



# Agricultural Policy, Market Barriers, and Deforestation: The Case of Mexico's Southern Yucatán

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**Summary.** — This paper examines the linkages between agricultural policies and deforestation in a development frontier of Southern Mexico, focusing on support programs targeted at buffering farmers from structural reforms. We argue that local barriers to market participation condition the responsiveness of farmers to program incentives, thereby constituting a key channel through which agricultural policies impact the environment. An econometric model parameterizes the influence of two programs, PROCAMPO and Alianza para el Campo, on cultivation. Consistent with an economic environment characterized by market barriers, results suggest that program support, even when decoupled from production decisions, significantly determines land use and deforestation.  
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## 1. INTRODUCTION

The formulation of policies that balance human welfare against environmental stewardship is among the most pressing challenges confronting countries with tropical forests. Beyond serving as global repositories of carbon and biodiversity, tropical ecosystems are home to nearly half of the world's 6.4 billion inhabitants, providing a critical resource base for both agricultural and extractive activities. In Latin America, where upwards of 84% of deforestation is attributable to agriculture (CIAT/PNUMA, 1998), the political economy of environmental management has been significantly shaped by so-called structural adjustment policies (SAPs) beginning in the mid-1980s. Introduced with the aim of fostering competition and industrialization through a combination of greater openness to international trade and the removal of state interference in domestic markets, these policies have dramatically altered the set of incentives and constraints influencing land allocation decisions (Liverman & Vilas, 2006; Rudel, 2007).

Although several studies have investigated the economic effects of particular policies associated with structural adjustment on Latin America's farming sector (Echánove & Steffen, 2003; Korten, 1993; Nadkarni & Vedini, 1996), there has been relatively less research on the implications for the environment. With regard to deforestation, three principle factors have complicated attempts to understand the impacts of SAPs at the micro-level. First, the exogenous drivers associated with such policies are often experienced uniformly within a region, so that temporal data capturing conditions before and after the policy are required if effects are to be discerned. Second, farm households in rural Latin America typically apply hybrid production strategies that combine—to varying degrees—subsistence and market-oriented cultivation. This heterogeneity results from household-specific differences in the transaction costs of market participation, which in turn conditions responses to economic incentives in complex ways

that make policy outcomes difficult to predict. Finally, in many cases, structural adjustment constitutes a package of “multiple and sometimes contradictory policy changes” (Liverman & Vilas, 2006), rendering it problematic to link the process as a whole to particular environmental effects. Such has been the case in Mexico, where the larger structural adjustment regime has been accompanied by support programs targeted at buffering the agricultural sector from the effects of price fluctuations on basic commodities.

Using household survey data collected from an agrarian frontier in the Southern Yucatán of Mexico, this paper addresses the question of how such ancillary programs affect crop allocation and deforestation at the farm level. The Mexican experience with structural adjustment serves as a particularly useful case study of associated environmental effects for two reasons. First, the country is widely recognized as a key player among regions in which dramatic changes in land cover are precipitating systemic climate change (Cairns, Haggerty, Alvarez, De Jong, & Olmsted, 2000; Liverman, 1990). During 1990–2000, Mexico lost roughly 1.1% of its forests annually (FAO, 2001), over half of which was attributable to agricultural expansion (Cairns *et al.*, 2000). Second, the Mexican

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government's embracement of structural adjustment policies beginning in the mid-1980s was far reaching, involving the abolition of trade barriers under the General Agreement on Tariffs and Trade (GATT) and later the North American Free Trade Agreement (NAFTA), tenure reform, and, more recently, the implementation of various support programs designed to promote commercialized production while countering the austerity associated with economic liberalization.

The focus of the present paper is on the effects of two such programs—PROCAMPO (Program of Direct Payments to the Countryside) and Alianza para el Campo (Alliance for the countryside, hereafter Alianza). Although both programs support farm households through financial and—in the case of Alianza—technical support, they are distinguished by their aims and the conditions attached to participating. PROCAMPO places no restrictions on how aid monies are spent, though it does attach conditions on land use pursuant to an array of environmental objectives, including the avoidance of agrochemicals, the abatement of soil erosion, and the promotion of conservation. Aid from Alianza, by contrast, is directed to particular agricultural activities that the recipient has agreed to implement, but the implementation itself is subject to no restrictions other than a perfunctory commitment to avoid environmental damage.

Our point of departure in analyzing the effects of these programs focuses on how barriers to market participation, such as those caused by high transportation costs, affect the adjustment of cropping patterns to changing economic conditions and policy incentives. We suggest that the *in situ* market structures emerging from such barriers may be one of the key channels through which centralized agricultural policies impact the environment, but one which has received relatively spare treatment in the related literature. To throw light on this issue, the analysis pursues three questions: (1) what are the comparative effects of Mexico's reform program on the area cultivated in subsistence and commercialized crops, (2) to what extent do these effects vary according to the costs of market access, and (3) what are the associated implications for forest cover at the parcel level? Results from an econometric model of the region's principle land uses indicate that while both PROCAMPO and Alianza positively impact the area cultivated, particularly in pasture, PROCAMPO alone has a negative impact on the area under forest. The environmental safeguards built into the program, thus appear to have failed in abating clearance, a finding from which we draw more general conclusions concerning the importance of considering both economic and environmental contexts in program design.

## 2. THE STUDY REGION: POLICY CONTEXT AND LAND USE

The history of structural adjustment in Mexico has been characterized by a continual tension between the pursuits of free-market strategies on the one hand and populist measures to mitigate associated economic hardships, particularly in the agricultural sector, on the other hand. This tension has been evident in the Southern Yucatán since Mexico's debt crisis in 1982, when fiscal constraints caused by falling prices for petroleum forced the government to scale back a decade long effort to colonize and develop the region. During the 1970s and early 1980s, the Southern Yucatán received massive inflows of state-financed investment, beginning with the construction of a highway through its center in 1972 (Figure 1). The highway instigated the first influx of agricultural colonists,

whose settlement was further encouraged by the extension of ejido land grants, a communal form of tenure that was created by the land reform following the Mexican Revolution (1910–17) (Klepeis, 2004; Turner *et al.*, 2001).

The provision of road infrastructure was accompanied by other measures to encourage the establishment of an export-oriented agricultural economy, including a comprehensive system of subsidies and credits to promote the commercial production of staples, as well as state financing of agricultural projects for rice cultivation and cattle breeding. Despite these interventions, most of the initial settlers were subsistence-oriented farmers, whose settlement along the highway was primarily driven by subsidized access to land. Confronted with a five-month dry season, extreme climatic variability, modest agronomic potential, and costly access to markets, farmers typically cultivated on an extensive basis using a system known as *milpa*, a centuries-old Mayan form of agriculture that involves the intercropping of maize, squash, and legumes within a rotation of forest fallow. As noted by Eakin (2005), this system has served to enhance livelihood stability and, indeed, has proved more resilient than the government-supported schemes: by 1982, many of the rice and cattle projects had failed primarily due to inadequate water management and weed infestation (Klepeis, 2003).

Beginning in the mid-1980s, a radical revision of economic policies toward greater liberalization was underway that would be bolstered by legal reforms beginning in the following decade. In 1986, Mexico entered into the GATT, the impact of which reached the agricultural sector by 1990, when tariffs on most products were dropped or drastically lowered, subsidies on inputs were withdrawn or sharply reduced, and the guarantee price was eliminated for all crops but maize and beans (Foley, 1995). The continuation of these reforms was secured under the terms of NAFTA, effective in 1994, obligating Mexico to fully liberalize its agriculture, including maize and beans, over a fifteen-year period. On the legal front, the Mexican Constitution was amended in 1992 to terminate the continued distribution of ejido lands to peasant communities and permit lands held in usufruct under the ejido system to be bought and sold (Goldring, 1995).

Against this backdrop, state support of agriculture nevertheless continued by other means. Starting in the mid-1990s, several programs were implemented to preempt the anticipated adverse welfare effects of agricultural liberalization, the two largest of which are PROCAMPO and Alianza Para el Campo, together accounting for over half of the expenditures in the Secretary of Agriculture's budget (USDA, 2007). The overarching aim of both programs is to increase investment and productivity in the agricultural sector without distorting production incentives, thereby facilitating the integration of agricultural producers into the market economy. In the case of PROCAMPO, farmers receive an annual lump-sum payment of roughly 867 pesos per hectare,<sup>1</sup> with the total payment being based on the hectares they cultivated in each of nine staple crops in 1993, the year prior to the start of the program. As one of the central goals of PROCAMPO is to promote land use intensification (SARH, 1993), the payments are conditional on the farmer maintaining the same plot of land under some designated productive use until the scheduled termination of the program in 2008. Unlike PROCAMPO, support by Alianza is provided on a demand-driven basis, with individual farmers or collectives petitioning for financial or technical assistance to undertake particular productive investments. If financial, this assistance is usually distributed under a matching grants scheme. In 1996, the first year of the program, producers provided an average of 50% of financing,

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