida program, we sought to identify more robust trends by comparing the average values for both of these variables (as recorded during the five years prior to Sembrando Vida's launch in each municipality), with the average values recorded since then, up to and including the year 2021.

As can be seen in Table 3, the area planted with legal crops decreased in 26 of our 46

31. In response to the freedom of information request with file number 330027922000064, the SIAP confirmed that the areas planted as part of the Sembrando Vida program are included in the Agricultural Statistics, specifically in the "Closure of Agricultural Production" document which was analyzed in this investigation.

32. The production value is calculated by multiplying the average rural price by the volume produced. In turn, the latter corresponds to the harvested area multiplied by the yield obtained on that area (measured in tons per hectare). Finally, the harvested area is defined as the area sown, minus the area that may have been damaged before harvesting.

33. According to data from the Mexican Drought Monitor (MSM) of the National Water Commission (CONAGUA), these municipalities suffered continuous periods of severe and extreme drought from August 2020 to June 2021 – lasting up until November 2021 in the case of Guadalupe y Calvo, Chihuahua.

municipalities of interest since the beginning of Sembrando Vida's implementation, while it increased in the remaining 20. The average reduction across all of the municipalities taken together was -6%. This result means that, **in most of the municipalities with a history of illicit crop cultivation in which Sembrando Vida operates, the area dedicated to legal agricultural production has decreased since the launch of the program.**

The value of legal agricultural production³⁴, on the other hand, increased in a majority of our municipalities of interest. Increases were seen in 28 of the 46 municipalities, while decreases occurred in only 18, equating to an **increase in the value of legal agricultural production of 6% on average.** While in most cases, a reduction in the cultivated surface area was accompanied by a decrease in the value of production – as was the case of all the municipalities in Chihuahua, and half of those in Durango and Sinaloa – another 12 municipalities saw a reduction in their average cultivated area, but an increase in the average production value (see Table 3), due to one or more of the following mechanisms:

1. Improved yields
2. Increases in producer prices
3. Substitution of certain crops for others that generate greater production values

Table 3. Evolution of cultivated surface area and value of agricultural production in municipalities of interest, before and since the beginning of Sembrando Vida.

Federal State	Municipality	Average annual sown area	Average annual production value
Chihuahua	Batopilas de Manuel Gómez Morín	-5%	-43%
	Chínipas	-59%	-54%
	Guachochi	-12%	-32%
	Guadalupe y Calvo	-42%	-55%
	Guazapares	-14%	-47%
	Morelos	-7%	-67%
	Ocampo	-9%	-34%
	Urique	-19%	-44%
Durango	Canelas	-2%	-25%
	Mezquital	-6%	12%
	Otáez	-3%	20%
	Pueblo Nuevo	-9%	-12%
	San Dimas	-20%	-14%

Federal State	Municipality	Average annual sown area	Average annual production value
Durango	Santiago Papasquiaro	1%	-8%
	Tamazula	-10%	-22%
	Tepehuanes	0%	4%
	Topia	-3%	8%
Guerrero	Ajuchitlán del Progreso	11%	14%
	Atlixnac	5%	-1%
	Atoyac de Álvarez	-1%	26%
	Coyuca de Catalán	1%	60%
	Chilpancingo de los Bravo	2%	28%
	General Heliodoro Castillo	-3%	15%
	Leonardo Bravo	-3%	11%
	Metlatónoc	9%	8%
	Petatlán	3%	36%
	Quechultenango	1%	20%
	San Miguel Totolapan	16%	55%
	Técpan de Galeana	3%	42%
	Tlacoachistlahuaca	0%	10%
	Zapotitlán Tablas	7%	17%
Acatepec	11%	18%	
Nayarit	Acaponeta	21%	75%
	Huajicori	-33%	17%
	Del Nayar	-22%	27%
	La Yesca	-7%	16%
Oaxaca	San Carlos Yautepec	-2%	65%
	San Juan Lachigalla	5%	49%
	San Pedro Quiatoni	1%	-1%
	Santo Domingo Tepuxtepec	5%	43%

Federal State	Municipality	Average annual sown area	Average annual production value
Sinaloa	Badiraguato	0%	-12%
	Concordia	-13%	35%
	Cosalá	-45%	-9%
	Choix	-43%	-71%
	Mocorito	12%	38%
	Sinaloa	1%	38%

NOTE: THE ANNUAL AVERAGES RECORDED DURING THE FIVE YEARS PRIOR TO THE START OF SEMBRANDO VIDA WERE COMPARED WITH THE ANNUAL AVERAGES RECORDED SINCE THEN AND UP TO AND INCLUDING THE YEAR 2021.

SOURCE: PREPARED BY THE AUTHORS BASED ON DATA FROM SIAP'S AGRICULTURAL PRODUCTION STATISTICS.

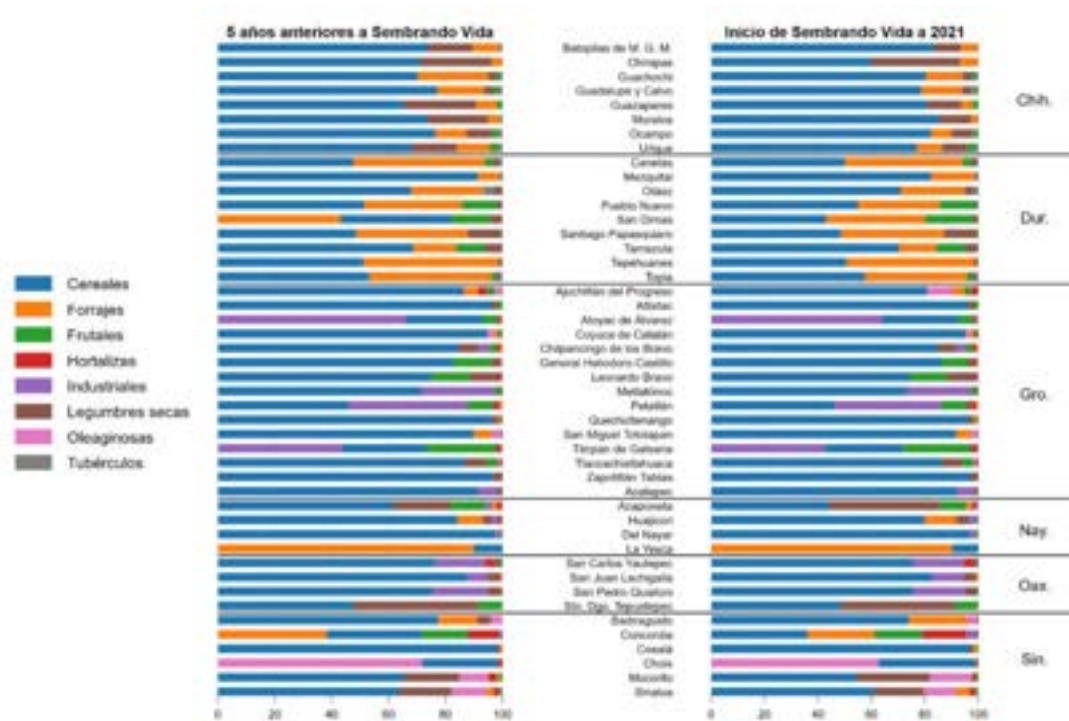
In the case of the municipality of Del Nayar (Nayarit), for example, the 27% increase in the average annual value of agricultural production, despite a drop in the total cultivated surface area, is attributable to an increase in the average rural price of corn grain from 2019 through to 2021, which reached levels 35% higher in the period of Sembrando Vida's operation (2020-2021), compared to the previous five years.

Meanwhile, in the municipality of Atoyac de Álvarez (Guerrero), the average annual value of production increased by 26%, at the same time as the area planted in the municipality decreased by 1%. In part, this was also due to an increase in the price of corn grain, which coincided with an increase in the area planted with the same crop of an additional 500 ha per year on average since the local launch of Sembrando Vida. This partly compensated for a drop in the average rural price of coffee, which decreased by 7%, spurring the area planted with coffee to decline by -990 ha per year on average. Above all, though, in Atoyac de Álvarez it was an increase in the average rural price of mangoes, which rose from \$5,240 MXN to \$7,726 MXN per ton, on average, between the two periods analyzed, as well as an improvement in yields – from 17 tons per ha to 18 tons – that contributed to the rising value of production despite a drop in the area cultivated.

Over all, however, in our 46 municipalities of interest, **we do not observe a significant substitution between legal crops since the launch of Sembrando Vida.** That is, if we compare the five-year period that preceded the program, with the period following its implementation, it is not evident that some types of crops have increased massively to the detriment of others (see Figure 4). In particular, the proportion of the cultivated area occupied by fruit trees or industrial crops – including coffee, cocoa and agave – did not expand significantly, even though these crops tend to be the ones most vigorously promoted as part of the Sembrando Vida program³⁵. Therefore, **the program does not seem to be substantially modifying the panorama of legal crop production in municipalities with a history of illicit crop cultivation.**

35. See the communiqué published on 15 June 2021 by the Secretariat of Welfare, accessible at <https://www.gob.mx/bienestar/prensa/sembrando-vida-reforesta-no-deforesta-inicia-siembra-de-429-millones-de-nuevos-arboles?idiom=es#:~:text=Con%20m%C3%A1s%20de%20420%20mil,%2C%20lim%C3%B3n%2C%20aguacate%20y%20durazno.>

Graph 4. Types of crops and areas planted with them in municipalities of interest, before and after the launch of Sembrando Vida



NOTA: LOS VALORES INCLUYEN LOS 64 CULTIVOS DE SEGUIMIENTO DEL SIAP ("QUE REPRESENTAN MÁS DEL 90 POR CIENTO DEL VALOR DE LA PRODUCCIÓN AGRÍCOLA NACIONAL"), ASÍ COMO LA CAÑA DE AZÚCAR FRUTA Y LA MANDARINA, QUE FIGURABAN EN LAS ESTADÍSTICAS DE TODO EL PERIODO 2003-2021.

FUENTE: ELABORACIÓN PROPIA CON BASE EN DATOS DE LA ESTADÍSTICA DE PRODUCCIÓN AGRÍCOLA DEL SIAP.

Evolution of illicit crop destruction in our municipalities of interest

According to SEDENA and SEMAR records³⁶, the **average area of illicit crops destroyed per year decreased in most of our municipalities of interest since the launch of Sembrando Vida**. This was true for a total of 38 out of 46 municipalities compared to the annual average of the previous five years, while there was an increase in the area of illicit crops destroyed in only 8 (see graph 5).

In particular, in the four municipalities of interest located in Oaxaca, the annual average area of illicit crops destroyed decreased by more than 80%. Meanwhile, the five municipalities with the largest areas destroyed during the five years prior to the start of Sembrando Vida – that is, Guadalupe y Calvo (Chihuahua), Tamazula (Durango), Badiraguato (Sinaloa), General Heliodoro Castillo (Guerrero) and Del Nayar (Nayarit), with average areas of between 1,000 and 5,000 ha destroyed per year – also witnessed a decrease of between 36% and 66% in destruction activities recorded since the launch of Sembrando Vida in their jurisdictions. On the other side of the spectrum, however, in Petatlán (Guerrero) and Morelos (Chihuahua), recorded illicit crop destruction increased by

36. Obtained through freedom of information requests with file numbers 330026422003143 and 330026622000987.

123% and 199%, respectively.

The trend observed in most of our municipalities of interest could reflect one or both of the following mechanisms:

1. **A reduction in the area dedicated to illicit crop cultivation**
2. **A reduction in the efforts of the Armed Forces to destroy these crops**

The first mechanism may or may not be related to the implementation of Sembrando Vida and the attendant crop substitution effects of the program, as desired by the federal government (see introduction). It could also, however, be driven by other factors external to the program, such as fluctuations in the market prices of marijuana and opium gum.

With regard to the latter, the information we were able to gather through **interviews conducted with poppy growers, staff of the Secretariat of Welfare, and state officials in Guerrero** in June 2022 suggests that, above all, relatively low prices of opium gum have driven a reduction in the area dedicated to poppy cultivation in that state. This phenomenon had already been noticed by Le Cour Grandmaison et al. (2019) in Guerrero and Nayarit as far back as 2018, i.e. two to three years before the start of Sembrando Vida in those states.

Regarding the second mechanism that could potentially be driving a reduction in the areas of illicit crops destroyed by the authorities, there is the hypothesis that, in coordination with the Secretariat of Welfare, the Armed Forces have decided to curb their des-

truction of illicit crops in those municipalities with a history of illicit cultivation that are now part of the Sembrando Vida program. In other words, the authorities could be “softening” their eradication campaigns in municipalities benefiting from this social program, so that illicit crop producers have the opportunity to gradually transition to exclusively legal agricultural activity.

However, according to a Sembrando Vida official we were able to interview, there exists no such coordination between the Secretariat of Welfare and the Armed Forces. In the absence of any official policy to this end, then, a decrease in the authorities' efforts to destroy illicit crops could be fuelled by other factors external to Sembrando Vida, such as a transfer of resources within the Armed Forces from eradication operations to other tasks now considered a higher priority by the federal government. Although we lack data to corroborate the above hypothesis³⁷, it is worth noting that, at national level, the cumulative area of the poppy plantations registered as having been destroyed by the Armed Forces went from representing around 90% of the total estimated area dedicated to poppy cultivation in Mexico between 2015 and 2018, to 71% in the 2018-2019 cycle, before dropping to 45% in the 2019-2020 cycle³⁸. In other words, between 2018 and 2020 there has been a dramatic reduction in the total area of illicit poppy cultivation registered as having been destroyed.

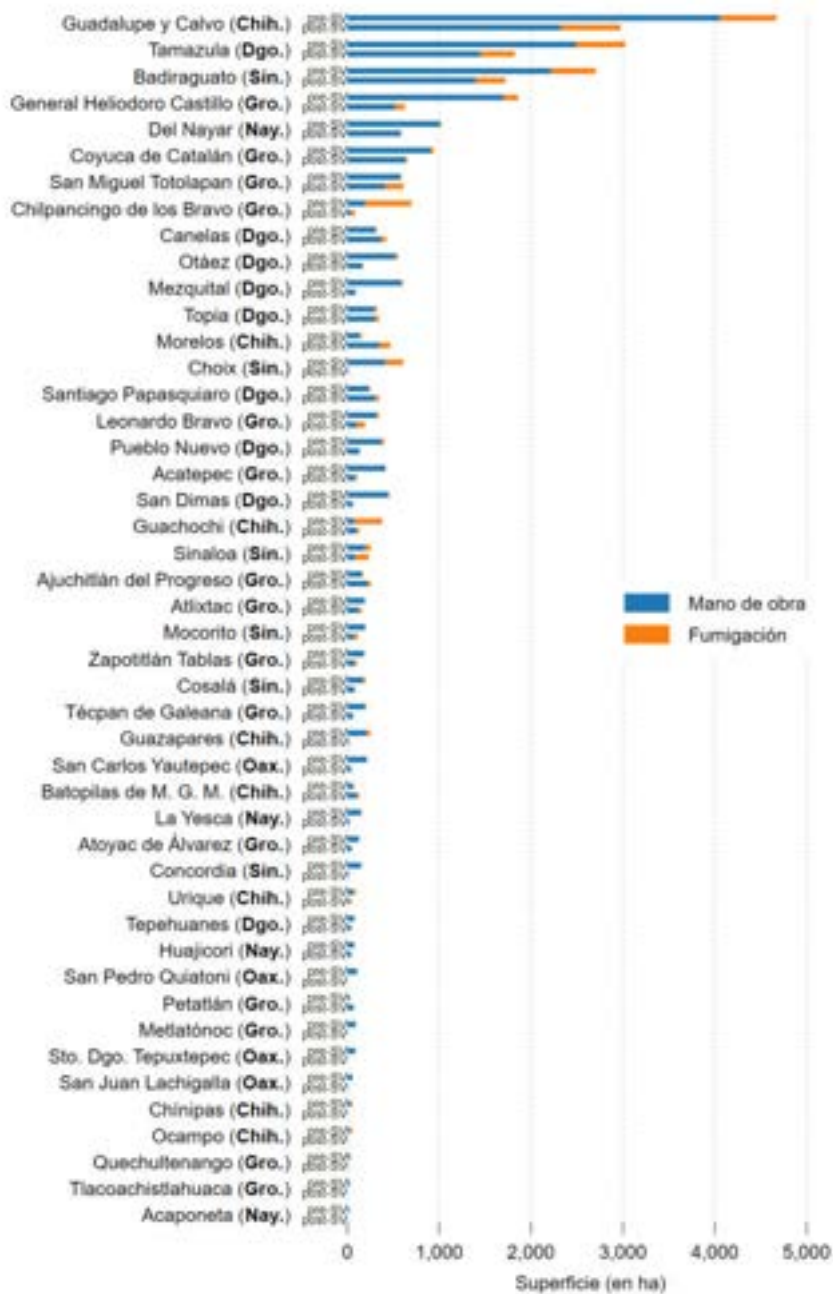
On the other hand, if we look at the method of destruction used, we can observe that the areas sprayed with herbicide increased in 16 of our municipalities of interest – including seven of the eight municipalities where

37. To corroborate this hypothesis, it would be interesting to analyze how the number of Armed Forces personnel dedicated to the destruction of illicit crops has evolved. In fact, the current federal government regularly discloses how many elements of the Secretariat of National Defense (SEDENA) are deployed in “intensive eradication of illicit crops” activities (between 3,887 and 9,551, according to the monthly security reports published between October 2019 and December 2021, accessible at https://www.gob.mx/presidencia/archivo/documentos?idiom=es&filter_origin=archive). However, this data could not be located in the previous administration's report on illicit crop eradication (SEDENA, 2018), nor in SEDENA's responses to freedom of information requests sent between 2012 and 2018 (in its responses to requests with file numbers 0000700006618_065 and 0000700141017_065, SEDENA refused to specify how many of its deployed elements participated in crop eradication activities).

38. The proportions of total area destroyed were calculated by dividing the areas of poppy registered as destroyed by SEDENA (freedom of information request with file number 330026422003143), and SEMAR (request 330026622000987), by the total amount of Mexican land that the UNODC estimated was dedicated to poppy cultivation (UNODC, 2022). Since the UNODC publishes its figures according to the cultivation cycle, measured from 1 July to 30 June of the following year, the monthly figures recorded by SEDENA and SEMAR were used to compare exactly the same periods.

there was a rise in the total area destroyed – while it decreased in 21 others (see graph 5). This means that, although in most of our municipalities of interest, destruction by fumigation decreased – as did destruction in general – in some contexts the Armed Forces opted to intensify the use of this eradication method. Considering that fumigation is a more punitive method than manual destruction – because it is applied at a greater distance and with less precision – the increase in fumigation in these 16 municipalities could reflect a desire to increase pressure on poppy and/or marijuana growers.

Graph 5. Average annual destruction of illicit crops in municipalities of interest, by method of destruction, before and after Sembrando Vida



AVERAGE ANNUAL DESTRUCTION OF ILLICIT CROPS IN MUNICIPALITIES OF INTEREST, BY METHOD OF DESTRUCTION, BEFORE AND AFTER SEMBRANDO VIDA.

In terms of the **type of illicit crops destroyed by the Armed Forces**, it should be noted that, on average, 82% of the area destroyed annually in each municipality was dedicated to opium poppy during the five years prior to Sembrando Vida. This proportion has remained similar (84%) since the program's launch. The remaining percentage is made up of marijuana plantations, plus an anecdotal area of coca cultivation³⁹.

During the five years prior to the launch of Sembrando Vida, in 42 of our municipalities of interest the majority of the eradicated area was occupied by poppy (*see graph 6*), while marijuana destruction accounted for the majority of the eradicated area in the remaining four:

1. San Juan Lachigalla, Oaxaca: 48 ha of marijuana, equivalent to 86% of the area destroyed annually, on average;
2. Cosalá, Sinaloa: 139 ha, equivalent to 70%;
3. San Pedro Quiatoni, Oaxaca: 60 ha, equivalent to 56%;
4. La Yesca, Nayarit: 80 ha, equivalent to 51%.

Since the start of the program, there are still four municipalities in which the Armed Forces destroyed a larger area of marijuana cultivation than of poppy:

1. San Juan Lachigalla, Oaxaca: 7 ha, equivalent to 100%;
2. Tlacoachistlahuaca, Guerrero: 2 ha, equivalent to 100%;
3. Cosalá, Sinaloa: 60 ha, equivalent to 71%;
4. La Yesca, Nayarit: 15 ha, equivalent to 62%.

These results suggest that, **since the beginning of Sembrando Vida, the imbalance between poppy and marijuana destruction** that already characterized most of our municipalities of interest during the five years prior to the program did **not change**. This imbalance could be explained by:

1. Larger areas being planted with poppy than with marijuana, and/or
2. The existence of more incentives for the Armed Forces to destroy poppy than marijuana.

39. In 2021, SEDENA reported having destroyed 4.2 ha of coca in Atoyac de Álvarez, Guerrero (see response to access to information request with folio number 330026422004871).

Graph 6. Average annual destruction of illicit crops in municipalities of interest, by type of crop, before and after Sembrando Vida



NOTE: THE ANNUAL AVERAGES RECORDED DURING THE FIVE YEARS PRIOR TO THE START OF SEMBRANDO VIDA WERE COMPARED WITH THE ANNUAL AVERAGES RECORDED SINCE THEN AND UP TO AND INCLUDING THE YEAR 2021.

SOURCE: AUTHOR'S OWN TABLE, BASED ON CROP DESTRUCTION RECORDS OF SEDENA AND SEMAR.

Evolution of lethal violence in our municipalities of interest

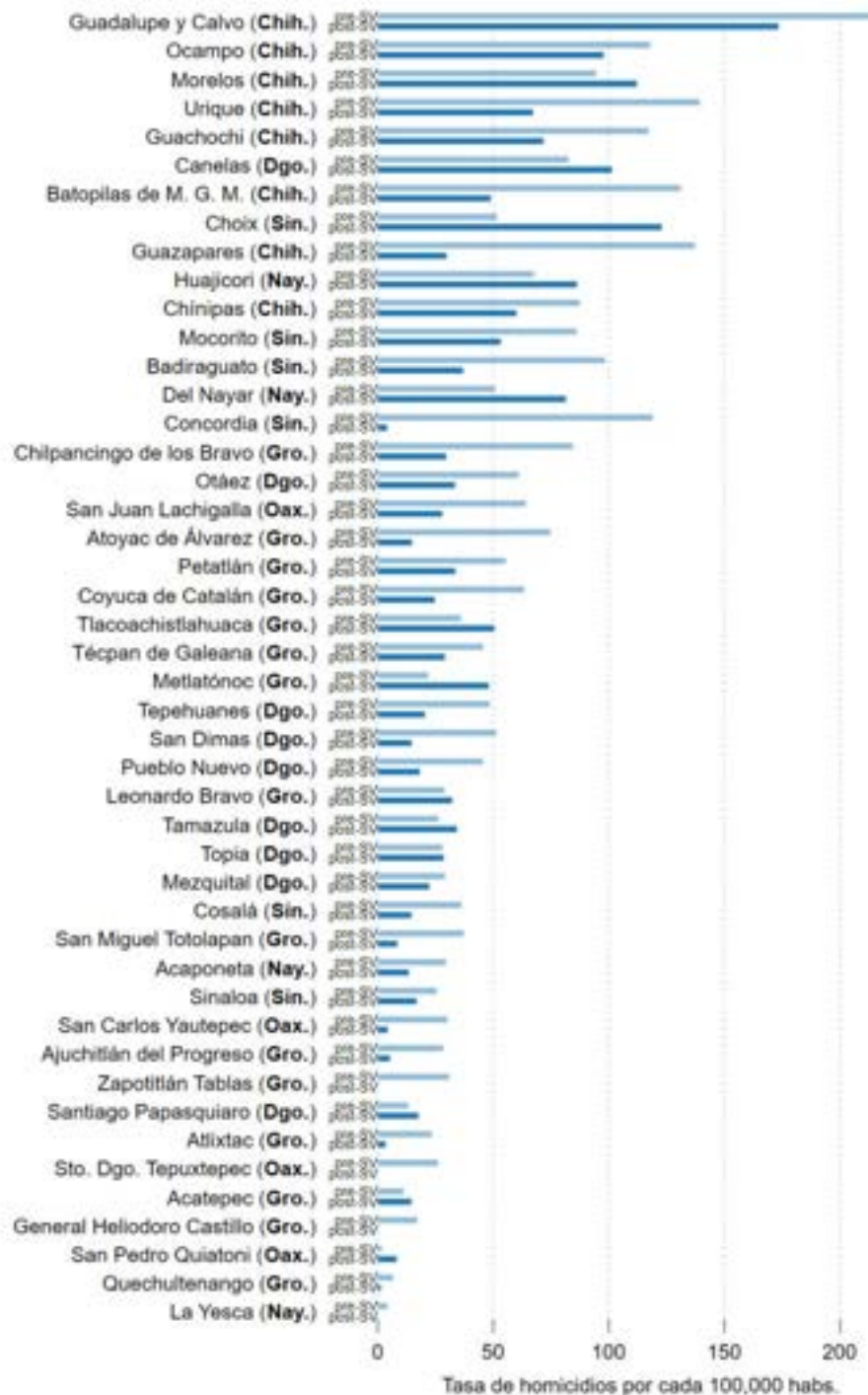
In terms of lethal violence, the INEGI's recorded death statistics indicate that, in municipalities with a history of illicit crop cultivation in which Sembrando Vida was operational, the annual homicide rate went from an average of 58 homicides per 100,000 inhabitants during the five years prior to the launch of the program, to 37 per 100,000 inhabitants between then and 2021.

This overall trend reflects the **reduction in lethal violence** observed in 33 of our 46 municipalities of interest (see Figure 7), including those that presented a combination of high total numbers of homicides and high overall homicide rates during the five years prior to the start of the program: namely Guachochi, Guadalupe y Calvo and Urique (Chihuahua), Badiraguato, Concordia and Mocorito (Sinaloa), and Atoyac de Álvarez and Chilpancingo de los Bravo (Guerrero) (see maps 6 and 7).

On the other hand, among the 13 municipalities that suffered an increase in lethal violence since the arrival of Sembrando Vida in their territories, we found that five had a combination of low pre-program homicide rates and totals: namely San Pedro Quiatoni (Oaxaca), Acatepec and Metlatónoc (Guerrero), and Santiago Papasquiaro and Topia (Durango). However, this group of 13 municipalities also includes Del Nayar (Nayarit) and Choix (Sinaloa), which had high pre-program annual homicide totals, as well as Huajicori (Nayarit), Canelas (Durango), and Morelos (Chihuahua), whose pre-program annual homicide rates were already among the highest of our municipalities of interest, and which have seen this measure of local, lethal violence rise further still since Sembrando Vida's launch.



Graph 7. Average annual homicide rate in municipalities of interest, before and after Sembrando Vida



NOTE: THE AVERAGE ANNUAL RATES RECORDED DURING THE FIVE YEARS PRIOR TO THE START OF SEMBRANDO VIDA WERE COMPARED TO THE RATES RECORDED SINCE THEN AND UP TO AND INCLUDING THE YEAR 2021.

SOURCE: AUTHOR'S OWN GRAPH, BASED ON MICRODATA FROM INEGI'S REGISTERED DEATH STATISTICS (UPDATED ON OCTOBER 26, 2022) AND POPULATION ESTIMATES CALCULATED FROM THE 2015 INTERCENSAL SURVEY AND THE 2020 NATIONAL POPULATION AND HOUSING CENSUS.

Now, if we focus on the means of aggression, it is worth highlighting that in our municipalities of interest, the proportion of **homicides committed with a firearm of some kind rose from 75% during the five years prior to Sembrando Vida, to 77% from then until 2021⁴⁰**, Conversely, at the national level, this proportion has remained stable since 2018, at around 70% of cases. To explain the divergence from the national trend seen in those Sembrando Vida beneficiary municipalities with a history of illicit crop cultivation, we posit **two hypotheses that are not mutually exclusive**:

1. **An increase in the availability of firearms**
2. **A growth in incentives and abilities to use firearms**

In particular, the proportion of homicides committed with a firearm increased in 21 of our municipalities of interest, including those with the highest incidence of such crimes: namely Guadalupe y Calvo (Chihuahua) and Chilpancingo de los Bravo (Guerrero), where 88% and 84% of the people murdered since the local launch of Sembrando Vida were killed with a firearm.

Finally, with regards to the occupations of homicide victims, the proportion of agricultural workers who were killed remained the same (21%) when we compare the five years that preceded the program, with the period from its inception through to 2021.

5. DISCUSSION

Evolution of legal crops and possible relationship with the dynamics of illicit crop cultivation

In a municipality in which both legal and illicit crops are grown, the official agricultural production monitoring system (SIAP) **only records the areas planted with legal crops, and therefore underestimates the total area under cultivation.**

According to several ethnographic studies, **poppy and marijuana growers do not tend to specialize exclusively in these crops, but rather integrate them among the other plants that make up their agricultural production model** (Alvarez, 2021; Le Cour Grandmaison, 2021; Morris, 2022). In other words, the growers of legal and illegal plants are often the same people. Likewise, during periods when the price of raw opium gum is low, it is usual for growers who do not migrate in search of better-paying work to stop producing opium poppy and instead plant some other legal crop.

On the other hand, according to the Sembrando Vida Program Operating Guidelines for 2021, the plots of land eligible for cultivation as part of the program had to meet one the following conditions:

40. This increase of two percentage points is far from marginal given that, in our municipalities of interest, the annual percentage of homicides that were committed with a firearm has fluctuated only a little – between 73% and 81% – since 2000.

1. “Be currently uncultivated.
2. Be abandoned or unused pasture or paddock.
3. Have a low level of acahual (secondary vegetation): which will be defined in accordance with the ecosystem that predominates in the relevant territory. In this case, acahual management and enrichment techniques must be implemented and incorporated into the design of the production unit, in order to promote the inclusion of as much pre-existing vegetation as possible, always respecting that which has a basal diameter of 10 centimetres or more.
4. Be cultivated as milpa (native corn varieties) or any other rainfed or short-cycle crop.”

According to these conditions, at least some of the plots to be dedicated to agricultural production under the auspices of Sembrando Vida – ie. areas of former cultivation or pasture that currently found to be idle, abandoned, or covered by low secondary vegetation – would, by definition, add to the total area of legal cultivation in a given municipality, rather than replacing already-cultivated land. This would lead to an increase in total amount of legally cultivated land that the SIAP registers as existing in our municipalities of interest (although this effect could in turn be mitigated by other factors that caused the non-replanting of previously cultivated plots, for example urban growth in formerly agricultural areas, or an exodus of the rural population).

In our municipalities of interest, poppy and marijuana plantations do not appear in official records concerning the cultivation of crops (such as the Agricultural Statistics collated by the SIAP). While a proportion of these areas of illicit cultivation may be located in zones that are not used for normal agricultural production – such as forests or the patios of homes, for example (Álvarez, 2021) – those that form part of a cultivator’s fields escape the official registration system and are considered by government statistics as acahuales or idle lands; that is, precisely those plots that are candidates for integration into the Sembrando Vida program.

Assuming that the implementation of Sembrando Vida was carried out in compliance with the Program’s Operating Guidelines, that is, was limited to acahuales and idle land, then **those plots planted with legal crops under the auspices of Sembrando Vida are likely to have directly replaced areas formerly dedicated to poppy or marijuana cultivation.** This hypothesis would be in line with what the federal government is proposing in terms of illicit crop substitution.

However, **fieldwork would be required to actually test this hypothesis**, since the absence of a registry of illicit crops at the municipal level⁴¹ prevents us from doing so via a more straightforward desk review.

6. CONCLUSION

Almost three years after the launch of Sembrando Vida – the largest social program to target the Mexican countryside, and one that, according to official announcements, would generate agricultural and social change in regions where illicit crops are cultivated – we took on the task of making a first assessment of the program's results, based on the analysis of data published by the authorities themselves.

By December 2021, 10% of Sembrando Vida's beneficiaries were located in 46 municipalities with histories of illicit crop cultivation – distributed throughout Chihuahua, Sinaloa, Durango, Nayarit, Guerrero and Oaxaca – which we have termed our municipalities of interest. **Although the program's guidelines claim to prioritize the rural population living in poverty, the truth is that Sembrando Vida operates in very heterogeneous municipalities, including some that are not overwhelmingly rural and/or have relatively few inhabitants living in poverty.**

Heterogeneity is also apparent in terms of the kinds of legal agricultural production prevailing in each municipality prior to the start of the program: whereas some were dominated by high-value, diversified and irrigated production, others depended on rain-fed cereal crops, more vulnerable to drought. On the other hand, **the municipalities with a history of illicit crop cultivation in which Sembrando Vida operates all had high average homicide rates prior to the launch of the program, although there were also significant disparities between these rates.**

Since the implementation of Sembrando Vida in our municipalities of interest, we have observed an overall reduction in the area planted with legal crops, and a concurrent increase in the overall value of legal production. Depending on the context, this trend reflects an increase in producer prices and/or an improvement in yields, but no substantial change in the types of legal crops planted. On the other hand, the area of illicit crops destroyed by the authorities in each municipality decreased, as a result of a possible reduction in the area dedicated to opium poppy and marijuana cultivation, and/or a reduction in the efforts of the Armed Forces to destroy them. There was also a decrease in homicides in most municipalities, but an increase in the use of firearms to commit homicides.

Meanwhile, the research that we carried out for this report has allowed us to identify information gaps that continue to hinder the understanding of the cultivation of plants declared illicit in Mexico, as well as the possible relationship between this phenomenon and the implementation of Sembrando Vida.

First, **the absence of open data at the municipal level regarding the cultivation – rather than the destruction – of poppy and marijuana prevents us from monitoring the areas planted and harvested, total yields or producer prices.** These basic variables for monitoring any type of crop are collected by the SIAP in the case of legal crops in Mexico and, in other countries, are also generated for crops declared as illicit via satellite imaging and

fieldwork.

In Colombia, for example, the Ministry of Justice and Law not only publishes annual municipal-level data regarding areas dedicated to coca cultivation, but also the actual cartographic files with which it measures the density of illicit crops detected by the Integrated Illicit Crop Monitoring System (Sistema Integrado de Monitoreo de Cultivos Ilícitos, or SIMCI), launched in 1999 and supported by UNODC. Similarly, another UNODC project, “Monitoring Opium Production in Afghanistan”, has since 1994 published data on poppy cultivation at the district level in Afghanistan. In Mexico, however, despite the existence of a similar program – the MEXK54 Monitoring System for Illicit Plantations in Mexican Territory (Sistema de Monitoreo de Plantíos Ilícitos en el Territorio Mexicano, or SMPITM) – the UNODC and the Mexican government only publish an annual report featuring aggregate estimates by region, and no open data at all at the local level.

Second, it should be noted that, **although the Mexican federal government presents Sembrando Vida as a program that encourages the voluntary substitution of illicit crops**, and despite the program’s beneficiaries committing in writing to not take part in “illicit activities”, the truth is that, **since its launch in 2019, this element of the program is not formally mentioned in Sembrando Vida’s rules of operation**. Its inclusion is an essential precondition for any external monitoring and evaluation of Sembrando Vida against previously established objectives and goals in this area.



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