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Research paper

Public perceptions towards oil palm cultivation in Tabasco, Mexico

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ABSTRACT

National policies and international market demand have spurred a rapid increase in oil palm cultivation for biodiesel feedstock production, which then causes important social impacts. However, little work has investigated local perceptions of oil palm expansion, particularly in areas expected to become key supply regions, like Latin America. This limits our understanding of the social dimension of oil palm-based biodiesel sustainability. To address this oversight, we present findings from a survey of Tabasco, Mexico, that focuses on community perceptions of local oil palm plantations, their impacts, and expansion potential in a major oil palm cultivation region. We found that oil palm expansion-related perceptions were associated with attitudes toward existing oil palm plantations, whether the palm oil was being cultivated for biodiesel export, and oil palm's ecosystem service provision. Our findings highlight the need for policy makers to consider social acceptability when crafting strategies to expand sustainable bioenergy feedstock production.

1. Introduction

Bioenergy's climate change mitigation potential has contributed to its recent global expansion [1–4]. Its usage for heat, power, and liquid transportation fuels (biofuels) presents tradeoffs related to social, economic, and environmental sustainability [5–7]. These tradeoffs vary across landscapes, countries, regions, feedstock types, and cultures. Because bioenergy can be created from many types of biological feedstocks grown under very different conditions, it is a particularly complex renewable energy source, making it impossible to draw one overarching conclusion about its sustainability [8,9]. Assessing bioenergy sustainability therefore necessitates region- and feedstock-specific investigation [9–11]. However, most of this work has focused solely on the environmental sustainability of this production, often missing social sustainability dimensions such local perceptions of its costs and benefits.

A local focus is particularly important within the global south, a region with exploding bioenergy feedstock production, much of it destined for global northern markets attempting to meet their own sustainability goals [11–15]. The possibility of recreating negative colonial export-based periphery-center relationships grounded in bioenergy raises fundamental questions about the economic, cultural, and political power shaping its social sustainability dimensions [11,13–15]. Production in biodiverse regions, such as much of Latin America, raises issues about its environmental sustainability [14,16], as do disagreements about the greenhouse gas (GHG) implications of alternative bioenergy forms and feedstocks [2,17]. Oil palm is one type of bioenergy feedstock receiving increased attention due to its tropical region expansion and concern about the negative impacts of its cultivation [11,14,17,18].

Our research therefore focused on one of these regions. It took place in Tabasco State in southeast Mexico with access to Gulf Coast ports. Secondary evergreen forests are common in the state due to plentiful rainfall. This climate supports the state's important agricultural sector including rapidly expanding oil palm plantations [19]. The state has been historically rich in petroleum and natural gas production as well, but that sector is in decline [20]. Much of the state's past economic growth failed to reduce rural poverty [21,22]. This is one reason the Mexican government saw Tabasco as a prime candidate for increased oil palm cultivation for biodiesel production [23].

Tabasco's expansion of oil palm cultivation is driven by federal bioenergy and rural development policies [24,25] coupled with feedstock demand for export to the global north [19]. As a result, Mexican palm cultivation increased 97.8% between 1989 and 2013 [26]. The States of Campeche, Chiapas, Tabasco, and Veracruz produced 292 kt of fruit in 2007 [27]. Tabasco is in one of five oil palm-growing regions in the country; its region has the largest land coverage potential for growing oil palm, with most recent estimates at 45,063 km2 where the crop could be planted [28]. In 2016, the state received an investment in oil palm worth over USD$100,000 for establishment of 30 thousand hectares of the crop and construction of a new processing plant [29].

These trends raise questions about the social sustainability of Tabascan oil palm cultivation for biodiesel production. How do oil palm-proximate communities perceive the plantations and their

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impacts? Are they providing good jobs for poor rural residents or solely benefiting companies and large landowners? Do communities proximate to plantations support the expansion? The answers have implications for local and global oil palm expansion [8]. To begin to answer these questions, we conducted an oil palm perceptions survey with households in the Tabascan region where oil palm cultivation is expanding [24]. The next section provides background key to understanding our study's policy context.

2. Background

Tabasco, Mexico, provides a valuable study region because its experience with oil palm expansion is comparable in key ways to other tropical areas of the world. For instance, it closely parallels Malaysia's experience. The United Fruit Company brought oil palm to Malaysia and Latin America at the same time to diversify both regions' agricultural production [19]. Negative social and environmental impacts have been reported for both regions [22,30,31]. Oil palm cultivation provided some jobs but severe poverty remains a major problem in both regions.

In 1998, the Mexican Agricultural Alliance program was created to diversify crops, increase exports, and stimulate rural development through expansion of cotton, soybeans, oil palm, and other export-oriented crops [25]. As a result, six states, including Tabasco, established extensive oil palm plantations, initially aimed at food production [25]. Mexico's federal biofuel expansion goals were first formalized in its 2008 Ley de Promocion y Desarrollo de los Bioenergeticos which directed the creation of a national bioenergy plan [32]. This law was premised on the idea that increased biofuel feedstock production would stimulate Mexico's agricultural sector making it possible to achieve energy independence without endangering domestic food security [33]. Policy makers also expected that the domestic biofuel feedstock cultivation and processing would enhance rural wellbeing and community development through expanded employment for the rural poor [6,34–37]. The 2012 General Law on Climate Change [38–40] further committed the country to increasing renewable energy production and consumption without endangering food security [32–34]. These policies prioritized reducing GHG emissions while promoting sustainable development [6,35–37], but the lack of scholarship on the social impacts of oil palm expansion in this region makes it difficult to determine the extent to which Mexico is actually achieving this goal.

Mexico is seen as a serious participant in the global dialogue on climate change [41]. It has made multiple commitments to mitigate climate change including being a signatory to the U.N. Framework Convention on Climate Change (UNFCCC), joining the Conference of the Parties (COP) to the 2000 Kyoto Protocol, and being one of the first developing countries that volunteered to reduce GHG emissions [41,42]. Globally, biofuels have become a potential tactic for potentially reducing emissions while also improving sustainable development in developing countries [37]. While sustainable development has been criticized for not being the silver bullet solution to environmental problems [43,44], it may be one possible solution of many.

3. Literature review

Sustainability is often described as including social, economic, and environmental elements [5,45–47]. Renewable energy projects, like oil palm cultivation for biodiesel, create positive and negative impacts across these dimensions [9,48]. For example, projects may provide local jobs and enrich energy developers while polluting waterways and reducing species habitat [5]. In turn, community members gain jobs but lose access to traditional foods and medicines [45]. In essence, economic and environmental impacts become social impacts as they affect community members differently.

Social sustainability has many dimensions that can be measured different ways. Some, such as increased employment, are often measured using state and national statistics. These types of data have great value, but they also risk missing equally important dimensions, including the views of community members impacted by local bioenergy projects, including increased feedstock cultivation and associated land use changes. Local views are important because they are our best source of information about the actual impacts on the people who are supposed to benefit. They are also important to understand because community members have insights into how local priorities are being impacted. Social sustainability is also premised on a community's ability to refuse projects perceived as creating too many negative impacts [45]. Community perceptions of oil palm projects are directly relevant to sustainability assessment [48–50].

However, few studies have investigated the perceived impacts of oil palm expansion in Latin American communities. For example, none of the 44 articles on biofuel perceptions reviewed by Radics et al. [51] addressed Latin American perceptions. This is a critical gap because many Latin American governments are promoting biofuel development as the best alternative to reduce reliance on fossil fuels, increase energy independence, and stimulate rural development [52]. This gap also has global implications because Latin America is expected to become one of the primary biofuel suppliers to China and India, helping these regions to fulfill their demand for oil palm [19]. Filling this gap is important because assessing the sustainability of this approach is impossible without a clear understanding of how impacted communities perceive potential oil palm expansion.

Rural development and energy security are two very important concerns in the debate about bioenergy development in Latin America. Mexico's citizens fear that opening the country's oil and gas reserves to international investment and development will lead to too much control from the outside [52]. Local energy production is seen as also having the potential to contribute to the rural economy and poverty reduction [37]. However, a legacy of growing crops like oil palm for biofuel exports can generate significant public opposition [35,53].

Public support is often critical to renewable energy project success [10,49,50,54,55]. Studies of public perceptions of renewable energy projects have shown that the factors related to support for these projects are diverse. They can include an individual's worldview and associated environmental beliefs [56–58], media exposure, demographic characteristics such as gender [36,59], beliefs about bioenergy's impacts [4,6,23,36,60], and prior renewable energy experiences [51,55]. However, much of this work has been done on woody bioenergy projects in the global north [61,62].

Oil palm's usage as a biofuel feedstock provides potential environmental benefits likely to positively impact public perceptions by putting marginal lands to productive use and increasing a region's carbon sequestration capacity [23,27,36]. Biodiesel production from oil palm can also reduce a region's GHG emissions. Of course, perceptions regarding its negative environmental impacts can also raise opposition. These include potential biodiversity losses due to deforestation, land-use changes that reduce traditional land uses, reductions in water quality and availability, as well as the temporary carbon stock reductions that occur when new oil palm plots are cleared [35,37,38,63,64].

Positive perceptions about the social impacts of biofuel feedstock development, such as providing rural infrastructure improvements, can also increase public support [23,35,51,65]. Nevertheless, perceptions of negative social impacts, such as poor working conditions in plantations, the inability to sustain traditional livelihoods or food production systems, could result in increased opposition to biofuel development [36,37,48]. Cultural norms and beliefs may also play a role in support or opposition to biofuel feedstock production: Stern et al. [58] found that in Western societies, there is a conflicting duality in worldviews, suggesting that people can either believe in the utility of nature or in protecting it. However, Bechtel et al. [56] and Corral-Verdugo and Armendariz [66] found that in Mexico, the opposing, dualistic worldview was not found (see Fig. 1).

While some research has been done on perceptions of oil palm