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México REDD+
Con la gente por sus bosques

Evaluation of Land use Policy and Financial Mechanism that Affect Deforestation in Mexico

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ALIANZA MÉXICO PARA LA REDUCCIÓN DE EMISIONES POR
DEFORESTACIÓN Y DEGRADACIÓN



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Los contenidos y opiniones expresadas aquí son responsabilidad de sus autores y no reflejan los puntos de vista del Proyecto de Reducción de Emisiones por la Deforestación y la Degradación de Bosques de México y de la Agencia de los Estados Unidos para el Desarrollo Internacional, el Gobierno de los Estados Unidos.”

REDD+ is a framework that has inspired unprecedented international cooperation around the protection of the Earth’s remaining forests. Bi-lateral agreements between countries have formed with financial commitments far exceeding any prior efforts to protect forests. Because of its potential and inevitable effect on nation states, a cogent REDD+ framework must be designed to fit within the historical land management practices within each country, as well as their political realities. As such, the following report addresses Mexico’s existing policies and financial frameworks that drive and/or combat land use change, and how they could affect the implementation of a REDD+ framework in Mexico.

The report first identifies the major drivers of deforestation, and then discusses current policies that are either directly or indirectly pushing these drivers. It then considers the major policy approaches tried in Mexico thus far to curb deforestation, including policies for more sustainable agriculture, illegal logging control, prevention of forest fires and disease, sustainable forest management, afforestation and reforestation efforts, commercial forest plantations, conservation through national protected areas, and payment for ecosystem services. Lastly, the report synthesizes forest financing efforts in Mexico and compares these efforts to the financing backing the major drivers of deforestation in Mexico.

Executive Summary

Mexico currently has 162.1 million hectares of forest, though over the last decade, an estimated 3.5 to 5.5 million hectares have been lost, contributing to habitat fragmentation, loss of ecosystem services and forest livelihoods, as well as climate change. Still, progress is being made: Mexico's Forest Resource Assessment indicates that the net rate of deforestation has decreased by 55 percent in the last decade. Still, significant hectares of forest (a mid-range estimate is 600,000) are being lost each year, and deforestation risks differ by Mexican state. REDD+ readiness and Mexico's recent climate change legislation have put curbing deforestation more at the forefront of the policy agenda. The major drivers of deforestation in Mexico, according to their REDD+ Readiness Plan, or R-PP, are land use change for agriculture and livestock (82 percent), illegal logging (8 percent), and forest fire and disease (6 percent).

Land use change for agriculture, though a powerful driver of deforestation, is often indirect and, because of the importance of agriculture to Mexico's people and economy, it is difficult to address. Because the sector is responsible for feeding Mexico's citizens and also produces over US\$11 billion worth of export goods, the Federal government has invested considerable time and financial resources in increasing agricultural productivity, and encouraging market competition. As a result, nearly 70 percent of spending in productive programs is geared towards the agricultural sector. It is unclear how much of this funding drives deforestation directly, however what is clear is that the nation's largest subsidies (Procampo, Alianza Para el Campo, and Ingreso Objetivo) present direct and indirect incentives to alter farming habits to boost production before considering the implications on land use change.

Illegal logging is the second largest driver of deforestation; it is estimated that illegal wood makes up 40 to 60 percent of the volume of the logging industry in Mexico. The root causes of illegal logging include unclear land tenure rights, insufficient enforcement of regulations, a lack of alternative employment opportunities in rural areas, and demand for inexpensive wood. Though there is some *tala hormiga*, or small-scale illegal logging, the most problematic illegal logging is conducted by large organized crime networks, with the actual laborers working as low-level intermediaries between the sawmills/lumberyards and the *ejidos*/communities.

Forest fires and disease, lumped together in the R-PP, also contribute significantly to deforestation in Mexico. Though many wildfires are natural and periodic forest fires help to

maintain a healthy canopy, 40 percent of undesirable forest fires are manmade and cause excessive harm. The most prevalent source of uncontrolled forest fires is slash and burn agriculture. The frequency and intensity of forest fires has not changed much in the last 15 years. In terms of forest disease, there are approximately 200 insect species known to cause forest degradation in Mexico, and an estimated 18 percent of Mexico's forest is vulnerable to disease.

Beginning in the 1990s, the Mexican government began to roll out policies and programs to address the issue of deforestation, and more recently, to address land use change as a contributor to climate change. The government has taken initiative to address the environmental implications of agriculture. The most promising example of this is Sagarpa's Program of Natural Resources and Environment, for which the Agency devotes 11 percent of its budget. This program aims to curb the impacts of farming practices on things such as soil carbon, biodiversity, and water, however very little of the focus is specifically on land conversion and deforestation. Aside from Sagarpa's Program of Natural Resources, INIFAP has organized numerous pilot projects to proliferate agro-forestry practices. And the government has worked to promote numerous sustainable certifications schemes for forest and agricultural products, such as the Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC), which monitor land conversion and forest degradation related to agriculture.

Other examples of policy efforts to curb deforestation in Mexico include:

- Profepa's, (Procuraduría Federal de Protección al Ambiente) *Cero Tolerancia*, a policy in the monarch butterfly reserve in the state of Michoacán, which organizes various actors to confront illegal sawmills and confiscate illegally-sourced wood.
- Forest certification programs such as that of the Forest Stewardship Council
- Afforestation and reforestation efforts by national and local authorities
- National Protected Areas
- The Mexico Payment for Ecosystem Services program, which attempts to compensate forest landowners for the opportunity cost of more productive land uses

These policies and subsidies attempt to counteract efforts toward illegal logging and agricultural land conversion. However, with the massive funding currently going toward agricultural expansion and intensification, they are unable to fully stop this trend. The introduction of REDD+ funding to Mexico will help to compensate landowners for the

opportunity cost of maintaining their forests. However, it is critical that REDD+ be introduced in a way that incentivizes the correct behavior and makes it clear to landowners *why* they are being paid. Especially because it could be built upon the foundations of the already-successful payments for ecosystem services program, REDD+ has the potential to work with other subsidies already in place, and fund land use in a way that could incentivize forest conservation.

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A Brief History of Forest Management and Deforestation in Mexico

The history of forest management in Mexico has been a story of competing incentives for land use, with traditional forest tenure often being challenged by agricultural and industrial interests. Most of country's national parks were created in the first half of the twentieth century, and Mexico continuously reformed its forest laws between 1926 and 1992. The first National Forest Plan was elaborated in 1965. Yet, forest conservation efforts were often paired with periods of unregulated forest exploitation, including land concessions made to large multinational companies. While most *ejido* and community forestland was integrated between 1948 and 1977, social participation was weak and the timber industry remained a priority. Starting in the 1970s, non-governmental organizations have proliferated and social development programs that promote sustainable forest management have come onto the scene.¹ Since then, the Federal Government has enacted numerous policies that aim to curb deforestation.

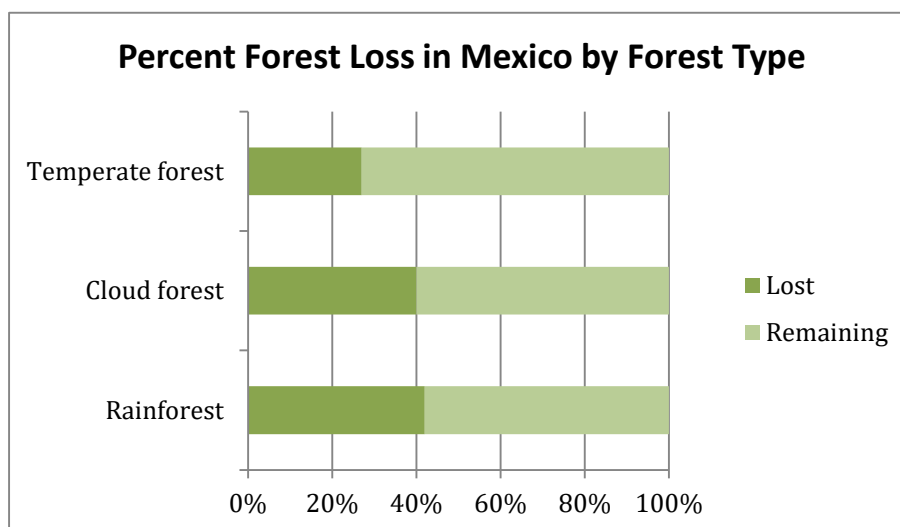
Today, Mexico has 162.1 million hectares of forest remaining (covering 82.3 percent of the country), but many of these hectares are threatened. Over the last decade alone, an estimated 3.5 to 5.5 million hectares were lost.² There is no reliable study that demonstrates annual deforestation rates in Mexico; a mid-range estimate is that 600,000 hectares are deforested every year, though estimates range from 200,000 to 1.5 million hectares.³ The majority of the clearing has occurred along the Volcanic Axis belt that goes across the center of Mexico, but there is also significant forest area loss in the rainforests in the southern regions. Forest degradation, or a reduction of forest canopy or stock, is also occurring, though degradation is especially difficult to monitor and verify. Semarnat estimates that, as of 2007, Mexico had

¹Conafor, *Programa Estratégico Forestal*, 2001.

²Secretaría de Medio Ambiente y Recursos Naturales (Semarnat), *Propuesta de preparación: México (R-PP Mexico)*, April 2011.

³ Conafor, *Programa Estratégico Forestal*, 2001.

transformed 29 percent of its original vegetation to other land uses; 42 percent of original rainforest, 40 percent of cloud forests, and 27 percent of temperate forests have been lost.^{4 5}



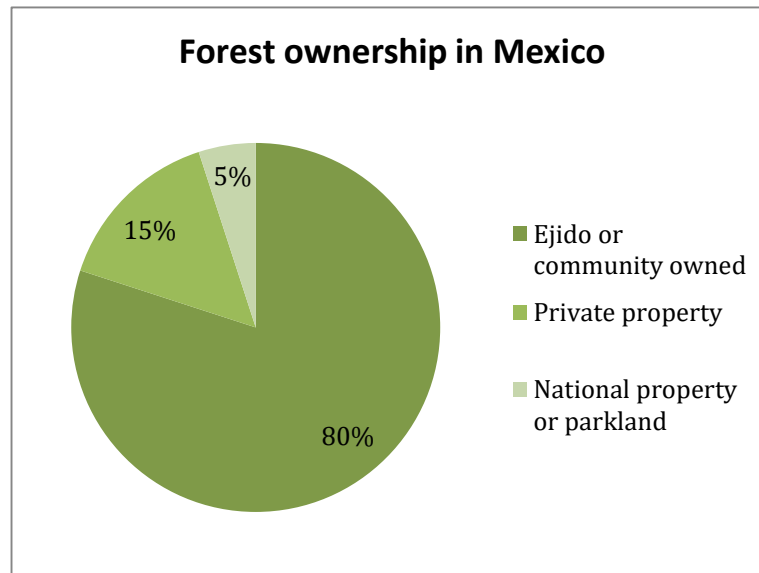
Source: Semarnat. Note that percent loss is estimated against ‘original vegetation,’ or Mexico’s theoretical forest cover in the absence of human activity.

Deforestation directly affects the people in Mexico whose livelihoods depend on forests and the ecosystem services they provide. Mexico’s forests are home to 12 million people, many of whom live in poverty and are dependent on the land. Eighty percent of the nation’s forest area is community or *ejido* owned, 15 percent is private property, and 5 percent is national property or parkland.⁶

⁴Secretaría de Medio Ambiente y Recursos Naturales (Semarnat), *Cambios en el uso del suelo en México*, Semarnat. Available at: http://app1.semarnat.gob.mx/dgeia/resumen_2009/02_ecosistemas/cap2_2.html

⁵Original vegetation is the vegetation that would likely cover Mexico in the absence of human activity, according to the *Carta de Vegetación Primaria Potencial* by the Instituto Nacional de Estadística y Geografía (Inegi).

⁶Conafor, Programa Estratégico Forestal, 2001.



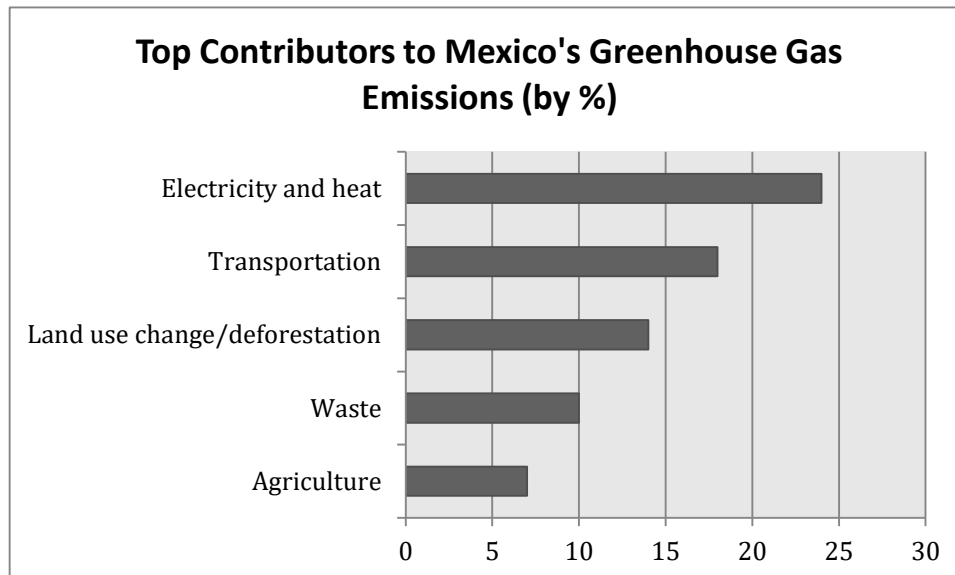
Source: Conafor, Programa Estratégico Forestal 2001

Lastly, deforestation in Mexico released 509.2 million tons of carbon dioxide (CO₂) between 1993 and 2007.^{7 8} Land use change and deforestation in Mexico accounted for 14 percent of GHG emissions between 1990 and 2002, slightly less than the electricity and heat (24 percent) and transportation (18 percent) sectors, but more than waste (10 percent) or agriculture (7 percent).⁹

⁷ Deforestation refers to the total loss of forest cover as the land is converted to another use. Degradation refers to the transition from primary to secondary vegetation. All types of forests in Mexico experience both deforestation and degradation.

⁸ Secretaría de Medio Ambiente y Recursos Naturales (Semarnat), *Propuesta de preparación: México (R-PP Mexico)*, April 2011.

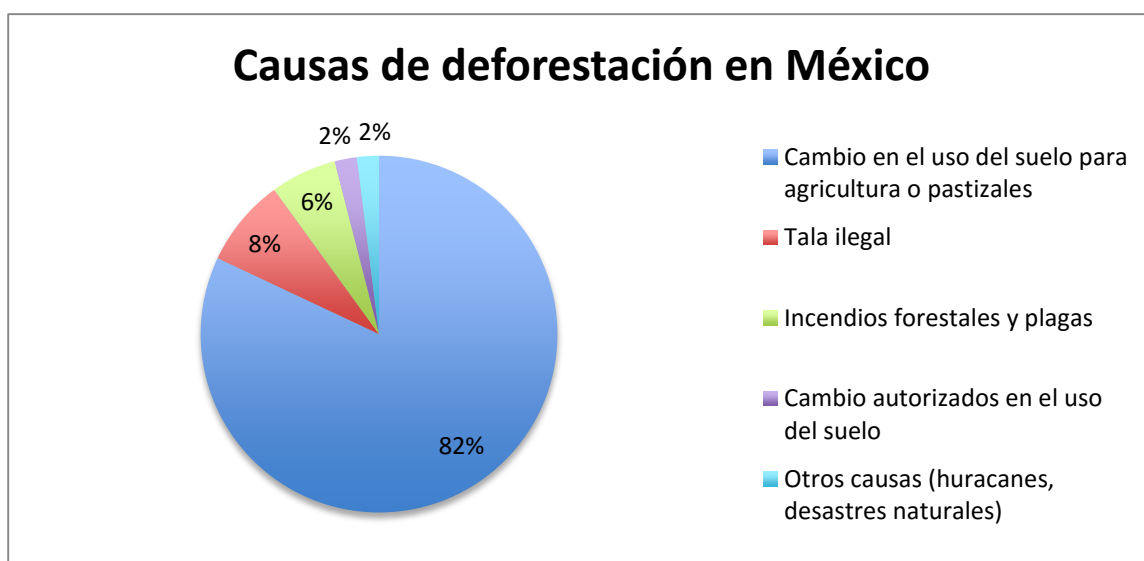
⁹ José Luis Luege Tamargo, Adrián Fernández Bremauntz, Julia Martínez Fernández, and Luis Conde Alvarez, *National Greenhouse Gas Inventory 1990-2002: Report of Mexico*, Secretaría de Medio Ambiente y Recursos Naturales (Semarnat) and Instituto Nacional de Energía.



Source: Semarnat and Instituto Nacional de Energía, National Greenhouse Gas Inventory 1990-2002: Report of Mexico

Drivers of Deforestation

Mexico's REDD+ Readiness Plan (R-PP) identifies the major drivers of deforestation in Mexico as land use change (primarily for agriculture or livestock grazing, (82 percent), illegal logging (8 percent), and forest fires and disease (6 percent).



Source: Mexico R-PP

Underlying causes of deforestation identified by the R-PP include limited use of forested areas, lack of investment in forest livelihoods, lack of funding for afforestation and forest preservation projects, development of agriculture and fisheries in forested areas, illegal extraction, lack of security and respect for the rights of forest dwellers, and poverty and lack of opportunities in the forest sector. A preliminary analysis by Conafor for the R-PP showed that the threats of illegal logging and forest fires were most acute in areas with unclear land rights; deforestation rates were lowest in areas with forest management plans.¹⁰

Mexico's Instituto Nacional de Ecología (INE) has tracked deforestation and its drivers for a couple of decades. Their *Índice de Presión Económico (Riesgo de Deforestación (IRDef))* model uses the economic, social, and geographic factors that influence deforestation—including type of forest, previous rates of deforestation, proximity to towns and cities, level of marginalization, agricultural density, and prices of corn and cattle—to approximate the opportunity cost, or economic gain forgone, of keeping a forest intact. The model then classifies nine-square-hectare parcels according to the risk that they will be deforested in the next seven years:¹¹

¹⁰Secretaría de Medio Ambiente y Recursos Naturales (Semarnat), *Propuesta de preparación: México (R-PP Mexico)*, April 2011.

¹¹ The model can be used both to (1) determine the most at-risk areas where resources should be focused and (2) to evaluate the efficacy of public policy to curb deforestation (by providing a baseline risk level against which the effects of programs and subsidies can be measured statistically).

Graph of Areas Most at Risk of Deforestation in Mexico

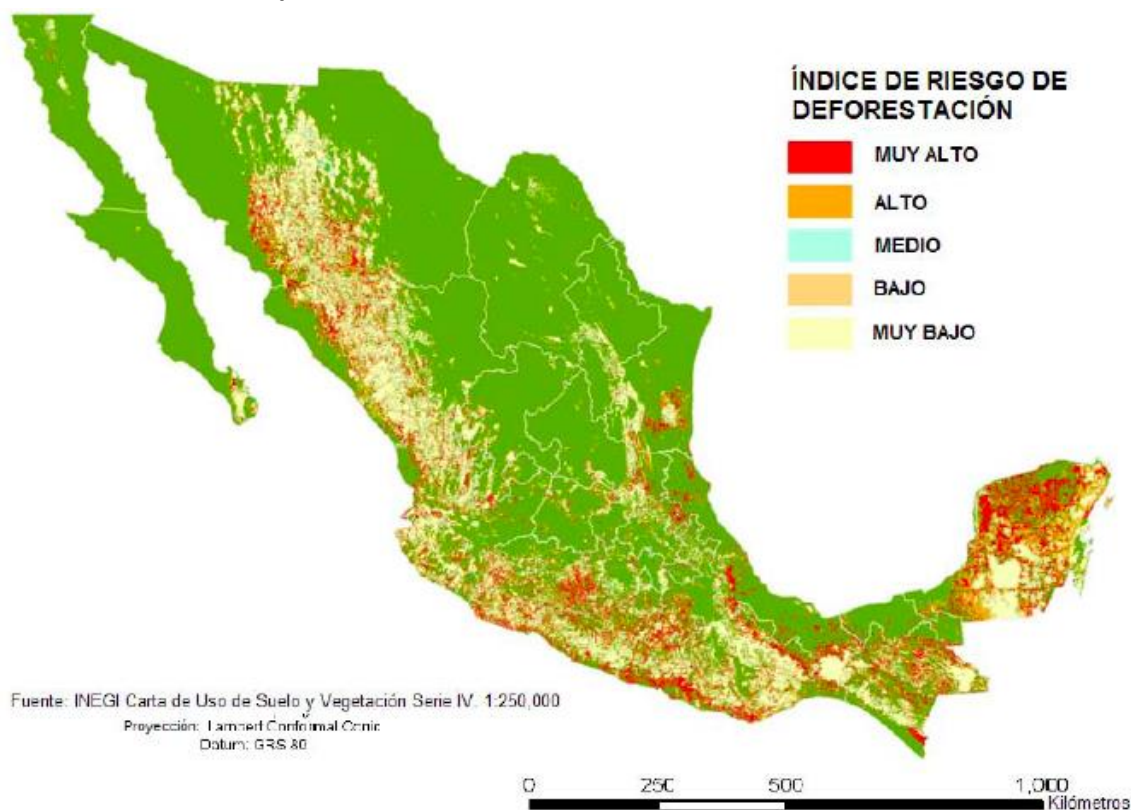
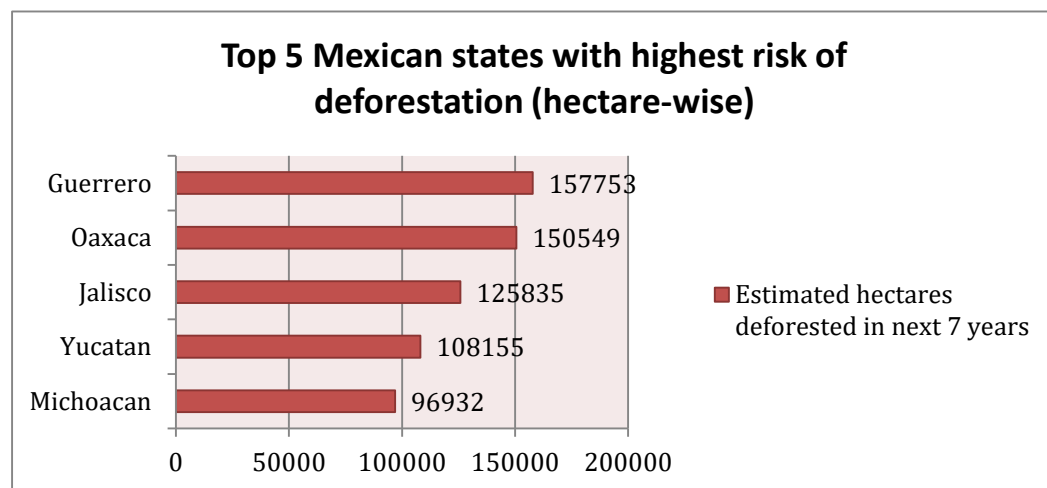
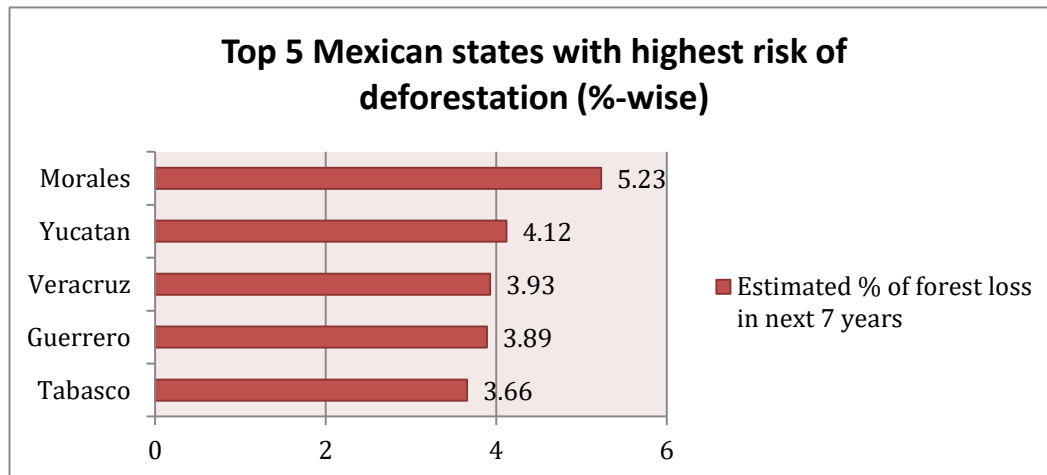


Figura 2. Mapa del Índice de Riesgo de Deforestación, de acuerdo al INE.

Source: Mexico R-PP, Data from INE. Map models the risk that an area will be deforested in the next 7 years according to economic, social, and geographic indicators, with red areas representing the highest risk of deforestation.

The five states with the highest average risk of deforestation are Morales (5.23 percent), Yucatán (4.12 percent), Veracruz (3.93 percent), Guerrero (3.89 percent), and Tabasco (3.66 percent). However, when ranked by estimated number of hectares that would be deforested in the next seven years, the top five list is a bit different: 157,753 hectares would be deforested in Guerrero, 150,549 in Oaxaca, 125,835 in Jalisco, 108,155 in Yucatán, and 96,932 in Michoacán.¹²

¹² Instituto Nacional de Ecología (INE), “Aplicaciones de datos del IRDef 2.0.1,” 2012. Available at: <http://www.ine.gob.mx/irdef-aplicaciones>



Source: Instituto Nacional de Ecología (INE), IRDef model

One of the most interesting lessons learned from this modeling, which was used for the 1993-2000 period and then again for 2000-2007, was that the drivers of deforestation did not change much between the two decades. Deforestation is therefore a “stable phenomenon” with structural causes, indicating that solving this issue will require structural changes.¹³ There is already progress being made in this initiative, according to Mexico’s Forest Resource Assessment, as the net deforestation rate has *decreased* by 55 percent in the last decade, from

¹³ Instituto Nacional de Ecología (INE), “Índice de Riesgo de Deforestación,” 2012. Available at: <http://www.ine.gob.mx/irdef>

408,000 hectares annually in 2000 to 187,000 hectares in 2010.^{14 15} Still, the IRDef model indicates that significant deforestation is occurring and will continue to occur in the absence of policy intervention.

The national forestry authority, Conafor, has developed a strategic forest plan for 2000-2025 that takes a similar systems approach to deforestation. It identifies the interrelated causes of deforestation as extensive agricultural incentives, rural marginalization, weak community and *ejido* governance, lack of resources available for forest vigilance, and limited forestry culture. These underlying factors create pressure to exploit forests for short-term gain, leading to long-term consequences such as river sedimentation; floods and water scarcity; erosion and lost land productivity; and increased rural poverty and migration. This flowchart, developed by Conafor, illustrates these interrelated causes and consequences of deforestation:

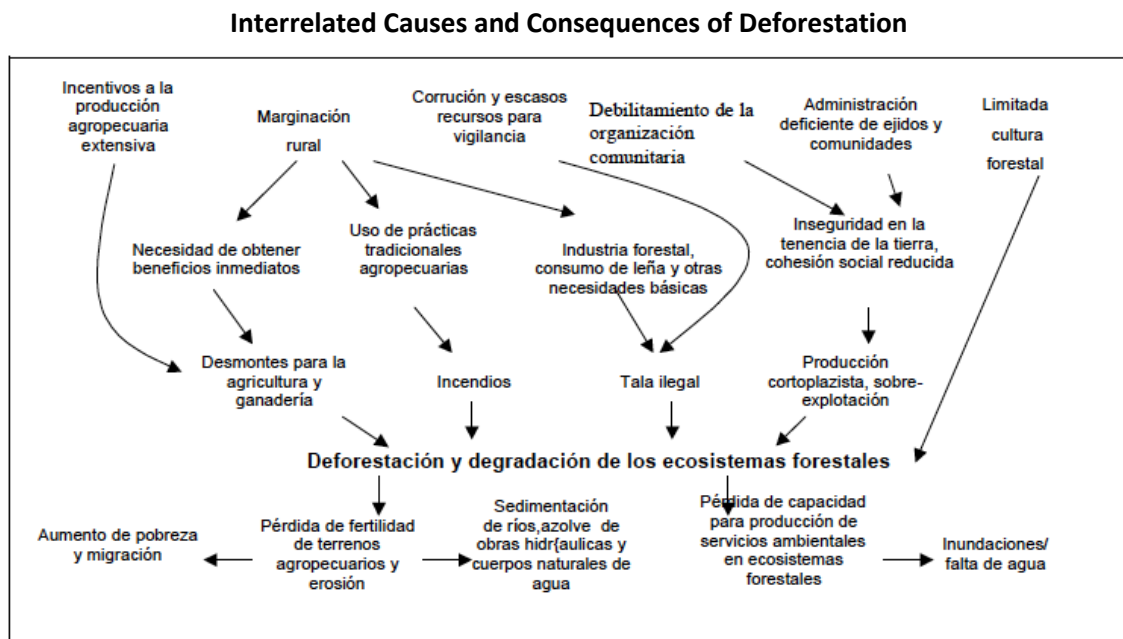


Figura 2.1 Árbol de problemas: Deforestación y degradación de ecosistemas forestales

Source: Conafor, Programa Estratégico Forestal

¹⁴ REDD Desk, "REDD in Mexico," Readiness Overview. Available at: http://www.theredddesk.org/countries/mexico/readiness_overview

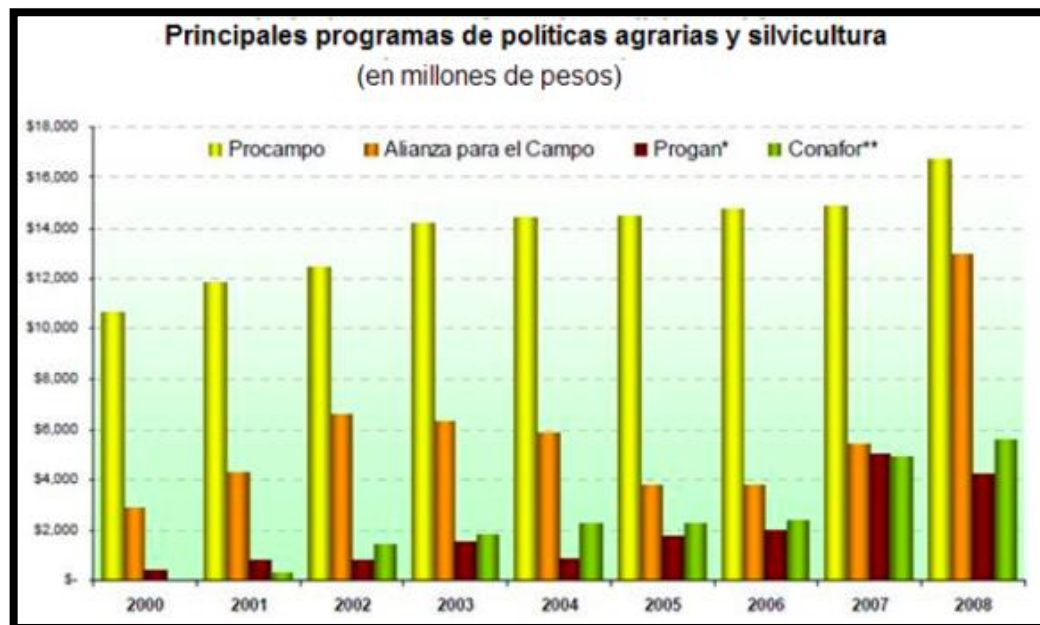
¹⁵ Note that the Food and Agricultural Organization, using a different definition of forests, claims that Mexico's rate of deforestation has instead dropped from 354,000 hectares in 2000 to 155,000 hectares in 2010. However, this is still equivalent to a 55% reduction.

Conafor identifies the driving *financical* force behind much of Mexico's deforestation to be the high value of commodities and investment in agriculture over that of the commodities and investment in forests. Though Conafor identifies several incentive schemes in the forest sector, including Programa de Plantaciones Forestales Comerciales (Prodeplan), Programa de Desarrollo Forestal (Prodefor), Programa de Desarrollo Comunitario (PROCYMAF), Programa Nacional de Reforestación (Pronare), Programa de Desenvolvimiento Rural (Proder), there is no central body to coordinate these forest subsidies, and many of them are underfunded and in their pilot phase. Some forest subsidies wax and wane depending on who is in office, undermining long-term security in the sector. More importantly, forest subsidies are simply dwarfed by other incentives, primarily those destined for agriculture. As Conafor notes, forestry funding represents only 0.88 percent of subsidies going towards the primary sector, and subsidies to forest industries represent only 1.5 percent of subsidies going to industry in general (as illustrated in the charts below).



Source: Data from Conafor

Though Conafor's budget has been increasing steadily over the years, it is still dwarfed by those of agricultural programs such as Procampo and *Alianza Para el Campo*, as this graph tracking 2000 through 2008 financing shows:



Source: Graph from Mexico R-PP

Conafor's 25-year forest plan is therefore largely focused on making forest stewardship more economically competitive with other sectors. Goals of the plan include creating 180,000 rural jobs, running effective payment for ecosystem services (PES) schemes, and increasing the forest sector's contribution to *Producto Interno Bruto* (PIB, or GDP in English) from 1 to 4 percent.¹⁶

The following sections provide an in depth analysis of the three primary drivers of deforestation in Mexico: agriculture/livestock, illegal logging, and forest fires and disease. For agriculture/livestock and illegal logging, the financial systems that support each will be analyzed as well.

Key Driver of Deforestation: Land Use Change for Agriculture

Agriculture is often cited as the largest threat to forest preservation in Mexico; INE reports that

¹⁶ Conafor, Programa Estratégico Forestal, 2001.

82 percent of land use change is caused by conversion to agriculture and grasslands used for livestock production.¹⁷ Agriculture accounts for a large portion of Mexico's PIB (GDP) and, understandably, it is an important policy issue for the country. Between 1980 and 2007, agricultural PIB grew by an average rate of 1.6 percent per year, and more than 70 percent of spending in productive programs is specifically geared for agricultural activities.¹⁸ Agricultural commodities also make up a large portion of Mexico's exports. According to the Food and Agriculture Organization (FAO), Mexico's food exports were valued at US\$11 billion (143 billion pesos) in 2010.¹⁹

The Federal government has long supported the agricultural industry with an aim to boost food production and increasing the competitiveness of agri-businesses. For many years, the federal government has attempted to increase farmers' access to credit and mobility within the privatized market. In 1954, *Fideicomisos Instituidos en Relación con la Agricultura* (FIRA) was started under the national bank to offer credits, guarantees, training, technical assistance, and support of technology transfer to Mexico's agricultural, forestry, fishery, and rural sectors. In 2010, FIRA lent US\$8.0 billion (102.9 billion pesos) for agricultural and rural financing. That same year, FIRA also guaranteed approximately US\$4.6 billion (59.4 billion pesos) in credits, supporting the efforts of over 1 million borrowers.²⁰ In addition, Mexico formalized *Financiera Rural* in 2003, a loan program for small-scale farmers that granted over 500,000 loans (valued at US\$7 billion) by 2009 alone.²¹

Yet these loan and credit programs have never been enough to support rural and agricultural development alone. Therefore, the federal government has continued to finance, with the help of international development banks and foreign aid programs, extensive agricultural and livestock subsidies. These subsidies mainly come in two forms: subsidized input and market price supports and vary in terms of their impacts on land use change.

¹⁷Muñoz et al. INE. 2003

¹⁸World Bank, *Mexico: Agriculture and Rural Development Public Expenditure Review*, Agriculture and Rural Development Unit, Sustainable Development Department, Latin America and the Caribbean Region, December 2009. Available at: <http://siteresources.worldbank.org/INTMEXICO/Resources/EnglishPERDec16.pdf>

¹⁹ FAOSTAT. Database available at: <http://faostat.fao.org/site/535/DesktopDefault.aspx?PageID=535#ancor>

²⁰ USDA. ERS. International Markets Trade. NAFTA. <http://www.ers.usda.gov/topics/international-markets-trade/countries-regions/nafta,-canada-mexico/mexico-trade,-policy-fdi.aspx>

²¹Financiera Rural, 2009.

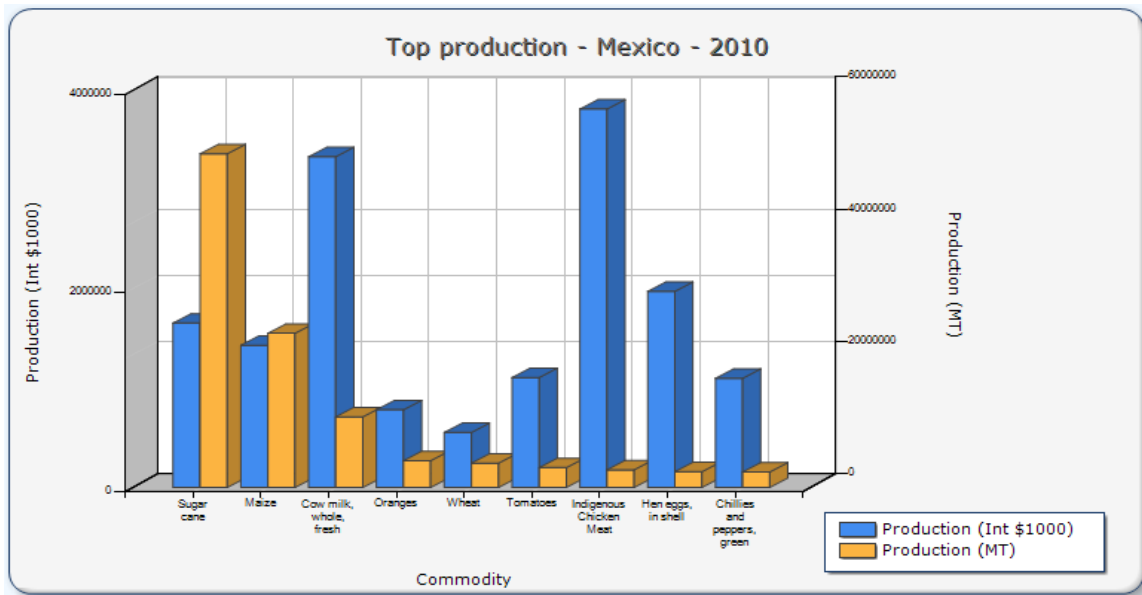
The reach of Mexico's agricultural subsidies, and rural subsidies overall, has always depended on the country's land tenure rights, which continue to change. Mexican land reform began in earnest after the Mexican Revolution with the 1934 *Agrarian Code*, thus beginning the country's first period of Agrarian Reform. During this period, half of the country's agricultural lands were taken from elite plantation owners and distributed to 3.8 million landless citizens through a communal ownership program, creating *ejidos*.²² The *ejido* system, which had an unprecedented reach and provided land to a great deal of farmers, continues to be plagued by the lack of clear property rights for individuals and incentives for individuals to protect *ejido* lands.

The Second Agrarian Reform period, prompted by Mexico's entry into the General Agreement on Tariffs and Trade (GATT) in 1986, and the subsequent enactment of the 1994 North American Free Trade Act (NAFTA), has had an equally large impact on agriculture in Mexico. By way of GATT and NAFTA, Mexico liberalized its agricultural market and increased trade with the United States and Canada. Since then, Mexico has been under immense pressure to increase food production in order to be more competitive in the international market. This has been difficult: less than 13 percent of Mexico's land is arable and water scarcity has prevented self-sufficiency in the production of staple foods. The pressure to produce more with less land has caused farmers to switch from traditional farming methods, such as *milpa* agriculture, which allows fallow lands to grow secondary vegetation, to intensive multi-season harvests of row and plantation crops.²³ Today, Mexico's top agricultural commodities are mainly row crops; ordered by quantity produced they are sugar, maize, cow milk, oranges, and wheat. The country's top exports are barley, wheat, tomatoes, and sugar.²⁴

²² Scott, John, "Social Failure of the Mexican Revolution: Redistributive Constraints Under High Inequality," CIDE, April 2009. Available at: <http://www.international.ucla.edu/economichistory/summerhill/scott.pdf>

²³ Susana Ochoa-Gaona *, Mario González-Espinosa. ECOSUR. *Land Use and Deforestation in the Highlands of Chiapas, Mexico*. April 1998.

²⁴ FAOSTAT. Database available at: <http://faostat.fao.org/site/535/DesktopDefault.aspx?PageID=535#ancor>



Source: FAOSTAT, 2012.²⁵

Mexico's Most Influential Agricultural Subsidies

The government agency responsible for the majority of agricultural policies and subsidies in Mexico is the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (Sagarpa, in spanish). Sagarpa, placed directly under the Federal Executive, has undergone many transformations under different administrations. It came into its current form in 1995, when the conservation and management of water resources was transferred from the agency's directive to the newly founded Ministry of Environment and Natural Resources (Semarnat). Still, Sagarpa's mandate is expansive.²⁶ In 2011, Sagarpa had an annual budget of US\$6.2 billion (73.8 billion pesos).²⁷

Perhaps Sagarpa's most tenuous task is balancing support for increased agricultural productivity with their support of the country's poorest citizens: rural farmers. While NAFTA has spurred the development of Mexico's agri-businesses and boosted production of large-scale farms, smallholder farmers are falling farther behind. Income inequality is rife in Mexico, and not surprisingly, the largest disparity in wealth is between urban and rural populations. However, large disparities exist within rural Mexico as well. The extreme poverty rate in Baja

²⁵ FAOSTAT. 2012. <http://faostat.fao.org/default.aspx?lang=en>

²⁶ Sagarpa. 2012. <http://www.sagarpa.gob.mx/Paginas/default.aspx>

²⁷ USDA. ERS. International Markets Trade. NAFTA.

California was 6.5 percent in 2008 while in Chiapas and Guerrero it was close to 60 percent.²⁸ While farms in some areas are quickly modernizing, incomes derived from smallholder farms, located primarily in the south, are steadily shrinking. A study published in 2010 found that families that own small farm plots and consider farming their principal occupation now earn the majority of their income from non-agricultural sources such as government subsidies, artisanal trade, and day labor.²⁹ Because rural development is one of Sagarpa's main objectives, the agency is tasked with supporting the country's least productive farmers, which often undercuts agricultural productivity and has caused the agency to manage a long list of inconsistent policies. The major subsidies are shown in the following table.

Key Agricultural/Rural Subsidies

Subsidy	Annual Budget (Million Pesos)	Manager	Year Started	Potential Impact on Land Conversion/ Deforestation?
Procampo	14,200 (2008) ³⁰	ASERCA (Sagarpa)	1994	-Demands land be cultivated, encourages planting cash crops -Now allows for forest products
INGRESO OBJETIVO	9,100 (2008) ³¹	ASERCA (Sagarpa)	2003	-Payments based on production level - encourages increasing plot size and multiple crop seasons instead of fallow land
ALIANZA	669 (2012) ³²	Sagarpa, Federal/State Government	1996	-Funding primarily for infrastructure, tools, and machinery – not production or land use. Difficult to tie to change in land use.
PROGAN	4,465 (2010) ³³	Sagarpa	2003	-Attempts to curb environmental impacts of livestock -Does not include any specific regulations on deforestation/forest degradation

²⁸ Fox, Jonathon and Haight, Libby, editors, *Subsidizing Inequality: Mexican corn policy since NAFTA*. Woodrow Wilson International Center for Scholars. 2010. Available at: http://www.wilsoncenter.org/sites/default/files/Subsidizing%20Inequality_0.pdf

²⁹ Scott, John, *Agricultural Subsidies in Mexico: Who Gets What?* Centro de Investigación y Docencia Económicas (CIDE), 2010. Available at: http://www.wilsoncenter.org/sites/default/files/Subsidizing_Inequality_Ch_3_Scott.pdf

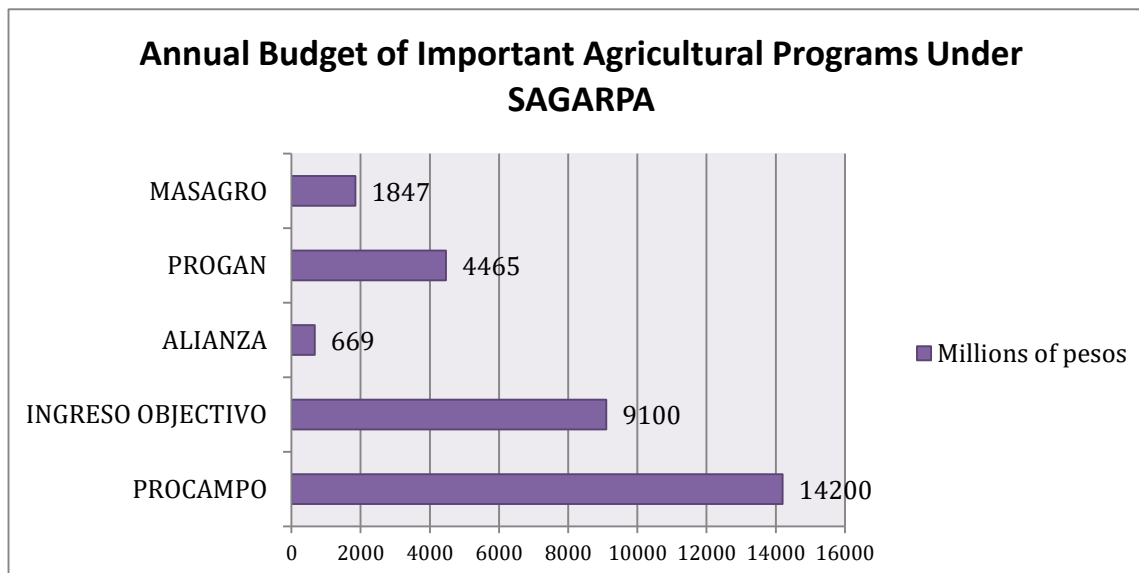
³⁰ *Agricultural Policies in OECD Countries – Monitoring and Evaluation*. OECD. 2009

³¹ *Agricultural Policies in OECD Countries – Monitoring and Evaluation*. OECD. 2009

³² Morales, Rosalinda, "Hasta 2012, Solicitudes de Alianza Para el Campo," *Imagen del Golfo*, 26 Oct. 2011. Available at: <http://www.imagendelgolfo.com.mx/resumen.php?id=275564>

³³ USDA ERS. International Markets Trade. NAFTA.

MASAGRO	1,847 (2012)	CIMMYT and Sagarpa	2012	-Attempts to curb environmental impacts of agriculture -Does not include specific regulations on deforestation/forest degradation
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Source: Various, see table above. Also note that these annual budgets are taken from different years between 2008 and 2012, depending on the most recent data available. The chart should therefore be used only to get a rough comparison among programs.

These five programs together represent roughly 30.3 billion pesos, or just over 40 percent of Sagarpa's 2011 budget. The next sections provide more detail on these five agricultural programs and their potential impact on land use land in Mexico.

Programa de Apoyos Directos al Campo (Procampo)

Procampo is a clear departure from pre-revolution reforms, with funding geared specifically for the economic development of rural farmers regardless of productivity.³⁴ The program is managed by the Support and Services for Agricultural Trading Administration (ASERCA, in spanish), which is a decentralized administrative body under Sagarpa that manages several other national subsidies.

³⁴ Fox and Haight 2010.

As its name suggests, Procampo is hailed as a progressive policy that is pro-farmer rather than pro-industry. It is the country's largest farm subsidy program, financed by the Inter-American Bank, and it serves as a direct cash transfer program that offers assistance to the farmers in Mexico who would be most affected by a collapse in commodity prices. It is unique in that its payment system is decoupled from production levels or commercialization. In 2008, Procampo provided US\$87 (1,160 pesos) per hectare to farmers with less than five hectares, and US\$72 (960 pesos) per hectare to those with five or more.³⁵ Between 2005 and 2008, Procampo had an annual budget of roughly US\$1.3 billion (14.2 billion pesos), which accounted for almost 20 percent of Sagarpa's annual budget.³⁶ As of 2010, the standard Procampo payment rate is 963 pesos per hectare for both the fall-winter and spring-summer agricultural cycles. For the spring-summer agricultural cycle, rain-fed producers with five hectares or less receive a payment rate of 1,300 pesos. The maximum amount of support that an individual farmer can receive is US\$7,668 (100,000 pesos) per agricultural cycle.³⁷

The reach of Procampo is impressive; by one estimate, 84 percent of *ejidatarios* have received the subsidy at some point.³⁸ However, Procampo has done a poor job of reaching farmers with less than 5 hectares and, because it pays farmers based on growing seasons, it often makes double payments to farms that have a more stream-lined process and are able to plant twice a year. The nation's poorest five states, most of them located in the south, receive only 22 percent of Procampo's funds.³⁹

Both the direct and indirect impacts of Procampo on land conversion and deforestation are difficult to ascertain. Regarding farm expansion, Procampo payments for farmers are, in fact, based on the number of hectares cultivated for specific crops, which could be seen as a direct incentive for farmers to expand their estates. However, the payments are based on the number of hectares farmed pre-NAFTA (the crop cycles between 1990 and 1993), and no additional funds are granted for those farmers who expand their acreage.

³⁵ "Procampo to Conclude this Year According to the Presidential Agreement," Marketing Solutions Firm via *inforural*, 7 May 2012. Available at:

http://www.msfmexico.com/index.php?option=com_content&view=article&id=524&Itemid=488

³⁶ "Agricultural Policies in OECD Countries – Monitoring and Evaluation". OECD. 2009.

³⁷ USDA ERS. International Markets Trade. NAFTA. <http://www.ers.usda.gov/topics/international-markets-trade/countries-regions/nafta,-canada-mexico/mexico-trade,-policy-fdi.aspx>

³⁸ Schmook, Birgit. "Agricultural Policy, Market Barriers, and Deforestation: The Case of Mexico's Southern Yucatan." 2008.

³⁹ Fox and Haight 2010.

Procampo's negative impact on land cover change is also difficult to gauge. Procampo payments originally were granted to farmers based on whether or not they farmed the program's targeted staple crops (maize, beans, wheat, rice, sorghum, soy, cotton, safflower, and barley) before 1993. Payments were not tied to the crops farmers actually planted. Yet, in 1995, Procampo was expanded to allow farmers to devote their land to any crop, livestock or forestry activity. The only land-use prohibited by the program, therefore, was letting land sit idle with no particular activity identified. This has allowed farmers to continue receiving payments while switching from staple crops to cash crops or livestock, or merely planting graze lands for cattle. It also allows farmers to cultivate forest products, and allows for secondary vegetation growth. Because payments are based off of pre-1993 production levels of certain crops, Procampo does *not* directly support the conversion of designated forests to agricultural lands, and in that way, the subsidy does not directly incentivize deforestation. However, by providing funding for farmers regardless of what they currently plant, farmers are able to switch from cultivating forest products (which are more labor-intensive and less valuable) to row crops, such as wheat or barley. Furthermore, by paying for each harvest cycle, the subsidy incentivizes farmers to plant several times a year rather than allow for fallow periods and second generation plant growth.

Procampo is set to expire at the end of 2012, and though it can be expected that a new subsidy program similar to it will be enacted, the expiration presents an opportunity to create an improved farm program. Should the Mexican government wish to create a more complimentary farm subsidy to REDD+, they could include further requirements regarding land conversion and forests.

Programa de Apoyo al Ingreso Objetivo y a la Comercialización

The *Programa de Apoyos a la Comercialización*, or Market Price Supports, began as a federal subsidy program in 1991. These support programs attempt to boost commercialized farming by discounting the cost of inputs that strengthen production, supply chains, transportation, and marketing. Mexico has a myriad of these subsidies geared for specific sectors, such as *Ordenamiento Mercado Granos* and *Diesel Agropecuario*. The largest market price support program in Mexico is *Ingreso Objetivo*, which has had an annual

budget of over \$9 billion pesos in some years (accounting for 18 percent of ASERCA's annual budget and 10 percent of Sagarpa's overall budget).⁴⁰

Ingreso Objetivo aims to fill the gap between the target price for a commodity and its determined actual market price. This type of agricultural subsidy has existed in Mexico for many years, however the program only recently (2001) began paying producers directly. *Ingreso* directly subsidizes grain production in order to drive down the domestic crop price to compete with subsidized import grains. The subsidy is undoubtedly regressive, with only 6 percent of its funding going towards the nation's poorest municipalities. In fact, payment recipients include transnational corporations and the program has been criticized for cancelling out the redistributive impacts of other rural development spending. *Ingreso* only supports producers who sell through registered handlers, which means that most subsistence farmers are not included. This exclusion is inherent to the program, because thorough monitoring of local harvest-time cash prices and production levels is only possible through existing marketing channels.⁴¹

Ingreso funds allow farmers to continue cultivating low-value crops, rather than respond to market forces and demand for cash crops. Yet it is difficult to ascertain whether this has positive or negative impacts on land conversion. Staple crops do not inherently demand more land than cash crops, and they certainly demand less than livestock farms. Still, *Ingreso* directly compensates farmers based on their production levels, which serves as a clear incentive for farmers to increase production and expand farm area. It also incentivizes farmers to replace sustainable farming practices with high productivity monoculture farming. Therefore, while it remains unclear what portion of *Ingreso* funds go to land conversion efforts, or how likely recipients of *Ingreso* payments are to increase their plot size, the program does provide a direct incentive for farmers to expand their operations by any means necessary.

Programa de Adquisición de Activos Productivos (Alianza Para El Campo)

Alianza Para el Campo was initiated in 1996 as a rural development program and it differs from Procampo in that it includes non-agricultural components such as

⁴⁰Riedemann, Cristina Steffen, *La focalización de los subsidios a los granos en México*, POLIS, 2007. Available at: <http://148.206.53.230/revistasuam/polis/include/getdoc.php?rev=polis05&id=377&article=376&mode=pdf>

⁴¹Balagtas, Joseph and Sumner, Daniel, "Economics of the Mexican Ingreso Objetivo Program," UC Davis and Purdue University, no date. http://aic.ucdavis.edu/publications/posters/balagtas_poster999.pdf

sanitation and housing. However, *Alianza* is still primarily aimed at improving food production and two thirds of its budget is targeted specifically toward agriculture. The program is funded primarily by the Federal Government, however, it was set up to empower states to choose their own priorities within a group of national policy goals and commit resources to the programs they are most interested in. The program targets several specific initiatives, such as improved use of water and fertilizer, improved seed quality and availability, and strong pest and disease control. The program also directs funding to livestock production by supplying improved cattle stocks and educating farmers on animal health and sanitation practices. *Alianza* is the most progressive of the three major agricultural subsidy programs, with 28 percent of its funding going to Mexico's poorest five states.⁴² In 1998, *Alianza* had a working budget of US\$300 million, however, the budget has decreased substantially since then (to US\$20 million in 2008 and US\$50 million in 2012).^{43 44}

Alianza is similar to Procampo in that it is meant to aid the development of the country's poorest farmers and boost overall production. Though both programs have invested in infrastructure and non-monetary goods, such as fertilizers and seeds, the majority of their funding comes in the form of supplemented income. However, the intense poverty of subsidy recipients often forces farmers to use the added income not as a source of boosted production, but rather a source of basic needs, such as food, education, and health care.

Though *Alianza* is soon to expire, the subsidy will live on as the *Programa de Adquisición de Activos Productivos*. In content and aim, *Activos* is almost a complete replica of *Alianza*, although several of *Alianza*'s payment systems for on-farm investments will be grouped together. *Activos* will continue to include measures to improve water and fertilizer efficiency, however the program's emphasis on environmental conservation is negligible. Because the subsidy is primarily focused on increased production, much of *Alianza*'s funding goes towards farm machinery and irrigation infrastructure, with very little effort to curb deforestation or avoid land-conversion. Still, it is extremely difficult to identify how *Alianza*, and now *Activos*, directly contribute to land-conversion and/or deforestation. It is possible that with more farm

⁴² Fox and Haight 2010.

⁴³ "Agricultural Policies in OECD Countries – Monitoring and Evaluation". OECD. 2009

⁴⁴ Morales, Rosalinda, "Hasta 2012, Solicitudes de Alianza Para el Campo," *Imagen del Golfo*, 26 Oct. 2011. Available at: <http://www.imagendelgolfo.com.mx/resumen.php?id=275564>

machinery and inputs, farmers would have the means to expand their plots, however it could also mean that farmers would be able to produce more on less land.

The Sustainable Livestock Production, Livestock Management and Bee Keeping Initiative (PROGAN)

PROGAN was initiated in 2003 with the aim of improving livestock productivity by improving technological practices as well as increasing the production of forage in pasture lands. This program offers direct payments to farmers based on the number of sows of reproductive age on their lot. In 2008, PROGAN's annual budget amounted to US\$285 million (3.7 billion pesos), and in 2010, it reached almost US\$346 million (4.5 billion pesos).^{45 46} PROGAN payments increase over a four-year period, from 300 pesos per sow to 600 pesos per head.⁴⁷ In this way, PROGAN offers an incentive for farmers to increase their herd and the size of their lot. However, for farmers to receive program funds they must comply with PROGAN's predetermined best management practices related to water use and land management, in addition to sanitation standards and animal handling.

One of PROGAN's objectives is to "reverse the deterioration of ecosystems," and as part of the goal, all farmers are required to improve crop cover on their graze lands in order to receive funds. Furthermore, feedlots and grain-fed livestock farms are excluded from the payments, so only grass-fed, free-range farms can receive funding. While this added requirement may incentivize farmers to use more sustainable farming practices, and even include agroforestry systems on their farms, PROGAN's ability to keep farmers from clearing forest lands in order to increase herd size and graze lands is minimal.

MasAgro

Sustainable Modernization of Traditional Agriculture (MasAgro) is the newest of Mexico's agricultural subsidies. The program, which commenced in January of 2012, is a collaborative effort between Sagarpa and the International Maize and Wheat Improvement Center (CIMMYT). Sagarpa is set to provide US\$138 million (1800 million pesos) over the 10-year

⁴⁵ *Agricultural Policies in OECD Countries – Monitoring and Evaluation*. OECD. 2009

⁴⁶ USDA ERS. International Markets Trade. NAFTA.

⁴⁷ Secretaria de Gobernancia. *Programa de Estimulos a la Productividad Ganadera*. http://www.e-local.gob.mx/wb/ELOCAL/ELOC_Productividad

span of the program, though matching funding is expected from IDB and other supporters.⁴⁸ The subsidy targets small-scale farmers who lack access to modern agricultural technologies and functional markets. MasAgro plans to focus on educational outreach about improved cropping practices, (including conservation and precision agriculture) and provide farmers with high-yield crop varieties. MasAgro's extension currently covers an area of more than 20,000 hectares in 16 Mexican states.⁴⁹

One of MasAgro's seven main objectives is to "make a more effective use of land, water, labor, fertilizers, and energy" in order to mitigate the climate change impacts of cultivating maize and wheat.⁵⁰ However, the subsidy seems to be focused on the impacts of soil management, seed varieties, and the use of inputs, such as fertilizers and pesticides and herbicides, rather than land conversion. The program does not include any specific requirements related to limiting land conversion for further food production, nor does it support the inclusion of forest commodities or agroforestry methods. Moreover, the program has set a goal to raise Mexico's annual maize production by 5-9 million tons and wheat production by 350,000 tons per year in the next ten years.⁵¹ If not monitored carefully, this subsidy could provide a direct incentive for farmers to increase land used for cultivating maize and wheat as they receive pressure to use less inputs on the land already used. However, the impact of this subsidy is yet to be seen, and further analysis is needed to verify whether or not it will cause deforestation or forest degradation.

Agricultural Subsidies as a Driver of Deforestation?

It is difficult to draw any overarching conclusions about how agricultural subsidies affect land conversion and deforestation in Mexico. One cannot simply look to the amount of money being provided, or the quantity of farmers being reached to know whether a subsidy has an impact on forests. While the funding currently provided for agricultural subsidies is comparable to

⁴⁸ GAIN Report. "Sustainable Modernization of Traditional Agriculture." USDA.

http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Sustainable%20Modernization%20of%20Traditional%20Agriculture%E2%80%A6%20MasAgro_Mexico_Mexico_4-27-2011.pdf

⁴⁹ <http://blog.cimmyt.org/?p=7591>

⁵⁰ CIMMYT. Modernización Sustentable de la Agricultura Tradicional, MasAgro. 2012.

<http://www.cimmyt.org/en/what-we-do/projects-by-region/modernizacion-sustentable-de-la-agricultura-tradicional>

⁵¹ International Maize and Wheat Improvement Center (CIMMYT), "Modernización Sustentable de la Agricultura Tradicional, MasAgro," CGIAR. Available at: <http://www.cimmyt.org/en/what-we-do/projects-by-region/modernizacion-sustentable-de-la-agricultura-tradicional>

historical levels, Mexico's deforestation rate has decreased since the end of *ejido* expansion. This was in part due to the end of government programs to greatly expand livestock production area at the turn of the century and again in the 1970s.⁵² However, what makes the issue more complicated is the fact that deforestation rates and the sources of deforestation vary greatly by region within the country. Between 1980 and 1990, the annual rate of deforestation in northern Mexico's coniferous forests was 1.4 percent, compared to 6.6 percent in the tropical forests in the south.⁵³ This can be explained by the fact that farmers in different regions farm differently: the average size of farms in the north is almost three times that of the farms in central and southern regions, and farms in the north tend to be more irrigated than those in the south, which are primarily rain-fed.⁵⁴ While Mexico's southern region is devoted primarily to plantation crops and fruits, the north dominates livestock production and grains.

More importantly, farms in the south are surrounded by, and at times directly under, forests, while much of those located in the north are not. When farmers use slash and burn methods in the south, uncontrolled fires are more likely to affect surrounding forests. And when farmers choose to increase production or modernize their operations (e.g. away from *milpa* agriculture and towards row crops) they have a direct effect on the forests remaining on their lots.

Beyond the variance in regional farm practices and their effects, the general impact of government subsidies on farmers' behavior is unclear. There are many sophisticated studies analyzing this issue, and much debate still exists on the topic. A study by ECOSUR in 2008 found that farmers' access to markets (by way of transportation infrastructure) was a key issue in predicting whether farmers used Procampo funds to actually produce more cash crops or not.⁵⁵ Another study by Mississippi State University and Northern Arizona University in 2006 found that the size and age of each *ejido* was predictive of their impacts on deforestation.⁵⁶ And still other studies have found that many subsidy funds (primarily Procampo) are not, in fact, spent on farm tools or inputs, but rather education and health care.⁵⁷

⁵² D.B. Bray et al. / Land Use Policy 21 (2004) 333–346

⁵³ Cartron, Jean-Luc E. et al. Biodiversity, Ecosystems, and Conservation in Northern Mexico. 2005

⁵⁴ Henderson, Joanne, et al. "Conversion from Staple to Cash Crop Production in Mexico After NAFTA: Effects of Procampo and Credit Constraints." 2010.

⁵⁵ Schmook, Birgit and Vance, Colin. ECOSUR (El Colegio de la Frontera Sur), Chetumal, Mexico. 2008

⁵⁶ Perez-Verdin, Gustavo et al. Factor driving deforestation in common-pool resources in northern Mexico.

⁵⁷ Fox and Haight 2010

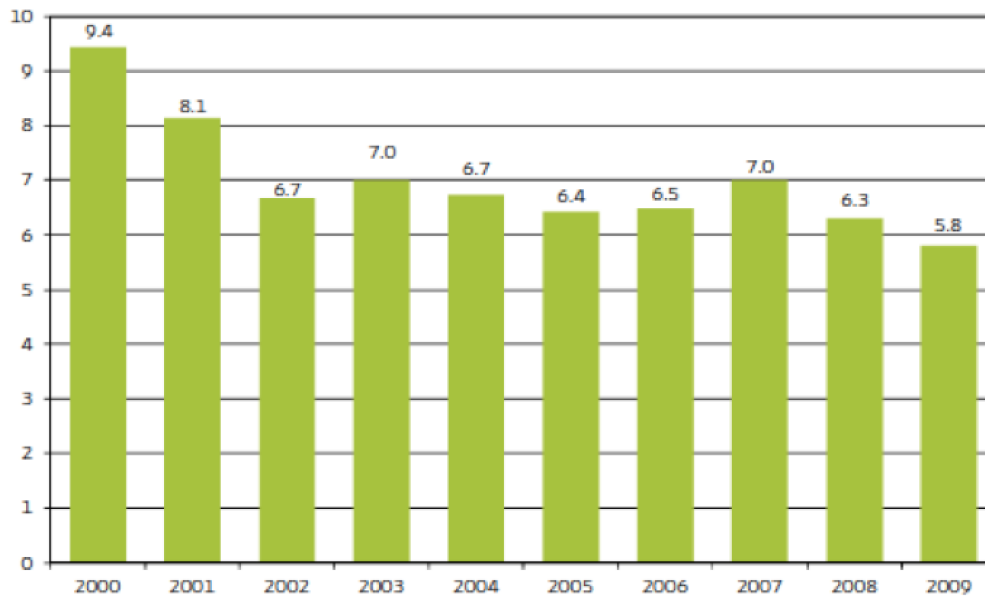
A lack of comprehensive analyses on the effects of subsidy programs on land-use change in Mexico makes it difficult to estimate how much money, overall, is in direct contradiction with forestry policy and funding. However, there are two issues with Mexico's major agricultural subsidies that are immediately apparent and could be addressed in the short term. First, none of them appear to have a clear penalty for deforestation or forest degradation. A farmer does not risk losing financial support if he or she is found to be cutting or burning existing forests on their own land. Second, the environmental and sustainability objectives within the subsidies' overall programs are focused on soil management, fertilizer and water use, and improved technology. Though MasAgro and Procampo do include "sustainable agriculture" schemes, none of the subsidies have clear goals for reducing land conversion or guidelines that would help farmers to do so.

Key Driver of Deforestation: Illegal Logging

Illegal logging contributes to approximately 8 percent of deforestation in Mexico. An estimated 3 to 5 million cubic meters of wood are extracted illegally every year—approximately 40 to 60 percent of the annual legal production.⁵⁸ Below is a graph showing *legal* production of timber in Mexico from 2000-2009 (production volumes from illegal activity are difficult to track precisely, for obvious reasons):

Production of Legally Sourced Timber in Mexico 2000-2009 (Million Cubic Meters)

⁵⁸ Alejandro Angulo, "Cero tolerancia a la tala ilegal," Centro de Estudios Jurídicos y Ambientales (CEJA).



Source: Semarnat, *Anuario Estadístico de la Producción Forestal 2009*

The financial incentives to log, both legally and illegally, are strong: the average price for precious wood rose from 2,539 pesos per cubic meter in 2005 to 3,605 pesos in 2009, an increase of 42 percent. The price for a cubic meter of pine rose 4.7 percent between 2005 and 2009 (from 1,159 pesos to 1,214 pesos) and the price for fir rose 54.5 percent (760 pesos to 1,174 pesos).⁵⁹ Precious wood is used for ceiling beams and luxury furniture while lower-value timber is used for planks, poles, fruit boxes, and regular furniture.⁶⁰

Conafor identifies the principle causes of illegal logging to be insecure land tenure, insufficient vigilance, lack of employment opportunities, and the disposition of the logging sector to acquire illegal wood to lower costs.⁶¹ According to *Nacional Forestal Periódico*, 21.6 million hectares, or about 60 percent of Mexico's total forest, has commercial potential, but of these 21.6 million hectares, only 8.6 million are technically managed.⁶² Though there is some *tala hormiga*, or small-scale illegal logging motivated by need for firewood and poverty, most illegal logging is actually done by large organized crime networks, with the actual laborers working as low-level intermediaries between the sawmills/lumberyards and the *ejidos*/communities. These loggers are mostly young men, some of them *avencindados*, or people excluded from decision-making in the *ejido* system. Illegally logged timber is relatively untraceable once inside a sawmill

⁵⁹ Semarnat, *Anuario Estadístico de la Producción Forestal 2009*.

⁶⁰ Jordi Honey-Rosés (2009): Illegal Logging in Common Property Forests, *Society & Natural Resources: An International Journal*, 22:10, 916-930.

⁶¹ Conafor, Programa Estratégico Forestal, 2001.

⁶² Conafor, Programa Estratégico Forestal, 2001.

(permits are fairly easily duplicated), so it is these hired loggers who assume a lot of the risk of the operation while logging ‘leaders’ orchestrate from afar. In the states of Michoacán and Estado de México loggers can make 2,000 pesos (about US\$190) for a single night of work.⁶³ The financial incentive for individuals to take the risk to log illegally is therefore substantial, particularly in the absence of other economic opportunities.

Key Driver of Deforestation: Forest Fire and Disease

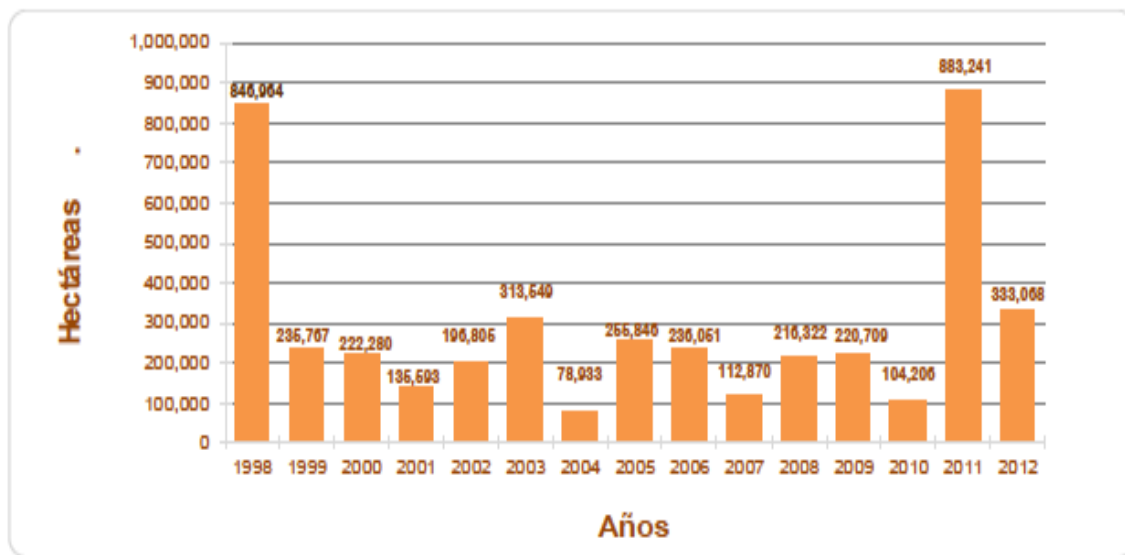
Forest fires and disease account for an estimated 6 percent of deforestation in Mexico and fire has destroyed more than 7.7 million hectares of forest ecosystems in the last 20 years.⁶⁴ In the first seven months of 2012, there were a recorded 6,977 fires in Mexico affecting more than 333,000 hectares, though 92 percent of these fires were in shrubland rather than treed areas. The average fire lasted about twelve hours—in fact 85 percent of fires in Mexico this year burned for less than a day. The vast majority of the 2012 fires so far were classified as minimal, meaning they destroyed less than 20 percent of the forest mass and will recuperate in a year or two. Less than one percent of fires (60) were severe, meaning they destroyed more than half the forest mass and will take over a decade to recover. The frequency of forest fires in México has not changed much in the last 15 years, with the number of hectares destroyed annually ranging from 78,000 to 314,000, with notable exceptions in 1998 and 2011—years during which more than 800,000 hectares were affected by fire.⁶⁵

⁶³ Jordi Honey-Rosés (2009): *Illegal Logging in Common Property Forests, Society & Natural Resources: An International Journal*, 22:10, 916-930.

⁶⁴ “El hombre provoca 99% de los incendios forestales,” *Milenio*, 7 January 2011.

⁶⁵ Conafor, *Reporte semenal de resultados de incendios forestales 2012*, datos acumulados del 1 de enero al 26 de julio de 2012, Coordinación General de Conservación y Restauración, Gerencia de Protección Contra Incendios Forestales.

Hectares of Forest Lands Effected by Forest Fires



Source: Conafor, Reporte seminal de resultados de incendios forestales 2012

Though there is no direct financial gain derived from forest fires, the value of agricultural commodities, cultivated with slash and burn practices, does create an incentive to initiate forest fires. Forty percent of forest fires are caused by agricultural practices (swidden), according to Conafor, and insecure land tenure can increase the risk of forest fire.⁶⁶ The states of Chiapas and Oaxaca, which have large indigenous populations and a high level of marginalization, have historically experienced rates of fire higher than the national average.⁶⁷

The R-PP also includes forest plagues, or insects that significantly degrade forests, as a deforestation driver along with forest fires. There are 200 species known to cause forest degradation in Mexico.⁶⁸ The most common forest diseases in Mexico are *escarabajos descortezadores* in temperate forests and *insectores barrendaroes* in rainforests. Ten million hectares—about 18 percent of Mexico’s total forest—are vulnerable to plagues.⁶⁹ In 2009, the most recent year for which data is available, forest plagues affected 80,820 hectares, destroying 373,931 cubic meters of wood. *Descortezadores*

⁶⁶ Conafor, Programa Estratégico Forestal, 2001.

⁶⁷ Pedro Joaquín Gutiérrez Yurrita et. al., “Evaluación de Diseno Programa Presupuestario S226: ProÁrbol—Apoyo par alas acciones preventivas de incendios forestales,” CONAFOR, 5 October 2009.

⁶⁸ Conafor Facebook page, “Entrega Conafor recursos para combate de plagas forestales,” 22 July 2011.

⁶⁹ Conafor, Programa Estratégico Forestal, 2001.

alone affected more than 24,000 hectares; their damage was most severe in the states of Oaxaca, Nuevo León, and Guerrero.⁷⁰

Though there are some efforts to combat forest fire and disease in Mexico (discussed in the policy section below), these drivers of deforestation are less of a policy concern than land use change or illegal logging since neither is directly tied to financial incentives.

Policy Approaches Addressing the Drivers of Deforestation

The period from 1995-2000 witnessed the beginning of the Federal government's efforts to develop a strategy on climate change and reducing deforestation. Some of the strategic policies included directly address the three main drivers of deforestation identified by the R-PP (land use change for agriculture, illegal logging, and forest fire and disease). Others focus on more progressive efforts, such as direct reforestation efforts, conservation, payment for ecosystem services, and commercial forest plantations. The following is an analysis of the major policies approaches that address deforestation in Mexico (though many of these policies have other goals as well).

Limiting Deforestation from Agricultural Expansion

Along with many programs that support rural development and increased productivity in the agriculture sector, Sagarpa manages the Program of Sustainability of Natural Resources. This program encourages producers to utilize sustainable practices that minimize or reverse environmental damage caused by the agricultural, livestock, and fishing sectors. Practices supported by the program include sustainable use of land and water, conservation of native plant genetic resources, promotion of biodiversity, efficient and productive use of natural resources, and management of environmental disruptions. According to the USDA, in 2011, the program accounted for approximately 11 percent of Sagarpa's annual budget, which would have amounted to over US\$613 million (8 billion pesos). However, the program's budget includes PROGAN as well as many other programs that are not only focused on environmental conservation or sustainability, but also increased production capacity and economic gains.

⁷⁰ Semarnat, *Anuario Estadístico de la Producción Forestal 2009*.

Furthermore, it is unclear how effective the program has been at curbing the expansion of agricultural lands or deforestation.

Mexico's National Institute of Forestry, Agriculture, and Livestock (INIFAP) is responsible for researching many issues related to agriculture and land use. Along with sustainable forestry and watershed management, agroforestry is listed as one of INIFAP's main research priorities. In 2005, INIFAP announced that it was working with municipal heads of rural areas to promote agroforestry practices.⁷¹ However, beyond pilot projects in different areas, it appears that very little headway has been made to include agroforestry in the national policy arena.

Of course, agroforestry is not a new concept in Mexico. Rural communities have been intercropping their food crops with trees for many years. Many *ejidos* still cultivate row and plantation crops along with forest products, allowing their property to remain a mosaic of multi-purpose lands. In fact, agroforestry is modeled, in many ways, after traditional Mayan farming practices. While *milpa* agriculture has its own environmental impacts and is not going to be able to supply the quantities of food the country needs to sustain its growing population, a return to certain traditional farming methods where possible could be a major policy agenda over the next decade.

There are also several international certification schemes that address the environmental impacts of agriculture, including deforestation. Though the certificate programs are not government initiatives, the Mexican government has continued to support the increased use of certified goods and has supported several certificate pilot projects.⁷² One of the largest certificate programs is managed by the Forest Stewardship Council (FSC), along with the Mexican Civil Council for Sustainable Silviculture (CCMSS), the SmartWood Program, and the Rainforest Alliance. The program currently certifies raw forest materials sourced in Mexico, as well as the agencies that produce certified forest goods. While the certification scheme is not primarily focused on agriculture or food production, many of the farmers who receive agricultural subsidies also produce forest products and can become certified producers.

⁷¹ INIFAP. <http://www.inifap.gob.mx/circe/publigto/agroforesteria.pdf>

⁷² Fonseca, Salvador Anta. Yale School of Forestry and Environmental Studies and Consejo Civil Mexicano para la Silvicultura Sustentable A.C.. Forest Policy and Governance. 2004.
http://www.yale.edu/forestpolicyandgovernance/symposium/pdfs/mexico_symposium.pdf

Though they are not directly included in government policies, other certification schemes that monitor producers' land-conversion practices exist for Mexican materials. There are many different certifications, all with different commodities of interest and all monitoring different indicators. They include RSPO Certified Palm Oil, Bonsucro Certified Sugar Cane, Rainforest Alliance Certified Good (including a range of goods), and the Food Alliance Certification.

Controlling illegal logging

In their *Programa Estratégico Forestal*, Conafor recognizes that in order to slow illegal logging, the risk of illegal activities needs to be heightened and the logging industry needs to become more transparent. The actors involved in the value chain must be better organized, and those cutting trees illegally should not have access to the market—or to subsidies.⁷³ This, of course, is easier said than done.

Procuraduría Federal de Protección al Ambiente (Profepa), is the main federal body in Mexico responsible for vigilance against illegal logging, though Semarnat, Conanp, police, and community vigilance groups also collaborate. Profepa's budget amounted to 3.6 million pesos in 2011, representing a 10 percent cut.⁷⁴ One of Profepa's major efforts to curb illegal logging is their 'Cero Tolerancia' policy effective in four Mexican states—Michoacán, Estado de México, Moreles, and Distrito Federal—as of February 2007. These states are home to the 56,259-hectare *Reserva de la Biosfera Mariposa Monarca* where monarch butterflies migrate during the winter; experts say the monarch will go extinct unless illegal logging in the reserve is stopped.⁷⁵ The *Cero Tolerancia* policy was designed to target the entire illegal timber value chain and ramp up vigilance in the reserve. Some consider it to be a turning point in the fight against illegal logging in that it takes preventative measures as well as prosecuting offenders. As of a 2011 program report, 1,592 vehicles, 327 *predios*, and 198 storehouses and sawmills had been inspected as part of these proactive efforts.⁷⁶ During their *Primer Operativo Forestal 2012*, Profepa closed 15 sawmills, secured more than 500 cubic meters of wood, and detained 16 people. Profepa boasts that in 2011, deforestation in the Reserve was only 0.48 hectares,

⁷³ Conafor, *Programa Estratégico Forestal*, 2001.

⁷⁴ Patricia Guitérrez Rodríguez, "Recortan 10% de presupuesto a Profepa; afectará programas," *El Heraldo de Puebla*, 24 Oct. 2011.

⁷⁵ Reuters, "Mexico vows to protect monarch butterfly," 24 February 2007.

⁷⁶ Profepa, "Cero Tolerancia: Programa Intensivo de Combate a la Tala Clandestina en la Reserva de la Biosfera Mariposa Monarca," 2011.

meaning illegal logging had effectively been controlled. In Mexico as a whole, 150,000 hectares were illegally logged in 2011—down from 350,000 hectares in 2007, when *Cero Tolerancia* was implemented.⁷⁷

However, some communities caught in the crossfire of illegal logging operations would disagree with the success of *Cero Tolerancia*. The residents of Cherán in the state of Michoacán have voiced disappointment with the State's insufficient efforts to protect them against paramilitary loggers that have cut 70 percent of the surrounding oak forest. In 2011, the residents took logging vigilance into their own hands, expelling their mayor and police force, kidnapping loggers and burning their trucks, and setting up vigilance bonfires at every intersection in town.^{78,79} Though community vigilance committees often work with Profepa and police to patrol and prosecute illegal loggers, these acts of resistance illustrate just how contentious policies to curb illegal logging can be.

Limiting Forest Fires and Disease

Mexico's *Programa Nacional de Protección Contra Incendios Forestales* is a coordinated effort among the national forest service, federal and state governments, municipalities, communities, and NGOs. In 2007, Conafor initiated a process to transition from forest fire *suppression* to forest fire *management*, recognizing the role of prescribed burns in agriculture and in natural ecosystem processes. Of the approximately 140 million hectares in Mexico that have some kind of shrub or tree cover, only 36 percent are 'susceptible' to fire and require management; 50 percent have vegetation that is actually 'dependent' on the occasional fire and the remaining 14 percent are 'independent' of fire because of their climate.⁸⁰

In 2010, the *Programa Nacional de Protección Contra Incendios Forestales* had a total of 6,815 personnel available to fight fires—1,685 from Conafor, 2,760 from government, and 2,370 from municipalities, *ejidos*, and NGOs. These firefighters were organized in a total of 665 brigades, and there were 149 observation towers.⁸¹ Of those fires reported, the average

⁷⁷ Profepa, "Exitoso, el Primer Operativo Nacional Forestal 2012 Implementado por la PROFEPA," March 2012.

⁷⁸ Adam Raney, "Battling Mexico's illegal logging trade," Al Jazeera, 23 July 2012.

⁷⁹ Karla Zabludovsky, "Reclaiming the Forests and the Right to Feel Safe," *NY Times*, 2 August 2012.

⁸⁰ Conafor, Coordinación General de Conservación y Restauración, "Gerencia de protección contra incendios forestales."

⁸¹ Conafor, "Recursos Disponibles 2010: Transparencia Focalizada—Incendios Forestales."

detection time was 35 minutes, with help arriving an average of about one hour later.⁸² Information on the amount of money dedicated to this national program (and the compensation received by the firefighters) is missing, perhaps because there are actors involved at so many different levels. However, a new ProÁrbol program, *Apoyo a las acciones de Prevención y Combate de Incendios Forestales*, initiated by Conafor in 2009, had a budget of US\$48 million (630 million pesos) that year.⁸³ State-level data provides preliminary evidence that monetary resources do translate into fewer hectares destroyed by fire; this year, the state of Chihuahua increased funding to combat forest fires from 13 to 16 million pesos and was able to add 42 new forest fire brigades and purchase protection equipment. As of July 2012, the average area affected per forest fire in Chihuahua was 11.5 hectares—significantly under the national average of 35.6 hectares affected per fire.⁸⁴

The Mexican government has also made various efforts to combat forest plagues. In 2008, Semarnat passed a norm regulating the fight against *descortezadores*, which the agency identifies as the most important forest pest in the country. Methods of fighting these insects include cutting damaged branches and trunks, burying or otherwise remediating cut branches, creating controlled burns, and, in some cases, applying insecticide.⁸⁵ Comprehensive information on the funding for these efforts is not available, however, in 2011, Conafor committed US\$56,000 (732,000 pesos) to applying biodegradable insecticide to fight forest plagues in the state of Nayarit.⁸⁶

Sustainable Forest Management

Sustainable forest management (SFM) refers to the optimization of forest assets to ensure the maintenance of forest stocks into perpetuity through management practices that increase economic, social, and biodiversity benefits.⁸⁷ In Mexico, SFM practices have been supported by

⁸² Conafor, *Reporte semenal de resultados de incendios forestales 2012*, datos acumulados del 1 de enero al 26 de julio de 2012, Coordinación General de Conservación y Restauración, Gerencia de Protección Contra Incendios Forestales.

⁸³ Pedro Joaquín Gutiérrez Yurrita et. al., “Evaluación de Diseño Programa Presupuestario S226: ProÁrbol—Apoyo para las acciones preventivas de incendios forestales,” Conafor, 5 October 2009.

⁸⁴ Juan José García, “Asignan 16 millones de pesos para combate de incendios forestales en Chihuahua,” *Milenio*, 15 August 2012.

⁸⁵ Semarnat, Norma Oficial Mexicana NOM-019-SEMARNAT-2006, Que establece los lineamientos técnicos de los métodos para el combate y control de insectos descortezadores, 23 July 2008.

⁸⁶ Conafor Facebook page, “Entrega Conafor recursos para combate de plagas forestales,” 22 July 2011.

⁸⁷ Forest Stewardship Council Principles and Criteria (available: <http://www.fsc.org/principles-and-criteria.34.htm>)

Conafor and funds have funneled through the community-owned forests. The benefits of sustainable forest management for carbon sequestration in Mexico are well documented. In a 2004 study, it was found that sustainable forest management ranked the best option for carbon capture on a per hectare basis as compared to reforestation and natural protected areas.⁸⁸

Sustainable forest management practices are an effective option for scaling carbon reductions from the forest sector in Mexico for two reasons: First, SFM can be incorporated into existing timber operations and thus does not require wholesale changes to management practices as conservation efforts such as national protected areas do. Thus, even traditionally managed timberlands that are clear-cut can benefit from SFM practices without completely stopping timber harvests. Second, SFM's goal is to maintain carbon stocks and therefore provide a revenue stream from timber harvests into perpetuity, minimizing or eliminating the boom-bust cycles caused by unmanaged clear-cut lands. For these reasons, SFM has relatively small barriers to implementation above other forest practices that seek to increase carbon stocks or prevent carbon loss.

Since 80 percent of Mexico's forests are owned by *ejidos* or cooperatives, many SFM practices are carried out by communities. *Ejidors* in particular are largely vertically integrated and thus can internalize the benefits of SFM practices more easily by keeping costs low, since they do not have to hire external contractors to harvest or process the wood products.⁸⁹ Due to continual political support from the Mexican government since the 1970s and a high degree of social capital in rural areas, it is estimated that 290-479 community forest enterprises (CFEs) have formed.⁹⁰ These CFEs have successfully harvested timber on their own lands and have shown significant economic development in the last 40 years.⁹¹ Community managed forestland is the single largest factor in the proliferation of sustainable forest management practices in the country. SFM is often successful because communities have an economic stake in managing the forest and preventing deforestation. The most successful communities are

⁸⁸ De Jong, Bernardus H.J., Omar Masera and Thomas Hernández-Tejeda (2004) "Opciones de captura de carbono en el sector forestal", in *Cambio Climático: una visión desde México*, Instituto Nacional de Ecología, Mexico.

⁸⁹ Torres-Rojo, J.M., Magaña, O. Bray, D., Guevara A. and C. Muñoz P. 2005. "Human Dimensions in Forest Management Decision Making: Community Forest Management. Documento de Trabajo, CIDE.

⁹⁰ Bray, Merino-Perez, Mexico's Community-Managed Forests as a Global Model for Sustainable Landscapes, *Conservation Biology*, Pages 672–677 Volume 17, No. 3, June 2003.

⁹¹ Bray, Merino-Perez, Mexico's Community-Managed Forests as a Global Model for Sustainable Landscapes, *Conservation Biology*, Pages 672–677 Volume 17, No. 3, June 2003.

employing sustainable forest management practices and a system for accountability and a fair distribution of benefits derived from forest revenues.⁹²

Afforestation/Reforestation and Community Silviculture

One of the earliest successes in Mexico's efforts to combat deforestation was the establishment of PROCYMAF, a program to support sustainable community silviculture and designed by the World Bank and SEMARNAP.⁹³ In addition, Mexico has participated in the UN Environment Programme's (UNEP) "Billion Trees Campaign" since 2007.

The result of such programs has greatly accelerated the pace of afforestation and reforestation activities. In fact, the Environmental Secretariat reports that between 2007 and 2011, Conafor protected, restored, or reforested 2,100,000 hectares.⁹⁴ According to UNEP figures, Mexico ranked in 4th place for the number of trees planted during this period—only behind China, India, and Ethiopia. In 2011, the main reforestation program in Mexico administered by ProÁrbol invested a total of US\$44.3 million (582 million pesos) to serve 11,000,199 subsidy requests, which resulted in 350,000 hectares of reforestation activities.⁹⁵

Category	Number of Applicants	Amount Requested (Pesos)	Number of Beneficiaries	Amounted Disbursed (pesos)
A. Forest Planning	13,923	1,781,954,211	8,386	324,585,029
B. Production and Productivity	15,106	4,379,444,832	9,522	1,880,963,527
C. Conservation and Restoration	47,695	7,825,698,795	29,118	2,852,129,479
D. Raising the Level of Competitiveness	3,466	725,997,799	1,694	206,982,403
Total	80,190	14,713,095,637	48,720	5,264,660,438

Source: Conafor, Semarnat, and the Colegio de Postgraduados, Reforestacion: Evaluación Externa Ejercicio Fiscal 2007

⁹² Klooster, D. 2000. Institutional choice, community, and struggle: a case study of forest co-management in Mexico. *World Development* 28:1–20.

⁹³ Garcia, Janvry, et. al, *An Assessment of Mexico's Payment for Environmental Services Program*, FAO, 2005.

⁹⁴ GEO-Mexico, *Is Mexico really one of the world's reforestation success stories?* (Available: <http://geo-mexico.com/?p=5726>)

⁹⁵ Milenio, *UN: Mexico Fourth in the World in Reforestation*, 28 December 2011 (Available: <http://www.milenio.com/cdb/doc/impreso/9086130>)

In 2008, Conafor, Semarnat, and the *Colegio de Postgraduados* conducted a national-level evaluation of reforestation programs to determine areas of improvement and the efficacy of the programs.⁹⁶ The main findings of the evaluation were as follows. First, the reforestation program was shown to create jobs. In fact, the study found that subsidies for reforestation activities create an average of 2.5 jobs in *núcelos agrarios* and 1.49 permanent jobs on private property for every dollar invested by the federal government.

Criticism of reforestation subsidies has focused on the high death rates (up to 60 percent) of seedlings before they reach maturity. This indicates the need for investment in nurseries as well as better timing of subsidies and plantings. The main recommendations from the 2008 evaluation found that first, Conafor must be more proactive in determining the demand to ensure that the subsidies fulfill the social objectives and reach the most degraded areas in Mexico. Second, landowners would be better served to apply for the subsidies in the fiscal period *before* the planting season to reduce premature seedling deaths and unnecessary delays (subsidies need to better coincide with the rainy season to ensure the timing of the planting matches various ecosystems.) Third, there is a great need for a single registry for subsidy recipients.

Commercial Forest Plantations

Commercial forest plantations (PFCs), by Conafor's definition, are planted on land that has lost its native vegetation. Tree-planting for commercial purposes on this degraded land is therefore classified as an effort to curb deforestation, both by providing employment opportunities in rural regions and because commercial tree-planting might be considered a form of reforestation—albeit one that lacks the biodiversity of species in natural forests. There are currently about 1,800 PFCs in Mexico, covering more than 117,000 hectares. Eighty-five percent of these hectares are devoted to producing timber, the most popular species being eucalyptus, red cedar, and pine, while 15 percent are used for non-wood products such as agave lechuguilla (used for its fiber and in sports drinks) and jatropha (used as biofuel feedstock).

Sixty percent of Mexico's total PFCs are located in the southern states of Veracruz, Tabasco, and Campeche. Though 70 percent of PFCs are 'microprojects' of less than 25 hectares, mega-plantations dominate in terms of number of hectares: the 15 largest PFCs in Mexico cover a

⁹⁶ Conafor, Semarnat, and the Colegio de Postgraduados, *Reforestacion: Evaluacion Externa Ejercicio Fiscal 2007*

collective 36,000 hectares, with *Forestaciones Operativas de México* alone covering more than 10,000 hectares. About 10,000 hectares of PFCs have been added annually in the last decade, with a projected 300,000 hectares by 2025.⁹⁷ However, commercial forest plantations are a fairly new economic development in Mexico, and it is estimated that as many as 10.7 million hectares in the country have the climate and soil needed to establish plantations.⁹⁸

The proliferation of commercial forest plantations in Mexico was supported by the *Programa para el Desarrollo de Plantaciones Comerciales* (Prodeplan) which began in 1997 with a public competition that resulted in an initial 17 projects supported by about US\$11 million (143.7 million pesos).⁹⁹ As of 2009, Prodeplan's budget was over 500 million pesos.¹⁰⁰ Prodeplan pays up to 65 percent of establishment and maintenance costs for the first seven years of plantation operation. Only 5-10 percent of PFCs in Mexico do *not* receive the Prodeplan subsidy, and most PFCs trees are less than 15 years old, coinciding with the start of the program.¹⁰¹ This indicates that the industry is just now maturing and more timber and forest products from PFCs will be coming on the market.

Commercial forest plantations are intended to be planted on previously deforested or degraded land and therefore contribute to net-positive impacts on forests in the country, perhaps even taking away some of the pressure on illegal logging of natural forests. However, there is the possibility of perverse incentives if Prodeplan subsidies incentivize the cutting of natural forests to establish PFCs of higher-value species.

Conservation of National Protected Areas

Globally, conservation areas have shown to be extremely valuable not just in the protection of biodiversity and animal habitats, but equally important, these areas ensure the continuation of an array of ecosystem services that sustain local communities and provide much needed

⁹⁷ Alejandro Velázquez Martínez et. al., "Situación Actual y Perspectivas de las Plantaciones Forestales Comerciales en México," Conafor, no date (but post-2009).

⁹⁸ Conafor, Programa Estratégico Forestal, 2001.

⁹⁹ North American Forest Commission, "State of Forest Activity in Mexico Information Note," Nineteenth Session, 16-20 November 1998, Villahermosa, Mexico.

¹⁰⁰ FORDAQ, The Timber Network, "PRODEPLAN sets pace for forest plantation development," from ITTO's Tropical Timber Market Report, 9 September 2009. Available at: http://www.fordaq.com/fordaq/news/forest_20781.html

¹⁰¹ Alejandro Velázquez Martínez et. al., "Situación Actual y Perspectivas de las Plantaciones Forestales Comerciales en México," CONAFOR 2009.

revenue for governments through continual demand for ecotourism.¹⁰² The Mexican government has matched global progress on establishing National Protected Areas (NPAs) and protecting the country's most valuable ecosystems. In total, Mexico's NPAs cover 10 percent of Mexico's land area and 1.5 percent of its sea for a total of 24 million hectares.¹⁰³ Over five percent of the rural population (1.3 million people) has a livelihood that is dependent on these NPAs.¹⁰⁴ The budgets of NPAs have grown from US\$4 million (52 million pesos) in 1995 to US\$65 million (848 million pesos) in 2008.¹⁰⁵

As a tool for conservation, NPAs have shown to be an effective mechanism for conservation in many areas, though deforestation still takes place in some NPAs. In 2008, a meta-study analyzed all NPAs within Mexico and found that 54 percent were effectively managed (meeting their purported conservation and biodiversity goals) while 23 percent were found to be ineffective.¹⁰⁶ Between 2007 and 2012, NPAs and other conservation strategies in Mexico (i.e. Wildlife Management Units, Sustainable Forest Management, Payment for Ecological Services, and Forest Pest Control) reduced deforestation by 310,000 hectares against business as usual.¹⁰⁷ Another study found that NPAs significantly reduced vegetation loss compared within its geographic context.¹⁰⁸ More specifically, biosphere reserves were found to be most effective in preventing vegetation loss than any other conservation program.¹⁰⁹

Payment for Ecosystem Services

Payments for environmental services (PES) schemes have existed in Mexico since the 1990s, in various localized forms. However it wasn't until Vicente Fox became president in 2000 that environmental issues came to the forefront of Mexico's political agenda, and many of these

¹⁰² Ervin, J. *Protected area assessments in perspective*. Bioscience 53:819–822. doi:10.1641/0006-3568(2003)053[0819:PAAIP]2.0.CO;2)

¹⁰³ The Nature Conservancy, *Valuing Nature* 2009. Available at: http://www.nature.org/ourinitiatives/regions/northamerica/mexico/explore/valuing_nature_english.pdf

¹⁰⁴ The Nature Conservancy, 2009.

¹⁰⁵ The Nature Conservancy, 2009.

¹⁰⁶ Fernanda Figueroa, Víctor Sánchez-Cordero, *Effectiveness of natural protected areas to prevent land use and land cover change in Mexico*, *BiodiversConserv* 2008 17:3223–3240 DOI 10.1007/s10531-008-9423-3

¹⁰⁷ De Jong, B. H. J., L. Iglesias Gutiérrez and J. Armando Alanís de la Rosa *Advances in Mexico in preparing for REDD*. (2008) UNFCCC Workshop on Methodological Issues relating to Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, Tokyo, Japan.

¹⁰⁸ Figueroa, Sánchez-Cordero, 2008.

¹⁰⁹ Figueroa, Sánchez-Cordero, 2008.

programs became unified. PES indirectly helps to combat deforestation by putting an economic value on the ecosystem services that forests provide (particularly in terms of water availability and quality); it pays people to conserve those ecosystem services, incentivizing forest protection and providing a source of rural development.

The first attempt toward a national-scale PES system came in 2002 with the National Payments for Hydrological Services Program (*Pago por Servicios Ambientales-Hidrologico/ PSAH*) This program was initially developed by the Department of Policy and Environmental Economics (PEA) and the Iberoamerican University (UIA); it attempted to target payments toward areas with high rates of poverty, located in overexploited watersheds. The program was to include 100 ejidos with an annual payment of roughly US\$20 per hectare, but never fully moved to the implementation stage.

Based on issues that arose from the initial pilot program, the government then revised the PSAH program into its current form. Many more landowners are now able to participate, whether they be private deed-holders, *ejidos*, or other groups. According to expert Jennifer Alix-Garcia, “Application for the program was very simple – all it required was to fill out a two pages form and present proof of legal ownership. For *ejidos*, an *Acta de Asamblea* was required, a document verifying that a general assembly had been called in the participating community and that a vote had taken place.”¹¹⁰

Once this information is given, the forest owner can then collect payments based on performance for forest area that meets the following criteria:

- Minimum forest area of 50ha
- More than 80 percent tree cover
- Located on overexploited aquifers (which cover approximately 18.69 percent of the area of Mexico)¹¹¹
- With nearby population centers greater than 5,000 inhabitants (which indicates demand for hydrological services)
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¹¹⁰ Alix-Garcia, Jennifer, Alain de Janvry and Elisabeth Sadoulet. *An Assessment of Mexico's Payment for Environmental Services Program*. (2005) UN Food and Agriculture Organization. Available at: areweb.berkeley.edu/~sadoulet/papers/FAOPES-aug05.pdf.

¹¹¹ Alix-Garcia, 2005.

Forest cover is verified on a yearly basis using satellite image analysis and/or ground visits, and contracts are then reassessed accordingly.

The government rewards roughly US\$40 (524 pesos) per hectare of cloud forest and US\$30 (393 pesos) per hectare of other types of forest, with payments coming from federal fiscal revenues. This amount was designed to compensate landowners for the opportunity cost of more lucrative alternative land uses, and is dispensed in the form of a conditional cash transfer. However, it is only guaranteed for a limited period of time: most contracts only last 5 years, after which time the landowner must find alternative buyers for environmental services.¹¹² After payments are dispersed, the landowner may then choose the best course of action for distribution and use. According to Alix-Garcia, use varies “from distributing 100 percent equally between all members, to the investing of all money into public goods for the community, with many intermediate cases where allocation includes a combination of direct distribution of payments, payments for guarding the forest and fire prevention, and investment in local public goods.”

After the PSAH program began in 2003, it was later expanded to become less focused on aquifers, and encompassing of biodiversity conservation efforts as a whole. The new policy stipulated that land in a National Protected Area or in a ‘Priority Mountain’ could receive the same priority as a property in an overexploited watershed. These new allowances were in line with the Mexico Program for the Sustainable Management of Mountain Ecosystems (PMSEM), which focuses on the protection of water production, carbon capture, and biodiversity of the country’s 60 most important mountains. Payments for these PMSEM forest areas are administered by Conafor in parallel to the PSAH program, with a budget of roughly US\$1.7 million (22.2 million pesos) per year.

One further boost to this program came in 2004, when Conafor received US\$100 million (1,304 million pesos) from the World Bank to “support local payment mechanisms” over the next 20 years.¹¹³ This funding has been used to support research into the effectiveness of the environmental services program, and to manage private environmental service contracts. Although the grant didn’t change the structure of the program, it has allowed Conafor to process applications more efficiently and begin thinking about how to adapt PSAH to meet

¹¹² Gonzáles Guillén, M. d. J. (2008) Evaluación externa de los apoyos de los servicios ambientales ejercicio fiscal 2007. México DF, Colegio de Postgraduados.

¹¹³ Alix-Garcia, 2005.

future conservation challenges.

After this initial startup phase, between 2003 and 2009, approximately 2.27 million hectares of land were entered into Mexico's program of payments for ecosystem services,¹¹⁴ making it one of the largest in the world. Researchers have found that the program has reduced the probability of deforestation in Mexico by 6-11 percent¹¹⁵ and of the area originally put in the program, less than 0.01 percent has been deforested.¹¹⁶

However, there has been much criticism of PSAH as well. Because it was originally designed to focus on aquifer preservation, the program has been unable to protect many of the country's highest risk forest areas. In addition, benefits from the program have been distributed unequally throughout the country: in the first few years, the states of Oaxaca, Durango, and Veracruz were receiving a combined total of 43 percent of the budget, with other states receiving much smaller shares. Also, the transaction cost of registering for payments has been much higher for *ejidos* and other communities than for private landowners, which has skewed the degree of coverage disproportionately toward private lands.¹¹⁷ Conafor has been working to smooth out these inequities and, with the support of the World Bank, improve the PES program in the future.

It is also important to note that the Mexican government has tried to implement similar programs for other ecosystem services, but with less success. For example, the "Payments for Carbon Sequestration Program" (CABSA-carbon) was piloted briefly in an attempt to sell carbon credits to the international compliance markets. However, most proposed projects were rejected and the program was eventually phased out with the 2006 implementation of CDM in Mexico.¹¹⁸ Aspects of and lessons learned from each of these pilots have been incorporated into

¹¹⁴ Shapiro, E.N. (2010). *Political Economy and Community-Level Impacts of the Mexican Federal Payments for Ecosystem Services Program*. Doctoral dissertation, Environmental Science, Policy & Management, University of California, Berkeley.

¹¹⁵ Alix-Garcia, Jennifer M, Elizabeth N Shapiro, Katharine R.E. Sims. (2010) *Forest Conservation and Slippage: Evidence from Mexico's National Payments for Ecosystem Services Program*. Working paper. Available at <http://cbey.research.yale.edu/uploads/Environmental%20Economics%20Seminar/Alix-Garcia%20Shapiro%20and%20Sims%20PES%20Mexico%208-6-10.pdf>

¹¹⁶ Karousakis, K. (2007) *Incentives to reduce GHG emissions from deforestation: lessons learned from Costa Rica and Mexico*. Paris, France, Organisation for Economic Co-operation and Development (OECD) & International Energy Agency (IEA).

¹¹⁷ Colegio de Posgrados (COLPOS). 2004. *Valuación de Programa de Pago por Servicios Ambientales Hidrológicos*

¹¹⁸ Corbera, E., C. G. Soberanis and K. Brown (2009) "Institutional dimensions of Payments for

the current unified system, which will likely be expanded to incorporate REDD as well.

Financing Forest Conservation vs. Drivers of Deforestation

Financing in Mexico's forest sector comes from direct government subsidies, but also from national non-profits, conservation funds, banks and international development organizations. Important international funding sources for conservation include the International Development Bank, the World Bank, USAID, the World Environment Fund, the Packard Foundation, and the MacArthur Foundation. Domestically, national development banks such as Banco Nacional de Comercio Exterior (Bancomext), Financiera Rural (FR), and Nacional Financiera (Nafinsa) as well as national funds like the Mexican Fund for the Conservation of Nature (FMCN) (the Mexican Fund for Natural Protected Areas), AGROASEMEX (a national insurance organization), Fondo de Capitalización e Inversión del Sector Rural (FOCIR) (a national rural investment fund), and Fondo Nacional de Apoyo para las Empresas en Solidaridad (FONAES) (a national fund for small businesses) provide financing in the forest sector.

The main government agency to disburse funds in Mexico's forest sector is Conafor. In 2011, Conafor had a budget of US\$493,267 (6,462,000 pesos) \$493,267 and 66 percent of this money went towards the ProÁrbol program.¹¹⁹ Under ProÁrbol, landowners can receive various subsidies under two basic categories: Forest Development and Conservation and Restoration. Eligibility for subsidies is based on a point system, with points awarded according to a set of criteria, such as being female, certified in forest management, from a majority-indigenous municipality, located in a social development priority zone, or part of an ejido that has not previously received ProÁrbol forest funding, among other criteria.¹²⁰

Ecosystem Services: An analysis of Mexico's carbon forestry programme". *Ecological Economics* **68** (3): 743-761.

¹¹⁹ "Cuenta Conafor con presupuesto de 68 mdp del ProÁrbol 2012," *MensajeroQueretaro*, 8 January 2012. Available at: <http://www.mensajeroqueretaro.com/2012/01/cuenta-conafor-con-presupuesto-de-68-mdp-del-proarbol-2012/>

¹²⁰ Secretaría de Gobernación, *Reglas de Operación del Programa ProÁrbol 2012*, 21 December 2011.

ProÁrbol Subsidies

Category A, Forest Development		
Subcategory	Description	Subsidy available (pesos)
Forest studies	Includes environmental impact studies, timber management programs, and technical studies for non-wood forest products such as germplasm	<ul style="list-style-type: none"> - Up to 270,000 for environmental impact studies - For timber management programs: <ul style="list-style-type: none"> 10,000 for 10 hectares (+500/ha up to 20 ha) 15,5000 for 21 hectares (+274/ha up to 100 ha) 37,000 for 101 hectares (+137/ha up to 1,000 ha) 160/ha for areas additional hectares over 1,000 - For technical studies: <ul style="list-style-type: none"> 5,480 for 20-100 hectares 55/ha for hectares 101-1,000 54,800 for 1,000+ hectares (plus 28/ha for hectares over 1,000)
Silviculture	Includes timber and non-timber forest management	<ul style="list-style-type: none"> - For timber resource management: up to 400,000 - For non-timber resource management: up to 300,000 - For forest management: up to 220,000 - For forestry <i>tecnificación</i>: up to 800,000 for projects (3,000,000 for regional projects) - For <i>caminos forestales</i>: up to 750,000 for projects (3,000,000 for regional projects)
Certification	Includes technical audits and national and international forest certifications	<ul style="list-style-type: none"> - Technical audits for timber-yielding areas: 19,000 to 210,000, depending on number of hectares - Technical audits for non-timber-yielding areas: 8,440 to 87,700, depending on number of hectares - For national or international certification: up to 100,000 for 250-1,000 hectares and 10/ha for additional hectares over 1,000, up to 240,000 pesos - Up to 200,000 for other certifications
Commercial forest plantations	For example, plantations for biofuel feedstocks (jatropha, cellulosic sources) or for tree seedlings	<ul style="list-style-type: none"> - 9,200/ha for jatropha - 10,000/ha for cellulosic plantations - 15,000 /ha for tree seedlings - Money also available for technical assistance
Category B, Conservation and Restoration		
Subcategory	Description	Subsidy available
Reforestation	Reforestation, maintaining and protecting reforested areas, maintaining reforestation practices and projects	<ul style="list-style-type: none"> - Between 1,511 and 2,417 per hectare for reforestation projects, depending on vegetation type (300-500/ha for technical assistance) - 1,088 per hectare for maintaining reforested areas (200/ha for technical assistance) - Between 1,269 and 2,417 per hectare for protection of reforested areas, depending on forest area (200/ha for technical assistance)

Environmental services—hydrologic	Conservation of forest cover that maintains aquifers and prevents erosion	- Between 382 and 11,100 per hectare per year for the hydrologic service itself, depending on forest area (up to 60,000 for technical assistance)
Environmental services—biodiversity	Conservation of flora and fauna in forest ecosystems as well as agroforestry ecosystems	- Between 280-550 per hectare per year for the biodiversity service itself (up to 44,000 for technical assistance)

Source: Reglas de Operación de ProÁrbol 2012

*Payment for ecosystem services subsidies are the only ones that pay out every year; others are a total per-hectare payments, often issued in installments over the course of projects.

As of November 30, 2011, ProÁrbol had approved subsidies for 26,613 solicitants over the course of the year, for a total of US\$215,108 (2,818,000 pesos). This money went towards reforesting 343,000 hectares and restoring 75,000 hectares. As of November, ProÁrbol's payment for ecosystem services program had already surpassed its goal of supporting 460,000 hectares. Conafor has a 2012 budget of US\$519,983 (6,812,000 pesos), a 7 percent increase.¹²¹

In addition to awarding subsidies for various activities in the forest sector, Mexico has specific policies in place to address the direct and indirect drivers of deforestation in the country, as outlined in the policy section above. (Note that some of these policies to address deforestation fall under ProÁrbol while others do not.) Below is a chart summarizing the funding going towards some of the policies meant to curb deforestation, as discussed previously.

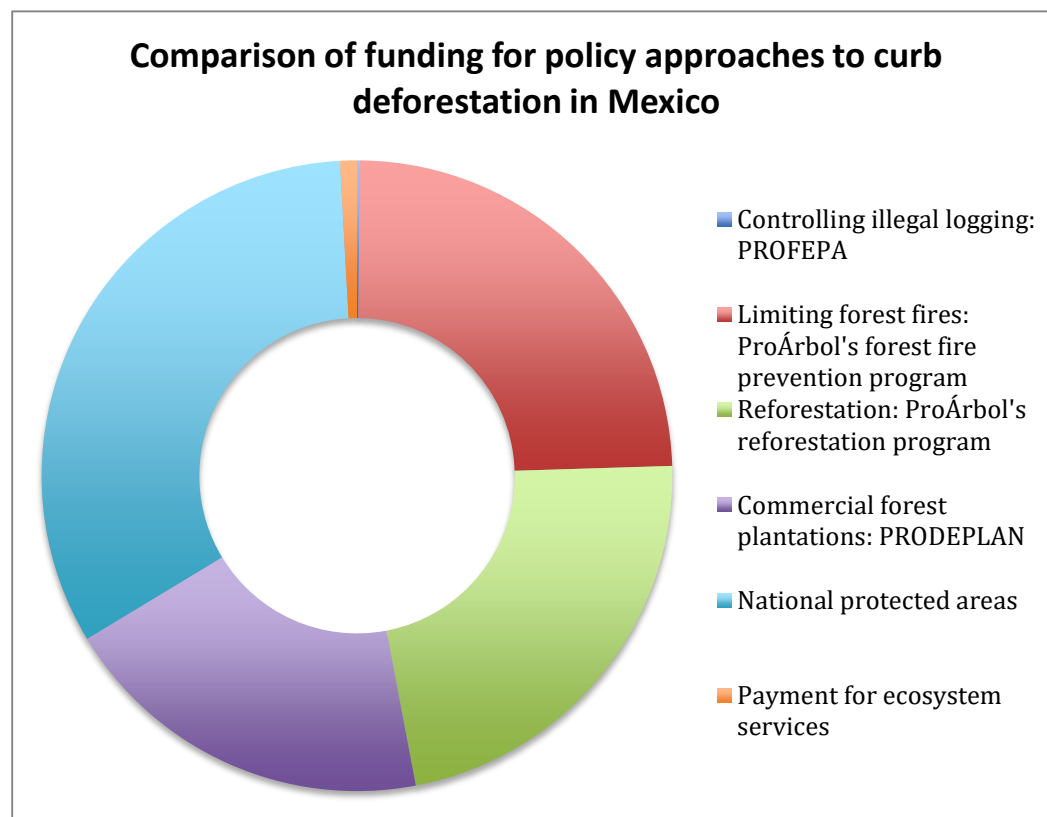
Forest Conservation Funding

Policy approach to curb deforestation	Funding: Millions of Pesos	Funding: Millions of US\$	Year for funding data
Limiting deforestation from agricultural expansion: SAGARPA's Program of Sustainability of Natural Resources*	8,000.00	613.40	2011
Controlling illegal logging: PROFEPA	3.60	0.28	2011

¹²¹ "Aumentará presupuesto de ProÁrbol más de seis mil mdp," *Impacto*, 19 December 2011. Available at: http://impacto.mx/nacional/nota-26640/Aumentar_presupuesto_de_Proarbol_a_mas_de_seis_mil_mdp

Limiting forest fires: ProÁrbol's forest fire prevention program	630.00	48.31	2009
Reforestation: ProÁrbol's reforestation program	582.00	44.63	2011
Commercial forest plantations: PRODEPLAN	500.00	38.34	2009
National protected areas	848.00	65.02	2008
Payment for ecosystem services	22.20	1.70	post-2003

***Note that this Sagarpa program also aimed to increase agricultural productivity; its effects on curbing deforestation are therefore unclear. For this reason, it is not included in the visual representation below.**



As you can see, in terms of policies explicitly aimed at curbing deforestation, National Protected Areas (NPAs) receive the most funding (848 million pesos in 2008). The funding for forest fire prevention (630 million pesos in 2009), reforestation (582 million pesos in

2011), and commercial forest plantations (500 million pesos in 2009) is similar. National funding for payment for ecosystem services and controlling illegal logging make up an almost negligible piece of the pie here, although there is not good data available for the latter, so its financing may be understated here.

In total, the funding for the above policies to curb deforestation amount to about US\$200 million (2.59 billion pesos), keeping in mind that the data above is not all from the same year. This financing only takes into account nationally funded efforts for which data was available; it excludes state- and community-level initiatives.

Though this estimate of forest financing is rough, comparison to the amount of money going towards the main driver of deforestation (land use change for agriculture), reveals stark contrasts. An estimated US\$2.32 billion (30.3 billion pesos) went to Sagarpa's five main agricultural subsidies discussed above. Though these subsidies may not *directly* cause deforestation, they add to the financial incentives for land use change that, hectare by hectare, are converting forests to agriculture/livestock uses across Mexico. Just looking at Sagarpa's versus Conafor's budgets—US\$6.2 billion versus \$520,000—illustrates the relative (un)importance of forest financing.

Though not all drivers of deforestation can be quantified in monetary terms, the below chart summarizes the three main drivers of deforestation (land use change for agriculture, illegal logging, and forest fires and disease) and the financial drivers behind them, if identifiable:

Funding for Drivers of Deforestation

Deforestation Driver	Program(s)	Objectives/Provisions	Financing	Sources of financing
Land use change for agriculture (82%)	Procampo, Ingreso Objetivo, Alianza para el Campo, PROGAN, MasAgro	Various, depending on the subsidy. Some payments (Ingreso Objetivo) are based on production level while others (Alianza) are primarily for infrastructure, tools, and machinery. Other goals include more productive, more efficient agriculture, with fewer negative impacts on the environment.	An estimated US \$2.32 billion (30.3 billion pesos) go to these 5 programs. Note that only government subsidies—not private financing for agriculture—are considered here.	Sagarpa, Aserca (Sagarpa), CIMMYT, Federal/State Governments
Illegal Logging (8%)	N/A	Motivated by high financial returns on domestic and int'l markets	Unknown, though illegal logging makes up an estimated 40	Free market

			to 60 percent volume of the logging industry.	
Forest Fire and Disease (6%)	N/A	N/A	N/A	N/A

Conclusion

While it is difficult to find accurate data on the range of policies related to forestry and land use, this report shows that the current Mexico subsidy structure promotes activities that both drive deforestation and lead to forest conservation. With the majority of subsidies going toward efforts at agricultural intensification, it is clear that the government prioritizes this sector over that of forest conservation. However, considerable efforts have been made to slow forest loss, and these efforts will likely continue to expand in the future. The introduction of REDD+ financing will also directly combat this focus on agriculture intensity, as it is designed to compensate landowners for the opportunity costs of converting forest to agricultural land.

All of these subsidies must be taken into account when developing a framework for the implementation of REDD+, to ensure that efforts are not duplicated or contradicting each other. Right now, the majority of government funding is going into programs that both encourage agricultural expansion and mitigate the effect of this expansion on forests, which is highly inefficient. Such subsidy dynamics are should be avoided when introducing REDD+ financing in the future. Especially because many of these programs will expire within the next few years, efforts should be made to ensure that subsidy financing is encouraging activities that do not damage Mexico's forests.

In addition to lessons learned, the subsidies discussed also provide inspiration for the successful implementation of REDD+. The PES system in Mexico sets a positive precedent for this type of conservation in the country, and will lay the groundwork for effective application of REDD+. It appears as if Conafor has already learned lessons about how to implement a payment system on the ground, which will be valuable when designing methods of distributing funds for REDD+. Regardless of whether a national REDD+ program can be incorporated into this PES current system (or vice versa), efforts should be made to ensure that the two payment schemes are efficient and well-aligned, to send a clear message about conservation priorities within the country.

For REDD+ to be effective in Mexico, it must be coordinated within this greater subsidy structure, using available funding channels and mechanisms whenever possible. It is critical that landowners have a clear idea of why they are being paid, and how REDD+ funding fits into the country's broader conservation and development priorities.



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