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Review

Ecological and Social Limitations for Mexican Dry Forest Restoration: A Systematic Review

Cristina Martínez-Garza [1,*], Eliane Ceccon [2] and Moisés Méndez-Toribio [3,4]

[1] Centro de Investigación en Biodiversidad y Conservación, Universidad Autónoma del Estado de Morelos, Morelos, Cuernavaca 62209, Mexico
[2] Centro Regional de Investigaciones Multidisciplinarias, Universidad Nacional Autónoma de México, Morelos, Cuernavaca 62210, Mexico; eliane@correo.crim.unam.mx
[3] Instituto de Ecología, A.C.-Centro Regional del Bajío, Red de Diversidad Biológica del Occidente Mexicano, Michoacán, Pátzcuaro 61600, Mexico; moises.mendez@inecol.mx
[4] Consejo Nacional de Ciencia y Tecnología (CONACyT), Mexico City 03940, Mexico
* Correspondence: cristina.martinez@uaem.mx; Tel.: +52-777-329-7019

Abstract: In Mexico, dry forests are one of the ecosystems in major need of restoration intervention. Here, we explored the ecological and social limitations on the restoration of Mexican dry forests from the perspective of restoration practitioners and researchers. We included three data sources: (i) projects included in a national evaluation (1979–2016), (ii) a systematic review of scientific literature (1979–2021), and (iii) restoration projects included in two governmental programs. The national evaluation and the systematic review coincided in identifying the establishment of plantings as the most important ecological limitation and low social participation as the most important social limitation. There were three times more publications addressing ecological limitations than those addressing social limitations. We did not find research to resolve the problems faced by practitioners related to invasive species, unpredictable climate, and poor soil quality. Governmental programs promoting the restoration of ecosystems need to include measurable indicators to document the socioecological limitations faced by local practitioners to restore Mexican dry forests.

Keywords: deciduous forest; tropical dry forest; ecological and social constraints; restoration plantings; natural succession; assisted natural regeneration

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1. Introduction

In 2019, the United Nations declared the "Decade for Ecosystem Restoration" (2021–2030; https://www.decadeonrestoration.org/es (accessed on 1 September 2021)), whose main aim was to reverse current forest loss. The last global evaluation of restoration priorities revealed that restoring arid ecosystems, which includes dry forests, minimizes the costs of restoration [1]. In Mexico, land formerly covered by tropical dry forests has suffered from degradation in part because urban areas have been established there since ancient civilizations [2]. This ecosystem originally covered 33.5 million hectares in Mexico, but by 2003 only 20% of this area remained in a conserved state [3]. A review of ecological restoration projects in Mexico from 1979 to 2016 revealed that fewer projects were conducted in dry forests compared to temperate and rain forests [4]. That same review revealed that practitioners of restoration recognized extreme climatic events as the most important ecological limitation for restoring all terrestrial ecosystems. The main social limitations were difficulties in building agreements with owners and problems with land tenure [5]. It remains to discern whether the same ecological and social limitations recognized for all terrestrial ecosystems hold for tropical dry forests.

The establishment of protected areas is a strategy to conserve and restore natural habitats and their biological diversity [6]. However, protected areas present challenges including limited resources for maintenance, non-sustainable use of resources, presence

of exotic species, fragmentation, and pollution, among others [7,8]. In Mexico, most protected areas are inhabited by human communities that use natural resources for their subsistence [9]. In this sense, the governmental conservation program for sustainable development (*Programa de Conservación para el Desarrollo Sostenible*; PROCODES) aims to ameliorate some of the challenges faced by human communities by funding projects related to the sustainable use of resources in the protected areas. A second program—Protection and Restoration of Ecosystems and Priority Species (abbreviated as PROREST in Spanish)—aims to protect and restore the ecosystems of protected areas with the participation of both the inhabitants of the communities that live in these areas and the academics who study them. Some information about PROCODES and PROREST projects is available on official websites, but there has been no formal analysis of their results in dry forests.

In this review, we evaluate the ecological and social limitations for the restoration of tropical dry forests in Mexico as seen by restoration practitioners and researchers. We did this using three sources of information: (1) projects found in the national evaluation (1979 to 2016; [5]), (2) a systematic review of the scientific literature from 1979 to 2021, and (3) restoration projects included in the PROCODES and PROREST programs in protected areas that contain tropical dry forest. By reviewing the ecological and social limitations faced by practitioners of restoration and the research available to solve these limitations, we can guide future actions and research to improve outcomes of restoration projects in one of the Mexican ecosystems that most urgently needs intervention.

2. Materials and Methods

National Evaluation. These data were collected in 2015 and 2016. In November 2015, in Mexico City, a workshop titled "Challenges and perspectives to comply with international agreements on Ecological Restoration" (original title in Spanish: *Retos y perspectivas para cumplir los acuerdos internacionales en materia de Restauración Ecológica*) took place. During the workshop, the attendees generated a list of actors and discussed how to identify restoration projects. Then, to find the projects, several complementary means were used, including google searches (keywords used: restaur *, recuper *, restor *, recover* *México* and *vegetación*), consultation with people and institutions, and review of abstracts from scientific meetings, among others. This broad search identified a sample of 188 projects, 11 of which were performed in Mexican dry forests (Table S1, available in supplementary materials). The information for all of the projects was structured using a digital survey composed of 137 questions. This survey was answered by the project manager by email or phone. Eight of the questions were related to ecological and social limitations. All details about the survey methodology and the overall results for the seven ecoregions of Mexico have been previously published [4,5,10].

Systematic review of scientific publications. To include scientific publications related to ecological and social limitations for dry forest restoration, we considered two strategies of restoration: ecological and productive. Productive restoration refers to the recovery of some elements of structure and function of the original ecosystem together with land uses that provide products that benefit the local population, contributing to landscape restoration [11,12]. Productive restoration may therefore increase the likelihood of social participation. A search with Google Scholar was conducted with the keywords ecological/social/limitation/restoration or reforestation/Mexico + Tropical dry forest or Tropical deciduous forest. The same was conducted in Spanish with an additional qualification for the type of biome (*ecológica/social/limitación/restauración/reforestación/México + Bosque tropical seco or Bosque tropical caducifolio/Selva baja caducifolia*). The search engines included titles, keywords, and abstracts. For ecological limitations, 142 scientific publications (papers, books, or thesis) were found; for social limitations, only seven scientific publications were found. We augmented the search with other terms in English and Spanish that could lead to works on issues of social limitations (i.e., social participation and traditional knowledge), which increased the number of scientific publications related to social limitations to 109 (Table S2). A search in Web of Science with the keywords in English detected 20 papers

for social limitations and 79 for ecological limitations (Table S3). The eligibility criteria to include a document was that it explicitly mentions in the text (introduction, results, or discussion) the keywords used for the search. The literature selection process is summarized in PRISMA flow diagrams (Figures S1 and S2).

PROCODES and PROREST projects. We gathered annual reports from 2016 to 2019 of these programs. The PROCODES program was created in 2001 to finance communities working in five broadly defined conservation-related areas: community projects, training, technical studies, and responses to environmental contingencies and to a lesser degree on the implementation of restoration actions (productive restoration; [13]). The PROREST program was created in 2019 and promotes the conservation and restoration of the representative ecosystems of Natural Protected Areas and their biodiversity through technical studies and restoration actions (ecological restoration; [14]). We first determined which protected areas include tropical dry forest using the National Commission of Natural Protected Areas (CONANP; [15]) network of information on protected areas and the map of land use and vegetation cover of the National Institute of Statistics and Geography of Mexico (INEGI; [16]). Then, we searched for the PROREST and PROCODES reports for those protected areas in the database of the National Institute of Transparency, Access to Information and Protection of Personal Data (abbreviated as INAII in Spanish). Finally, within those protected areas, we select only the localities with dry tropical forests. In the annual reports, we searched keywords such as limitation, ecological or social.

Data Analysis. All information was organized in Excel® spreadsheets. The information from the national evaluation was further processed using the "plyr", "dplyr", "tibble", and "tidyr" libraries of the free access R environment (R Foundation for Statistical Computing, Vienna, AT). In the national evaluation, five options for ecological limitations were offered to respondents: (i) *low quality in soil attributes, including steep slopes*, (ii) *availability of species for restoration plantings and tree mortality*, (iii) *unpredictable climate*, (iv) *invasive species* and (v) *fires*) and six options for social limitations ((i) *clarity of benefits from restoration*, (ii) *lack of commitment from the participating communities*, (iii) *agreements with stakeholders*, (iv) *low degree of social bonding*, (v) *land tenancy,* and (vi) *institutional credibility* [5]. The documents about ecological limitations were first classified by the type of project: practical projects (ecological restoration) versus research that is relevant to practical restoration (restoration ecology). Then, we classified the restoration ecology documents by the limitation they aimed to resolve considering the five ecological limitations offered to respondents in the national evaluation. The documents about social limitations were first classified into two types of projects: ecological restoration versus productive restoration. Then, seven main topics were recognized in the publications; with this information, the frequency that each topic appeared in the documents was calculated. Finally, within each topic, we selected the limitations that appeared more than once in the documents analyzed and calculated the percentage in relation to the total frequency of mentions.

We constructed five word cloud plots using text mining procedures to identify the most frequent keywords in the documents detected by the systematic review. Among the documents related to ecological limitations, these procedures were carried out separately for practical projects (3 documents) versus restoration ecology research projects (62 documents). Additionally, 50 research documents in English and 12 in Spanish were analyzed separately. For documents related to social limitations, we also analyzed documents in English (6 documents) separately from those in Spanish (8 documents). The most frequent words were searched in the title, abstract, introduction, discussion, and conclusions. Abstracts in other languages and figure and table legends were not included. The words in the texts were counted and represented as word clouds plots, in which the size of the word indicates the frequency in which it appears in the texts. The "Text Mining (tm)" library [17] for R version 3.6.3 (R Foundation for Statistical Computing, Vienna, AT) was used for the word count. The "tm_map" function from "tm" library was used to remove special characters, symbols, punctuation, numbers, stopwords (articles, pronouns, prepositions) in English or Spanish, convert the text to lower-case and eliminate extra white spaces.

3. Results

3.1. Ecological Limitations

National Evaluation. Five options related to ecological limitations were offered to respondents: (i) *low quality in soil attributes, including steep slopes*, (ii) *availability of species for restoration plantings and tree mortality*, (iii) *unpredictable climate*, (iv) *invasive species*, and (v) *fires*. The most frequent ecological limitations mentioned for the 11 projects carried out in Mexican dry forests were *availability of species for restoration plantings and tree mortality* (36.4% of the projects) and invasive species (36.4%). *Unpredictable climate* was mentioned in second place (27.3%), and to a lesser degree, the projects also identify the *low quality in soil attributes, including steep slopes*, as an ecological limitation (18.2%). *Fires* were not mentioned at all as an ecological limitation to carry out restoration projects in the Mexican dry forests.

Systematic review. Among the 84 documents found, only 19% (16 publications) reported practical restoration projects. Of those, 10 publications were related to projects already identified in the national evaluation, so they were not analyzed again in this section. The four remaining publications reported ecological limitations related to *mortality of trees* in restoration plantings (three publications) and *soil erosion* (one publication). Two publications were reviews, and the remaining sixty-eight publications (81%) reported restoration ecology studies (i.e., research that is relevant to restoration projects; Figure 1a). To analyze these documents, nine ecological limitations were considered: the five offered to respondents in the national evaluation plus four limitations found in the documents. These additional options were: (i) *lack of information about natural succession*, (ii) *lack of prioritization*, (iii) *lack of information about processes related to the recovery of animal populations*, and (iv) *assisted migration*. Most of the documents analyzed (57%; 39 documents; Figure 1b) reported research aimed to resolve limitations related to the establishment *of plantings, including poor field performance, lack of knowledge about propagation* or *direct seeding* (29 publications) and *criteria to select species* (11 publications; Figure 1c). In second place, 13 publications (19%) mentioned that the *lack of information about natural succession* in dry forests was limiting restoration intervention (Figure 1b). Eight publications (12%) claimed that a limitation to restore dry forests was the *lack of prioritization* of sites to intervene, whereas five publications (7%) mentioned the *lack of information about processes related to the recovery of animal populations* as a limitation. Finally, two publications aimed to resolve limitations related to soil properties and one dealt with *assisted migration* (Figure 1b). None of the documents analyzed reported research aimed to resolve limitations related to *unpredictable climate, invasive species*, or *fires*.

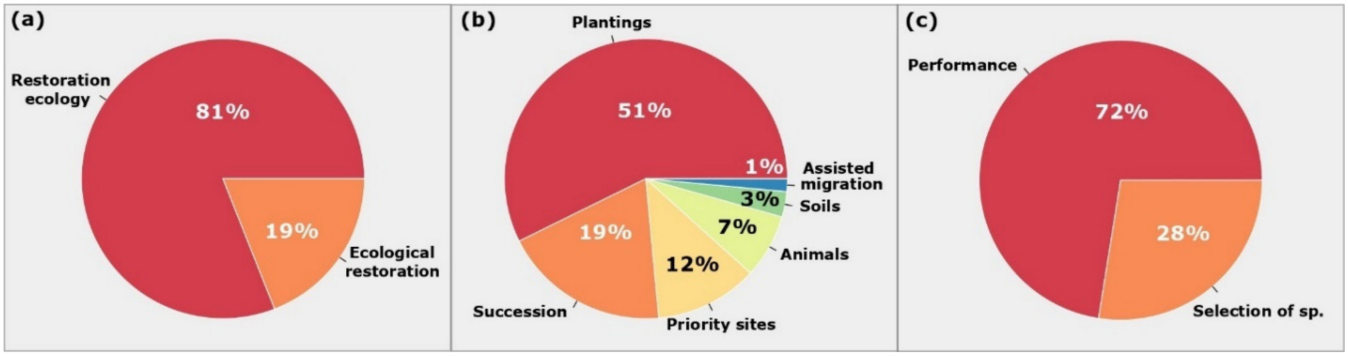

Figure 1. (**a**) Percentage of documents related to ecological restoration (practical projects, N = 16) or restoration ecology (research, N = 68); (**b**) Research documents aimed to resolve limitations related to: establishment of restoration plantings (Plantings), process of natural succession (Succession), establishment of priority sites to restore (Priority sites), recovery of animal populations (Animals), restoration of soil attributes (Soils), or assisted migration. (**c**) For the documents related to the establishment of plantings, two topics were recognized: field performance including growth rates and causes of mortality (Performance) and criteria to select species (Selection of sp.).

Word cloud analysis from the research documents in English regarding ecological limitations revealed that the most frequent word was "species" (Figure 2a, in grey), followed by "forest" (in green), then "seed", "dry", and "soil" (in purple), then "seeds", "tropical", and "study" (in orange). In the word cloud for the documents in Spanish, the most frequent words were "*especies*" (species) (Figure 2b, in grey); followed by "*uso*" (use; in pink); "*árboles*" (trees), "*bosques*" (forests), "*México*", and "*tropical*" were in the third place (in orange). In the Word Cloud for the practical projects, the most frequent word was "species" (Figure 2c, in grey); in second place, we found "gullies", "plant", and "amf" (arbuscular mycorrhizae fungi); "forest", "survival", and "gully" were in third place (in orange).

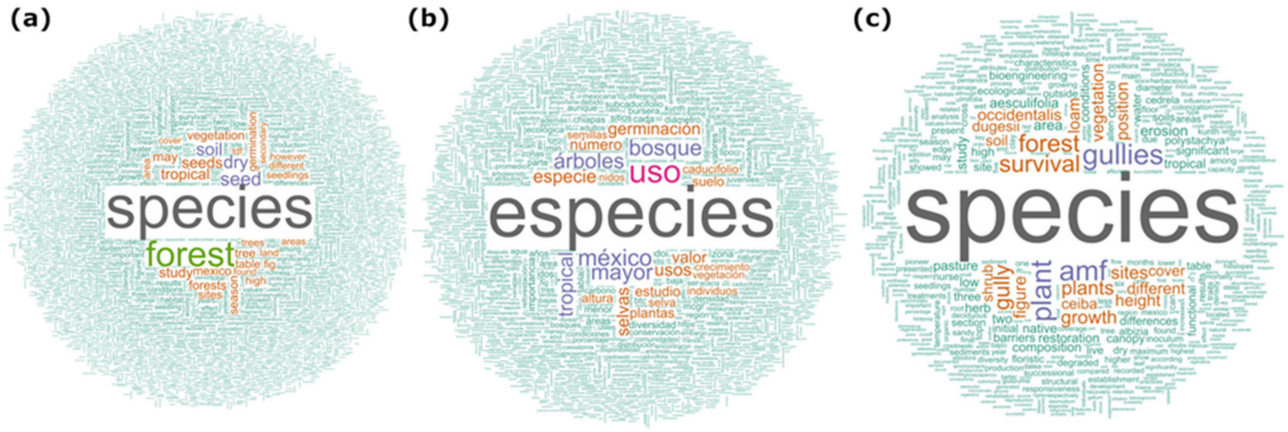

Figure 2. Word clouds for (**a**) 50 documents in English and (**b**) 12 documents in Spanish related to research and (**c**) 3 documents in English for practical projects associated with ecological limitations for Mexican dry forest restoration.

3.2. Social Limitation

National Evaluation. Six options related to social limitations were offered to respondents: (i) *clarity of benefits from restoration*, (ii) *lack of commitment from the participating communities*, (iii) *agreements with stakeholders*, (iv) *low degree of social bonding*, (v) *land tenancy*, and (vi) *institutional credibility*. In 27.3% of the restoration projects, *low degree of social bonding* was mentioned as the main social limitation detected. The *absence of clarity of benefits from restoration and institutional credibility* (18.2% each) were in second place. In third place, we found the *lack of commitment from the participating communities* and *agreements with stakeholders* mentioned in 9.1% of projects. The land tenancy was not mentioned as a limitation in the projects evaluated.

Systematic review. Nine topics related to social limitations were considered. These included five of the six options offered to respondents of the national evaluation. Four additional topics were found in the documents analyzed: (i) ***management***, (ii) ***capacity building***, (iii) ***perception***, and (iv) ***governance***. The limitations related to *agreements with stakeholders*, which were analyzed in the national evaluation, were not found in the systematic review. The most important limitation was related to ***social participation*** (60% of documents, Figure 3). In this topic, among the 24 limitations mentioned, the *deterioration of community organization* was the most frequently mentioned (37.5%), followed by *lack of social participation* (20.8%; Figure 4a). The topics of ***management*** and ***socioeconomic limitations*** were the second most mentioned in the documents (50%, Figure 3). Within ***management limitations***, we found 13 different limitations; however, only two were cited more than once with the same percentage (20%): (i) *restoration activities must be linked to productive use to be accepted* and (ii) *stakeholder resistance to paradigm shifts in rural practices* (Figure 4b). For ***socioeconomic limitations***, we found 20 limitations; *problems with wood and non-wood markets* was the most mentioned (21%), followed by *extreme poverty* (18%; Figure 4c). Although ***governmental programs*** were mentioned in less than a half of the documents (45%, Figure 3), this topic included the highest number of different limitations (35), including *lack*

of financial support for restoration activities (17.1%), *lack of technical assistance* (8.6%), and *low survival of seedlings provided by the government because delivery occurs when the rainy season is over* (8.6%), among others (Figure 4d). The topic of ***capacity building*** was also mentioned by less than half of the documents (45%, Figure 3), but 20 different types of limitations were found within those documents. *Absence of training in restoration* was the most mentioned (45%), mainly in greenhouse activities. Within that topic, 10% of the documents mentioned the *lack of knowledge of the usefulness of wood and market value of tree species* as limitations for restoration practices. More than a third of the documents (35%) considered the ***perception of the peasants on restoration*** an important limitation (Figure 3). Within this topic, 50% of the documents mention that restoration was considered *an unproductive activity on productive lands*, and in 38% of cases, local people did not *recognize the need to restore the ecosystem* (Figure 4f). Only 30% of the documents mentioned that ***social conflicts in the communities*** was a limitation for restoration (Figure 3). Within this category, *conflicts over land use or tenure* was the most frequently identified issue (37.5%), while 28.6% of these documents mentioned *violence caused by drug trafficking and water conflicts* as a social limitation (Figure 4g). In the topic of ***governance***, absence of governance was the limitation named in all three documents that mentioned it (15%; Figure 3).

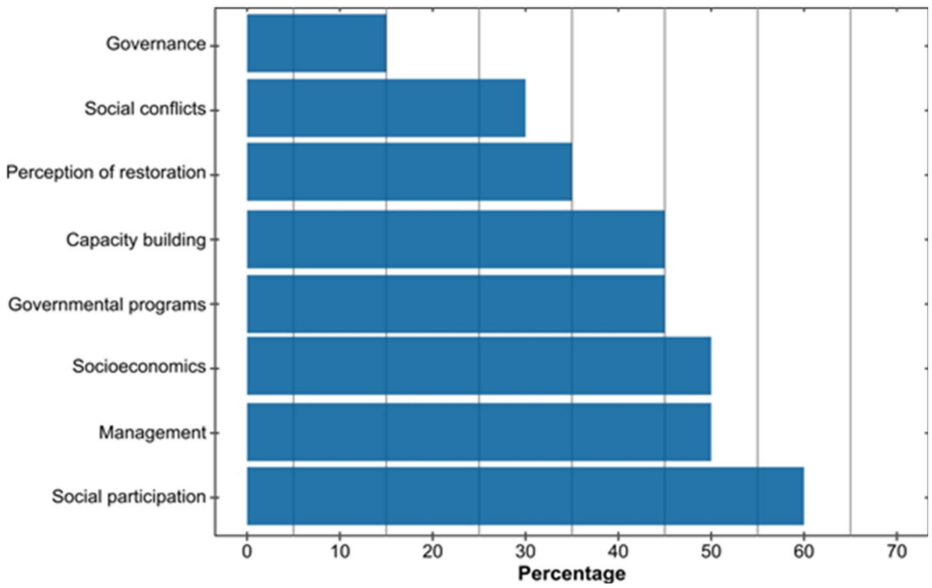

Figure 3. Percentage of documents related to eight main topics found in the systematic review (N = 20) of social limitations for the restoration of the Mexican dry forests.

In the word cloud for the documents in English, the most frequent word was "species" (Figure 5a, in grey); in second place, we found "land" and "reforestation" (in brown); "stakeholders" and "use" were in third place (in green) followed by "forest", "community", "social", "restoration", and "people" (in purple). In the word cloud for the documents in Spanish, the most frequent words were "*especies*" (species), "*comunidades*" (communities), and "*conservación*" (conservation) (Figure 5b, in grey); in second place, we found "*restauración*" (restoration) and "*recursos*" (resources) (in brown); "*uso*" (use), "*árboles*" (trees), and *México* were in third place (in yellow) followed by "*región*" (region), "*agua*" (water), "*desarrollo*" (development), "*trabajo*"(work), "*manejo*" (management), "*comunidad*" (community), and "*población*" (population).

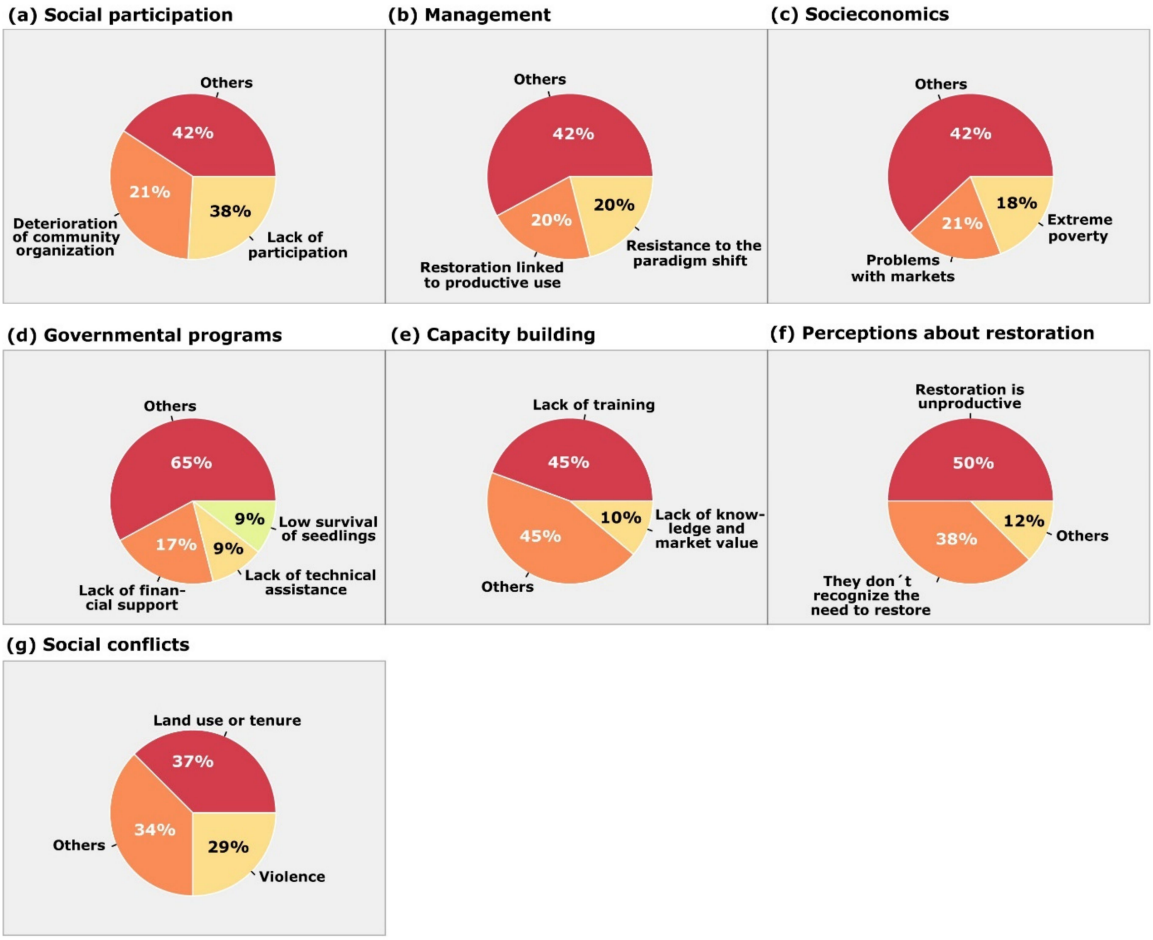

Figure 4. Percentage of social limitations related to the main topics mentioned in Figure 3 that were found more than once in the systematic review (N = 20) related to the restoration of Mexican dry forests; (**a**) Social participation; (**b**) Management; (**c**) Socieconomics; (**d**) Governmental programs; (**e**) Capacity building; (**f**) Perceptions about restoration; (**g**) Social conflicts.

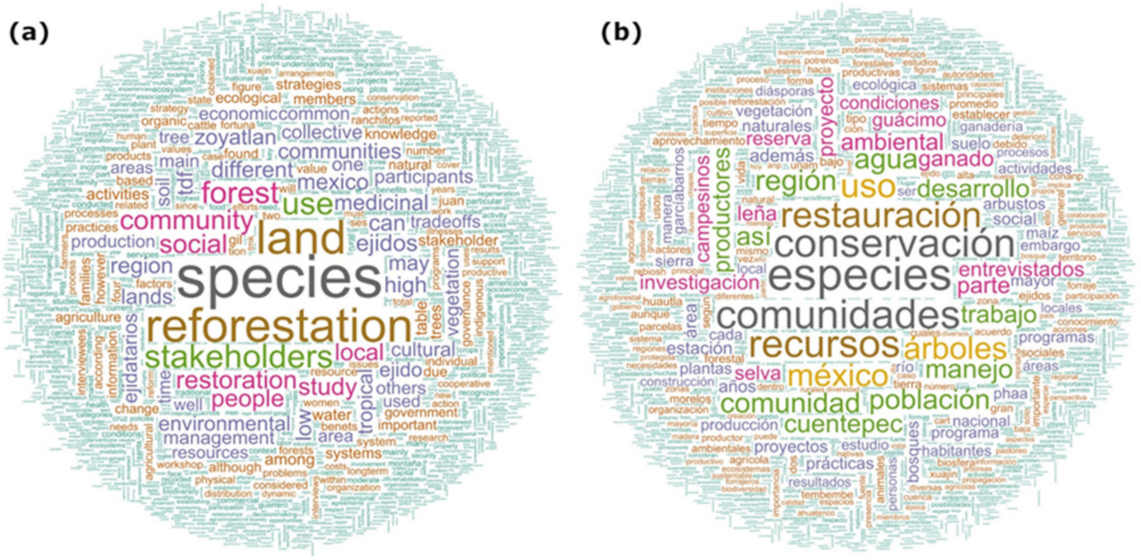

Figure 5. Word clouds for (**a**) six documents in English and (**b**) eight documents in Spanish related to social limitations for Mexican dry forest restoration.

3.3. PROCODES and PROREST

Between 2016 and 2019, PROCODES and PROREST funded a total of 145 restoration actions in Mexican dry forests (annual mean ± Standard Deviation (SD) = 29 ± 10; Table 1 and Table S3). During the study period, the total investment of both programs was USD 824,528, with an annual mean (±SD) of USD 164,906 ± 55,379. The highest percentage of funding was provided in 2017 (Figure 6). Overall, women and indigenous women accounted for a smaller fraction of participants in restoration projects (Table 1). The participation of these social groups was greater in 2017 when there was a 35% increase in the programs' budgets from 2016. The annual reports of these programs did not provide information about ecological or social limitations.

Table 1. Yearly investment by PROCODES and PROREST programs in restoration actions from 2016 to 2019. Number of projects (#), amount invested (USD), total number of people in projects (People), total number of indigenous participants in projects (Indigenous), percentage of women involved in the projects (%; Women), and percentage of indigenous women involved in the projects (%; Ind Women).

Year	Program	#	USD	People	Indigenous	Women	Ind Women
2016	PROCODES	33	183,056	481	48	10	11
2017	PROCODES	45	247,419	770	200	26	34
2018	PROCODES	24	140,322	450	86	19	21
2019	PROCODES	23	98,308	454	7	2	2
2019	PROREST	20	155,422	316	27	9	6
Total		145	824,528	2471	368	15	16

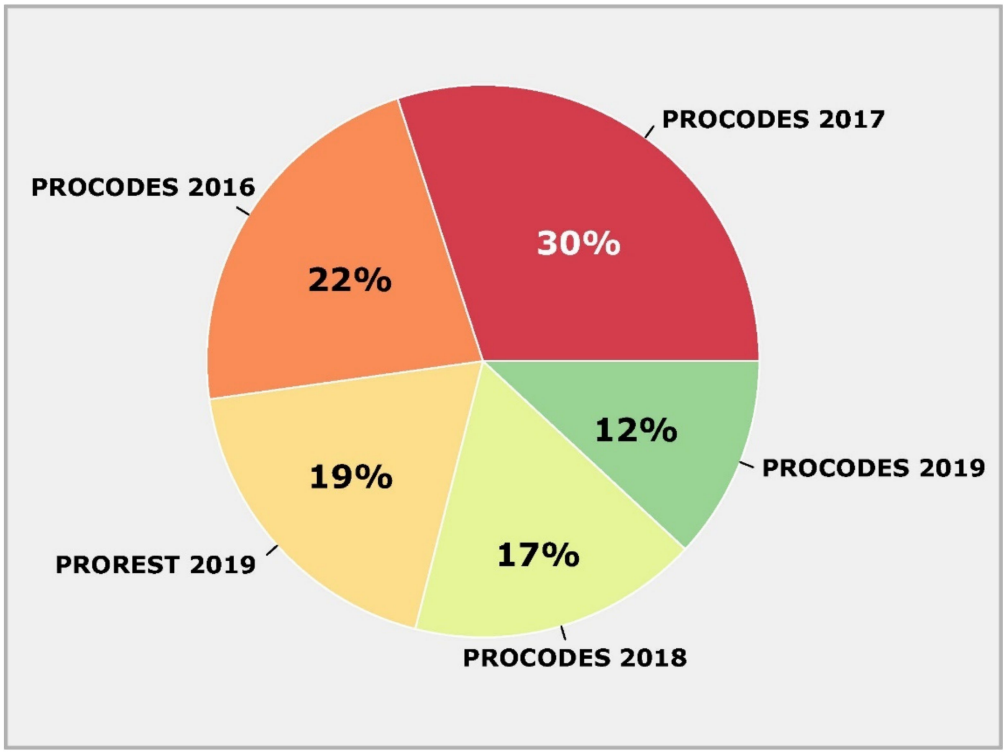

Figure 6. Percentage of yearly investment by PROCODES and PROREST programs to restoration actions from 2016 to 2019.

4. Discussion

The objective of this review was to identify the ecological and social limitations for the restoration of tropical dry forests in Mexico from the point of view of restoration practitioners and researchers. The results of the national evaluation and those of the systematic

review coincided in the most important ecological limitation for Mexican dry forest restoration: the establishment of plantings. The results of both sources also coincided with the most important social limitation: social participation. The number of publications related to ecological limitations was three times greater than those related to social limitations. Additionally, the information available from the governmental programs did not provide information about social or ecological limitations faced by practitioners.

4.1. Ecological Limitations

The ecological limitations most frequently mentioned in the national evaluation were *the availability of species for restoration plantings and tree mortality*. This coincides with the systematic review, which revealed that most research publications aimed to resolve the lack of information *to establish restoration plantings*. Further, most practical projects found in the systematic review identify the *mortality of trees* in plantings as an ecological limitation. The systematic review revealed that researchers consider that the establishment of plantings has been limited by a lack of knowledge about (i) *plant reproductive phenology*, (ii) *storage of seeds*, (iii) *propagation*, and finally, (iv) *growth and survival of species* in the field. These issues are closely related to each other, and we will discuss their intersections in the following paragraphs:

Knowledge about the *reproductive phenology* of trees (i.e., flowering and fruiting times) is necessary to propagate tree species. However, only two documents deal with that topic (see Table S3; [18,19]). Although other studies were available [20–23], few make the connection to restoration. Once seeds are collected, the knowledge about the *storage of seeds* is identified as an ecological limitation: for that topic, three publications were found, covering only 28 species [24–26]. Given that in some of these dry forests, the total number of tree species is estimated to be >150 species [27–29], the degree of knowledge on this topic is clearly insufficient. On the other hand, it is possible that much of the knowledge related to the collection and storage of seeds does exist as local knowledge of community members (see [30]). That knowledge may be available to the academic community if social participation is favored (see below). Little or no information on *plant propagation protocols* may influence the low availability of species for dry forest restoration (reviewed in [31]). For example, in a community nursery in the state of Michoacán, southeast Mexico, 11 tree species from the dry forest, from a regional species pool of ca. 155 tree species were propagated there, and 70% of plant production centered on a single species [28,32]. The knowledge of seed scarification and direct seeding falls within the topic of propagation; seven documents were related to those topics (Table S3). Given that the establishment of plantings with seedlings can be 40% more expensive than direct seeding (e.g., [33]), the information about this technique is relevant to reducing the costs of restoration. Lack of information from plant phenology to protocols for propagation limits the availability of species for restoration plantings.

Regarding *tree mortality*, most of the research documents reported extreme microclimatic conditions as the main cause of the mortality of the tree species [34–37]. Lack of information on plant species performance under the harsh environmental conditions of degraded land explains why *tree mortality* is mentioned as an ecological limitation. A review of dry forest species revealed that only a small fraction of trees species were planted and their performance monitored in degraded areas [31]. Dry forest trees are subject to a long dry season, erratic droughts during the rainy season, high spatial variability in water availability and high evapotranspiration demand [38–40]. These environmental factors undoubtedly impact plant survival in restoration plantings, even among species that are adapted to these conditions [41,42]. Survival of tree species in planting trials may be also related to climatic conditions (e.g., [43,44]) soil characteristics (e.g., [37,45,46], disturbance regimes, or plant quality (e.g., [47]). The availability of information to establish a restoration planting, from the collection of seeds to predicted performance in the field, is incomplete (Table S3). Further, related to this topic, the timing of delivery of seedlings for planting by government programs (e.g., at the end of the rainy season) was mentioned as a major social

limitation for dry forest restoration. More research related to strategies to increase plant survival is needed to secure effective ecological restoration of the dry forest.

The systematic review revealed that 14 of the documents described the process of natural succession (Table S1), making it the second most important topic in the systematic review. Before restoration plantings are established, it is necessary to evaluate whether that level of intervention is required. In the International principles and standards for the practice of ecological restoration (hereafter, "the standards"; [48]), the third principle refers to the establishment of a reference ecosystem. The six key attributes recognized in the reference ecosystems are used to measure the progress of restoration projects [48]. These six attributes are related to the ecological description of the site to restore, which include the baseline and the natural regeneration potential (Table 1 from [4]). Evaluating the natural regeneration potential is a necessary step to determine the level of restoration intervention needed: when the potential is high, halting disturbance, e.g., by excluding cattle [49] or preventing fires [50], may be sufficient to allow natural succession to proceed without requiring more intensive interventions such as seeding or planting. Further, the description of the successional process helps to recognize whether recovery is progressing or whether the process has been arrested [51,52]. Further, it is possible to predict the success of natural succession to recover the dry forest. For example, one of these publications identified that the distance to villages and roads, the percentage of the economically active population, and the percentage of households with no water supply might predict natural regeneration potential [53]. Additionally, the slope at the sites and distance to the village has been identified as predictors of the potential for natural regeneration in reviews dealing with tropical and subtropical regions [54,55]. In conclusion, the description of the natural succession process or the prediction of the natural regeneration potential is a useful first step for restoration projects.

The presence of *invasive species* was the second most important limitation mentioned in the national evaluation. However, in the systematic review, we did not find any research related to this topic except for a single document [44] that mentioned *Mimosa arenosa*, Wild var. *leiocarpa* (Fabaceae) as an invasive species that may arrest succession for 20 years (Table S3). The third most important limitation mentioned in the national evaluation was *unpredictable climate*. Although this limitation was mentioned frequently in the documents from the systematic review, it was never the focus of the research (see Table S2). An unpredictable climate was most frequently mentioned in studies on seedling mortality (see above). *Low soil quality, including steep slopes*, was tied for the third most important limitation in the national evaluation and was the second most important in the practical projects found in the systematic review, but it only represented 1% of the research documents found. This is striking given that an analysis of 145 Biophysical Environmental Units in Mexico revealed a high degree of soil degradation in 32% of the units and a very high degree of degradation in 44% of the units [56]. *Fire* was not considered a limitation for practitioners of restoration in the dry forest, while in the systematic review, one document dealing with prioritization mentioned an increase in fire events due to climate change (Table S3), suggesting that fire might become an issue in the future. The national evaluation and the systematic review coincided in the principal ecological limitation for Mexican dry forest restoration, all steps involved in *restoration plantings*, but these two sources of information disagree in the second and third most important limitations. It is especially striking that there is no research attempting to resolve the problems faced by practitioners related to *invasive species* and *soil quality*.

4.2. Social Limitations

The social limitation most frequently mentioned in the national evaluation was *the low degree of social bonding*. This coincided with the systematic review, which revealed that the topic ***absence of social participation***, including *lack of participation* and *deterioration of community organization*, were the main limitations to restoration projects (Table S2). The ***absence of social participation*** might be explained by the impressive growth of non-agricultural

income in rural households [57]. Furthermore, a close link between the deterioration of cultural roots of young people in the communities and the migratory flow from rural areas has been detected [58]. One possible reason for the *deterioration of community organization* is that many of the collective land tenancy systems in Mexico have problems with the definition of boundaries, often leading to confrontations among peasants. In this sense, agrarian conflicts and family feuds define social ties, reducing social cohesion. The agrarian reform distributed more than half of the Mexican territory to peasants between 1917 and 1992 [59]. The endowment of land occurred in three ways: (i) Small private rural property, where the owner had the right to use and usufruct of the land and the right to sell or dispose of it; (ii) *Ejido*, which was made up of an agrarian nucleus where the land was given to the members for their use and usufruct, but it still belonged to the nation; in this case, rights were inherited and, (iii) Community, where the possession of the land was collective [60]. The institutional framework that regulated rural property rights has been extremely complex. Furthermore, it has been applied to a heterogeneous rural space with different agroecological environments, socioeconomic conditions, and ethnic characteristics; the mix of these conditions may explain some of the conflicts within communities that result in the deterioration of social bonding.

The *clarity of benefits from restoration* was the second most frequently mentioned limitation in the national evaluation, coinciding with the systematic review, in which the topic of ***socioeconomics*** (including *problems with wood and non-wood markets* and *extreme poverty*) was the second most mentioned limitation (Table S2). These two limitations are strongly related. According to the National Council for the Evaluation of Social Development Policy (CONEVAL in Spanish), in 2018, poverty affected 55.3% of the total population in rural zones of Mexico. In the dry tropical zones, the peasants are small and medium-sized farmers who do not have access to credit, insurance, or savings services, and the indigenous population also suffers from racial discrimination and lack of access to markets for their products, which are usually produced in subsistence systems [61]. For example, in a community nursery in the state of Michoacán, initially, 11 tree species from the dry forest were propagated, but in addition to ecological limitations (see Ecological limitations), they also faced low local demand for the plants they propagated [32]. A review of the planning phase of restoration projects in Mexico revealed that social variables were seldom evaluated in baseline studies and the most important socioeconomic goal for restoration projects was the generation of local employment, an immediate but short-term benefit; community participation was limited to the implementation part of the projects [4]. Favoring community participation beginning at the planning phase of projects may help to establish long-term benefits from restoration for people.

Under many socioeconomic difficulties, restoration must be linked to a *productive use* to be accepted by peasants, a limitation frequently included in the topic of ***management***. Economic insecurity results in peasants having doubts about changing the agricultural practices; this was found in the systematic review as *resistance to paradigm shift* (Table S2). They have a culture of harvesting trees, rather than planting them, due to the historical abundance of forests. Additionally, the few trees they plant are intercropped with shade-tolerant agricultural crops and are used to produce food and fuelwood for the family or fodder for animals. These intercropping systems are found near houses and are known as homegardens [62,63]. Thus, some limitations to carrying out restoration projects may be related to the vision of nature that social group owns, and that vision is part of their culture and influenced by their scale of values [64]. This is also linked to the ***perception*** by farmers that ecological restoration is *an unproductive activity* and there is *no need to restore* the ecosystems. This perception might be caused by the agrarian concept in Mexican legislation that prevails in many traditional communities, the so-called "law of idle land", which states that those who do not use the land they acquired due to agrarian distribution may be required to forfeit it [65]. To restore tropical dry forests in Mexico, it will be necessary to reconcile the perceptions and requirements of local people with the need to recover lost natural resources [11,66].

In the systematic review, the third most important topic related to social limitations was ***governmental programs***, which roughly coincided with the social limitation of *institutional credibility* (second place in importance in the national evaluation). About 98.5% of restoration projects in Mexico are financed by government programs [5]. Accordingly, 35 social limitations were recognized as coming from governmental programs. The most frequently mentioned were *lack of final support* and *of technical assistance* and *low survival of seedlings* received from the government to establish restoration plantings. Dry forests are the ecosystem that receives the lowest amount of government investment in restoration projects in Mexico [5]. Furthermore, indigenous and small rural producers are frequently excluded from government programs because these programs have complex rules and requirements for participation that these communities are unable to follow [67]. The limitation *lack of technical assistance* is related to the 1992 Mexican Forestry Law, which privatized technical forestry services. Currently, technical assistance in reforestation projects is conducted through *Prestadores de Servicios Técnicos Forestales* (Forestry Technical Service Providers)—individuals or legal entities who are accredited to provide technical services to the communities [68]. Communities have some options to select their technical provider [69], but providers offer their services when the annual call from governmental programs opens. In practice, technical providers become managers of forest public policies rather than true technical advisers to the communities [68]. The *lack of technical assistance* could be solved through ***capacity building***, another important topic mentioned as a social limitation. In that topic, *lack of training* was the most frequently mentioned. In Latin America, there are few restoration training initiatives for farmers. For example, Yale University has an important capacity-building program [70], and the Sinchi Institute in Colombia promotes a novel restoration training program for the poorest people in the Colombian Amazon [71,72]. An example from Mexico comes from the dry forest of Sierra de Huautla, a Biosphere Reserve co-managed by the State University of Morelos and CONANP, where some successful capacity-building programs related to environmental education have taken place [73]. Further, given the small financial support available for restoration in the dry forest, this becomes crucial to increase the research aimed at decreasing the costs of restoration; for example, the evaluation of the potential for natural regeneration and the information about techniques, as direct seeding can decrease the costs of establishing restoration plantings. Finally, some new governmental programs for conservation and restoration have been directed to solve the problem faced by practitioners, but evaluation of their success is still in progress (see below PROCODES and PROREST programs).

Some results from the national evaluation and the systematic review did not coincide. For example, the *lack of agreement with stakeholders* was the third most important limitation in the national evaluation but was not mentioned in the documents analyzed in the systematic review. Additionally, problems related to *land tenancy* were not found as a limitation in the national evaluation, while in the systematic review, within the topic of ***social conflicts***, *land use,* and *violence* were frequently mentioned as limitations (Table S2). These two social conflicts are related since, in some regions, tourist mega-business, drug cultivation, and the violence associated with it have increased the value of the land and peasants' desire to protect their claims [74]. Finally, *the lack of governance* was only mentioned once in the systematic review. It is possible that the geographic locations of the projects found in the national evaluation and in the systematic review influence these results. For example, more scientific publications are derived from projects carried out within natural protected areas (see Table S2), and those will be represented in the systematic review but not necessarily in the national evaluation (Table S1).

Word cloud analysis. In all five word clouds, including ecological and social limitations and the document in English and Spanish, the word "species" was the most frequently mentioned word. This agreement clearly shows that species is the level of biological organization that is considered in both practical and research restoration projects in the dry forest (Table S4; in green). The word "forest" (in grey) was frequent in the documents on ecological limitations (practical and research) and in the documents of social limitations,

but only those in English. In the documents of social limitation in Spanish, the related word was "*árboles*" (in brown), which was also very frequent in the documents on ecological limitation in Spanish. It is noteworthy that the documents in English and Spanish for social limitation also coincided with the research documents in Spanish for ecological limitations in the word "use" (in red). This may be related to the fact that one criterion that is frequently considered when selecting species for restoration projects is their use. However, this is more frequently mentioned in documents related to social limitations and ecological limitations when publications are written for local audiences (i.e., in Spanish). For the social limitations, word clouds in English and Spanish coincided in concepts related to the social dimension such as "community" and "peasants". The word clouds confirm that the documents used in the analysis had a social focus; the most frequent words refer to social actors (stakeholders), which in the case of Mexico, were the members of the communities where the restoration projects were carried out.

4.3. Public Policy Instruments (PROCODES and PROREST)

Restoration is a process that goes far beyond the number of intervened hectares, resources granted, and the number of beneficiaries. PROCODES is a program created by the federal government in 1996, previously called the Sustainable Regional Development Program (PRODERS in Spanish). It constitutes a public policy instrument promoting the conservation of ecosystems and their biodiversity [75]. This program has four broadly defined conservation areas: (i) community projects, (ii) local capacity building through training courses, (iii) technical studies, and (iv) financial support to environmental contingency brigades [76]. To carry out all the above actions, CONANP encourages the participation of the local population in the processes of land management, sustainable use of resources, protection, and restoration. Restoration interventions within the framework of this program are aimed towards the implementation of productive restoration, such as agroforestry systems (https://www.conanp.gob.mx/procodes2022/ReglasDeOperacionPROCODES2022.pdf (accessed on 19 January 2022). This aim, if successful, could resolve the social limitation linked to the perception by farmers that ecological restoration is an unproductive activity. Ecological restoration is not explicitly considered in PROCODES, which is why PROREST emerged in 2019 to clearly incorporate the conservation and ecological restoration of ecosystems in the Natural Protected Areas network [77]. Overall, the design of both programs is innovative, and they are aligned with the new conservation paradigms since they favor social organization and collective action while promoting the conservation and restoration of biodiversity [75]. The implementation of PROCODES and PROREST also contribute to meeting restoration goals [78] and Mexico's sustainable development goals [79]. Moreover, the two programs are articulated with Mexico's National Development Plan objectives, enabling the convergence of financial resources for their development [80,81]. Although biodiversity and other environmental and social objectives are important parts of PROCODES and PROREST, both programs frame their achievements in terms of numerical indicators that indirectly assess the social and environmental benefits resulting from their implementation. Indicators used to measure success include the number of intervened hectares, the number of economic resources granted and the number of beneficiaries, differentiating among women, men, and indigenous women and men [75]. This manner of evaluating program success does not identify the ecological and social limitations that projects and local people usually face, which are clearly pointed out in the present review and identified in the national evaluation [4,5]. Ignoring these limitations diminishes the effectiveness, progress, and social and environmental benefits of both programs and of restoration itself. Thus, there is an urgent need to design and include measurable indicators to document the socioecological limitations local practitioners are facing under these two programs to restore Mexican dry forests.

5. Conclusions

The national evaluation and the systematic review coincided in the principal ecological limitation for Mexican dry forest restoration, all of which were steps involved in the establishment of restoration plantings. However, these two sources of information disagree on the second (i.e., information about natural succession) and third (i.e., soil quality) most important limitations. It is especially striking that there was no research available to resolve the problems faced by practitioners related to invasive species, unpredictable climate, and soil quality.

For social limitations, the national evaluation and the systematic review agree that the low degree of social bonding resulting in a lack of participation and deterioration of community organization was the main limitations for restoration projects. The second most important social limitation was related to socioeconomic issues, which were also linked to the topics of management and perception. The limitation of agreement with stakeholders, third in importance in the national evaluation, was not found as a limitation in the systematic review. In contrast, the topic of land tenancy was not mentioned by the respondents of the national evaluation but was found in the systematic review, although it was not one of the most important limitations.

Key recommendations. As the standards for restoration state [48], the first step for restoration should be to involve all the stakeholders in a restoration project. In this first step of a restoration project, it is important to evaluate the social conditions of the community in terms of social bonding and organization. A restoration project may help to increase the social bonding of a community, but a minimum of social participation needs to be assured for the project to start. Favoring community participation from the planning phase of projects may help to establish the benefits of restoration to people in the long term. Other actions that are needed to resolve social limitations are related to regulations, including simplifying the institutional framework that regulates rural property rights and applying different regulations depending on rural space with different agroecological environments, socioeconomic conditions, and ethnic characteristics.

Increasing the number of native trees available in local nurseries and implementing strategies to increase plant survival is needed to secure effective ecological restoration of dry forests. The first issue can be resolved through capacity-building programs related to propagation protocols. The community nurseries favored by the new governmental program *Sembrando vida* (Sowing life; https://www.gob.mx/bienestar/acciones-y-programas/programa-sembrando-vida. (Accessed on 19 January 2022) promise to be important for this aim, although it has not been evaluated yet and needs to include measurable indicators to document the socioecological limitations faced by practitioners. The establishment of community nurseries will also resolve the bad timing of seedling delivery by government programs (e.g., at the end of the rainy season), which was mentioned as a major social limitation for dry forest restoration. For the second issue, increase plant survival, there is a need for more research on the causes of this mortality, such as soil quality and how to select tree species in the face of extreme climate events due to climate change.

Supplementary Materials: The following are available online at https://www.mdpi.com/article/10.3390/su14073793/s1, Table S1: Location of the dry forest projects identified in the National Evaluation in Mexico, Table S2: Publications that mentioned social limitations related to tropical dry forest restoration in Mexico, Table S3: Publications related to the five ecological limitations established in the National Evaluation of restoration projects in Mexico for tropical dry forests, Table S4: Most frequent words found in documents from a systematic review of ecological social limitations for Mexican dry forest restoration, Figure S1: Flow diagram for systematic review including searches of databases for ecological limitations related to restoration of Mexican dry forests, Figure S2: Flow diagram for systematic review including searches of databases for social limitations related to restoration of Mexican dry forests [18,19,24–26,34–37,44–46,49–53,82–163].

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References

1. Strassburg, B.B.N.; Iribarrem, A.; Beyer, H.L.; Cordeiro, C.L.; Crouzeilles, R.; Jakovac, C.C.; Braga Junqueira, A.; Lacerda, E.; Latawiec, A.E.; Balmford, A.; et al. Global priority areas for ecosystem restoration. *Nature* **2020**, *586*, 724–729. [CrossRef]
2. Trejo, I.; Dirzo, R. Deforestation of seasonally dry tropical forest: A national and local analysis in Mexico. *Biol. Conserv.* **2000**, *94*, 133–142. [CrossRef]
3. Challenger, A.; Soberón, J. Los ecosistenas terrestres. In *Capital Natural de México, Vol. I: Conocimiento Actual de la Bioiversidad*; Conabio, Ed.; Conabio: Mexico City, Mexico, 2008; pp. 87–108.
4. Martínez-Garza, C.; Méndez-Toribio, M.; Ceccon, E.; Guariguata, M.R. Ecosystem restoration in Mexico: Insights on the project planning phase. *Bot. Sci.* **2021**, *99*, 242–256. [CrossRef]
5. Méndez-Toribio, M.; Martínez-Garza, C.; Ceccon, E.; Guariguata, M.R. *La Restauración de Ecosistemas Terrestres en México: Situación Actual, Tendencias, Necesidades y Oportunidades*; CIFOR: Bogor, Indonesia, 2018; p. 116.
6. Locke, H.; Dearden, P. Rethinking protected area categories and the new paradigm. *Environ. Conserv.* **2005**, *32*, 1–10. [CrossRef]
7. Leisher, C.; Touval, J.; Hess, S.M.; Boucher, T.M.; Reymondin, L. Land and Forest Degradation inside Protected Areas in Latin America. *Diversity* **2013**, *5*, 779–795. [CrossRef]
8. Rodríguez-Jorquera, I.A.; Siroski, P.; Espejo, W.; Nimptsch, J.; Choueri, P.G.; Choueri, R.B.; Moraga, C.A.; Mora, M.; Toor, G.S. Latin American protected areas: Protected from chemical pollution? *Integr. Environ. Assess. Manag.* **2017**, *13*, 360–370. [CrossRef]
9. Gómez-Pompa, A.; Dirzo, R. *Reservas de la Biosfera y Otras Áreas Naturales de México*; Conabio: Mexico City, Mexico, 1995.
10. Méndez-Toribio, M.; Martínez-Garza, C.; Ceccon, E. Challenges during the execution, results, and monitoring phases of ecological restoration: Learning from a country-wide assessment. *PLoS ONE* **2021**, *16*, e0249573. [CrossRef]
11. Ceccon, E. *Restauración en Bosques Tropicales: Fundamentos Ecológicos, Prácticos y Sociales*; Ediciones Díaz de Santos: Bogota, Colombia, 2013; p. 290.
12. Ceccon, E. Productive restoration as a tool for socioecological landscape conservation: The case of "La Montaña" in Guerrero, Mexico. In *Participatory Biodiversity Conservation—Concepts, Experiences and Perspectives*; Baldauf, C., Ed.; Springer: Berlin/Heidelberg, Germany, 2020; pp. 113–128.
13. CONEVAL. Consejo Nacional de Evaluación de la Política de Desarrollo Social. *Ficha de Monitoreo*. 2013. Available online: https://www.coneval.org.mx/Informes/Evaluacion/Ficha_Monitoreo_Evaluacion_2013/SEMARNAT/16_S046.pdf (accessed on 1 September 2021).
14. CONEVAL. Consejo Nacional de Evaluación de la Política de Desarrollo Social. In *Fichas de Monitoreo y Evaluación 2020–2021 de los Programas y las Acciones Federales de Desarrollo Social*; CONEVAL: Ciudad de México, Mexico, 2021; p. 288. Available online: https://www.coneval.org.mx/InformesPublicaciones/Documents/FMyE_20-21.pdf#search=PROREST (accessed on 1 September 2021).
15. CONANP. Comisión Nacional de Áreas Naturales Protegidas. *Información Espacial*. 2022. Available online: http://sig.conanp.gob.mx/website/pagsig/info_shape.htm (accessed on 11 January 2022).
16. INEGI. *Conjunto de Datos Vectoriales de Uso de Suelo y Vegetación*; Escala 1:250,000, Serie VII; Conjunto Nacional, escala: 1:250,000; Edición: 1; Instituto Nacional de Estadística y Geografía: Aguascalientes, Mexico, 2021.
17. Feinerer, I.; Hornik, K. tm: Text Mining Package. R Package Version 0.7-8. Available online: https://CRAN.R-project.org/package=tm (accessed on 1 September 2021).
18. Nuñez-Cruz, A.; Meave, J.A.; Bonfil, C. Reproductive Phenology and Seed Germination in Eight Tree Species from a Seasonally Dry Tropical Forest of Morelos, Mexico: Implications for Community-Oriented Restoration and Conservation. *Trop. Conserv. Sci.* **2018**, *11*, 1–14. [CrossRef]
19. Luna-Nieves, A.L.; Meave, J.A.; Morellato, L.P.C.; Ibarra-Manriquez, G. Reproductive phenology of useful Seasonally Dry Tropical Forest trees: Guiding patterns for seed collection and plant propagation in nurseries. *For. Ecol. Manag.* **2017**, *393*, 52–62. [CrossRef]

20. Cortes-Flores, J.; Hernandez-Esquivel, K.B.; Gonzalez-Rodriguez, A.; Ibarra-Manriquez, G. Flowering phenology, growth forms, and pollination syndromes in tropical dry forest species: Influence of phylogeny and abiotic factors. *Am. J. Bot.* **2017**, *104*, 39–49. [CrossRef]
21. Cortes-Flores, J.; Cornejo-Tenorio, G.; Urrea-Galeano, L.A.; Andresen, E.; Gonzalez-Rodriguez, A.; Ibarra-Manriquez, G. Phylogeny, fruit traits, and ecological correlates of fruiting phenology in a Neotropical dry forest. *Oecologia* **2019**, *189*, 159–169. [CrossRef]
22. Ayestarán-Hernández, L.M. *Ecología de la Polonización y Fenología Reproductiva de Ipomoea Pauciflora en la Selva Baja Caducifolia de Sierra de Huautla, Morelos*; Universidad Autónoma del Estado de Morelos: Cuernavaca, Mexico, 2004.
23. De Leon-Ibarra, M.A. *Fenología de Especies de Plantas con Frutos Carnosos y Disponibilidad Espacial y Temporal de Eszte Recurso en la Reserva de la Biosfera Sierra de Huautla: Implicaciones Para los Vertebrados*; Bachelor Dissertation, Universidad Autónoma del Estado de Morelos: Cuernavaca, Mexico, 2005.
24. Cervantes, M.; Ceccon, E.; Bonfil, C. Germination of stored seeds of four tree species from the tropical dry forest of Morelos, Mexico. *Bot. Sci.* **2014**, *92*, 281–287. [CrossRef]
25. Soriano, D.; Huante, P.; Gamboa-deBuen, A.; Orozco-Segovia, A. Effects of burial and storage on germination and seed reserves of 18 tree species in a tropical deciduous forest in Mexico. *Oecologia* **2014**, *174*, 33–44. [CrossRef]
26. Cervantes, V.; Carabias, J.; VázquezYanes, C. Seed germination of woody legumes from deciduous tropical forest of southern Mexico. *For. Ecol. Manag.* **1996**, *82*, 171–184. [CrossRef]
27. Conanp. *Programa de Conservación y Manejo Reserva de la Biosfera Sierra Huautla México*; CONANP: Cuernavaca, Mexico, 2005; p. 210.
28. Ibarra-Manríquez, G.; Cornejo-Tenorio, G.; Hernández-Esquivel, K.B.; Rojas-López, M.; Sánchez-Sánchez, L. Vegetación y flora vascular del ejido Llano de Ojo de Agua, Depresión del Balsas, municipio de Churumuco, Michoacán, México. *Rev. Mex. Biodivers.* **2021**, *92*, 7. [CrossRef]
29. Durán, E.; Meave, J.A.; Lott, E.J.; Segura, G. Structure and tree diversity patterns at the landscape level in Mexican tropical deciduos forest. *Bot. Sci.* **2006**, *79*, 43–60. [CrossRef]
30. Ortega-Álvarez, R.; Tobón, W.; Urquiza-Haas, T.; Ruiz-González, S.P.; Koleff, P. Exploring local perceptions, implementation, benefits, and limitations of community-based restoration projects in Mexico. *Restor. Ecol.* **2022**, *n/a*, e13604. [CrossRef]
31. Bonfil, C.; Trejo, I. Plant Propagation and the Ecological Restoration of Mexican Tropical Deciduous Forests. *Ecol. Restor.* **2010**, *28*, 369–376. [CrossRef]
32. Luna-Nieves, A.L.; García-Frapolli, E.; Bonfil, C.; Meave, J.A.; Ibarra-Manríquez, G. Integrating conservation and socioeconomic development: The potential of community nurseries in Mexican protected areas. *Environ. Conserv.* **2019**, *46*, 310–317. [CrossRef]
33. Pérez, D.; Ceballos, C.; Oneto, M.E. Costos de plantación y siembra directa de Prosopis flexuosa var. depressa (Fabaceae) para restauración ecológica. *Acta Botánica Mex.* **2022**, *129*, e1888. [CrossRef]
34. Martínez-González, I.; Sánchez-Velázquez, L.R.; Ruíz-Guerra, B.; Pineda-López, M.D.; Velázquez-Rosas, N. The role of seed size in the emergence and survival of seedlings in contrasting environments: The case of Ceiba aesculifolia. *New For.* **2021**, *52*, 493–507. [CrossRef]
35. Hernández-Oria, J.G.; Hawkins, R.I.Y.; Tostado, E.C.; Barradas, V.L. Early establishment and survival of the neotropical dry deciduous forest tree Lysiloma microphyllum from mountainous Bajio Queretano, Mexico. *J. Trop. Ecol.* **2017**, *33*, 213–227. [CrossRef]
36. Alvarez-Aquino, C.; Barradas-Sánchez, L.; Ponce-González, O.; Williams-Linera, G. Soil seed bank, seed removal, and germination in a Seasonally Dry Tropical Forest in Veracruz, Mexico. *Bot. Sci.* **2014**, *92*, 111–121. [CrossRef]
37. Barajas-Guzmán, M.G.; Barradas, V.L. Costs and benefits of the use of mulches in Deciduous Tropical reforestation. *Bot. Sci.* **2013**, *91*, 363–370. [CrossRef]
38. Pineda-García, F.; Paz, H.; Tinoco-Ojanguren, C. Morphological and physiological differentiation of seedlings between dry and wet habitats in a tropical dry forest. *Plant Cell Environ.* **2011**, *34*, 1536–1547. [CrossRef]
39. Pineda-García, F.; Paz, H.; Meinzer, F.C.; Angeles, G. Exploiting water versus tolerating drought: Water-use strategies of trees in a secondary successional tropical dry forest. *Tree Physiol.* **2016**, *36*, 208–217. [CrossRef]
40. Méndez-Toribio, M.; Meave, J.A.; Zermeño-Hernández, I.; Ibarra-Manríquez, G. Effects of slope aspect and topographic position on environmental variables, disturbance regime and tree community attributes in a seasonal tropical dry forest. *J. Veg. Sci.* **2016**, *27*, 1094–1103. [CrossRef]
41. Mendez-Alonzo, R.; Paz, H.; Zuluaga, R.C.; Rosell, J.A.; Olson, M.E. Coordinated evolution of leaf and stem economics in tropical dry forest trees. *Ecology* **2012**, *93*, 2397–2406. [CrossRef]
42. Mendez-Toribio, M.; Ibarra-Manríquez, G.; Paz, H.; Lebrija-Trejos, E. Atmospheric and soil drought risks combined shape community assembly of trees in a tropical dry forest. *J. Ecol.* **2020**, *108*, 1347–1357. [CrossRef]
43. Álvarez-Aquino, C.; Williams-Linera, G. Seedling survival and growth of tree species: Site condition and seasonality in tropical dry forest restoration. *Bot. Sci.* **2012**, *90*, 341–351. [CrossRef]
44. Castillo-Mandujano, J. *Efecto del Barbecho y del Trasplante de Especies Arbóreas en la Recuperación de Bosques Secundarios de un Bosque Tropical Seco, Jalisco*; Univrsidad Nacional Autónoma del México: Morelia, Mexico, 2010.
45. Barajas-Guzmán, M.G.; Campo, J.; Barradas, V.L. Soil water, nutrient availability and sapling survival under organic and polyethylene mulch in a seasonally dry tropical forest. *Plant Soil* **2006**, *287*, 347–357. [CrossRef]

46. Barajas-Guzmán, M.G.; Barradas, V.L. Microclimate and sampling survival under organic and polyethylene mulch in a tropical dry deciduous forest. *Bol. Soc. Botánica México* **2011**, *88*, 27–34.
47. Basave Villalobos, E.; Cetina Alcalá, V.M.; López López, M.A.; Aldrete, A.; Del Valle Paniagua, D.H. Nursery practices increase seedling performance on nutrient-poor soils in Swietenia humilis. *Iforest-Biogeosciences For.* **2015**, *8*, 552–557. [CrossRef]
48. Gann, G.D.; McDonald, T.; Walder, B.; Aronson, J.; Nelson, C.R.; Jonson, J.; Hallett, J.G.; Eisenberg, C.; Guariguata, M.R.; Liu, J.; et al. International principles and standards for the practice of ecological restoration. Second edition. *Restor. Ecol.* **2019**, *27*, S1–S46. [CrossRef]
49. Quisehuatl-Medina, A.; Averett, J.P.; Endress, B.A.; López-Toledo, L. Removal of cattle accelerates tropical dry forest succession in Northwestern Mexico. *Biotropica* **2020**, *52*, 457–469. [CrossRef]
50. Cantarello, E.; Newton, A.C.; Hill, R.A.; Tejedor-Garavito, N.; Williams-Linera, G.; López-Barrera, F.; Manson, R.H.; Golicher, D.J. Simulating the potential for ecological restoration of dryland forests in Mexico under different disturbance regimes. *Ecol. Model.* **2011**, *222*, 1112–1128. [CrossRef]
51. Andresen, E.; Pedroza-Espino, L.; Allen, E.B.; Perez-Salicrup, D.R. Effects of selective vegetation thinning on seed removal in secondary forest succession. *Biotropica* **2005**, *37*, 145–148. [CrossRef]
52. Quesada, M.; Sánchez-Azofeifa, G.A.; Alvarez-Anorve, M.; Stoner, K.E.; Avila-Cabadilla, L.; Calvo-Alvarado, J.; Castillo, A.; Espirito-Santo, M.M.; Fagundes, M.; Fernandes, G.W.; et al. Succession and management of tropical dry forests in the Americas: Review and new perspectives. *For. Ecol. Manag.* **2009**, *258*, 1014–1024. [CrossRef]
53. Guerra-Martínez, F.; García-Romero, A.; Cruz-Mendoza, A.; Osorio-Olvera, L. Regional analysis of indirect factors affecting the recovery, degradation and deforestation in the tropical dry forests of Oaxaca, Mexico. *Singap. J. Trop. Geogr.* **2019**, *40*, 387–409. [CrossRef]
54. Borda-Niño, M.; Meli, P.; Brancalion, P.H.S. Drivers of tropical forest cover increase: A systematic review. *Land Dreg Dev.* **2020**, *31*, 1366–1379. [CrossRef]
55. Crouzeilles, R.; Maurenza, D.; Prieto, P.V.; Barros, F.S.M.; Jakovac, C.; Ferreira, M.S.; Chazdon, R.L.; Lindenmayer, D.B.; Brancalion, P.H.S.; Ceccon, E.; et al. Associations between socio-environmental factors and landscape-scale biodiversity recovery in naturally regenerating tropical and subtropical forests. *Conserv. Lett.* **2020**, *14*, e12768. [CrossRef]
56. Bollo Manent, M.; Hernández Santana, J.; Méndez Linares, A. The state of the environment in Mexico. *Cent. Eur. J. Geosci.* **2014**, *6*, 219–228. [CrossRef]
57. Carton de Grammont, H. La desagrarización del campo mexicano. *Converg. Rev. Cienc. Soc.* **2009**, *16*, 13–55.
58. Kropff-Causa, L.; Stella, V. Abordajes teóricos sobre las juventudes indígenas en Latinoamérica. *LiminaR* **2017**, *15*, 15–28. [CrossRef]
59. Morett-Sánchez, J.C.; Cosío-Ruiz, C. Panorama de los ejidos y comunidades agrarias en México. *Agric. Soc. Desarro.* **2017**, *14*, 125–152. [CrossRef]
60. Gilbert, J. *Indigenous Peoples' Land Rights under International Law: From Victims to Actors*; Transnational Publishers: New York, NY, USA, 2006; p. 349.
61. Martínez-CarrascoPleite, F.; Colino-Sueiras, J.B.; Gómez-Cruz, M.Á. Pobreza y políticas de desarrollo rural en México. *Estud. Soc.* **2014**, *22*, 9–35.
62. De Clerck, F.A.J.; Negreros-Castillo, P. Plant species of traditional Mayan homegardens of Mexico as analogs for multistrata agroforests. *Agrofor. Syst.* **2000**, *48*, 303–317. [CrossRef]
63. Castañeda-Navarrete, J. Homegarden diversity and food security in southern Mexico. *Food Secur.* **2021**, *13*, 669–683. [CrossRef]
64. Lindig-Cisneros, R.; Lindig-Cisneros, E. Social Construction of Ecological Restoration. In *Beyond Restoration Ecology: Social Perspectives in Latin America and the Caribbean*; Ceccon, E., Pérez, D.R., Eds.; Vázquez Mazzini Editores: Buenos Aires, Argentina, 2017; pp. 22–40.
65. Del Castillo-Cueva, P. La experiencia forestal en Veracruz. In Proceedings of the Memoria del II Foro Internacional Sobre los Aprovechamientos Forestales en Selvas: Su Relación con el Ambiente, Ciudad de Mexico, Mexico, 1 October 1997.
66. Aronson, J.; Milton, S.J.; Blignaut, J.N. Restoring Natural Capital: Definition and Rationale. In *Restoring Natural Capital: Science, Business, and Practice*; Aronson, J., Milton, S.J., Blignaut, J.N., Eds.; Island Press-SER: Washington, DC, USA, 2007.
67. Baca del Moral, J.; Cuevas Reyes, V. Desvinculación de las políticas públicas en el campo mexicano. *Andamios* **2018**, *15*, 319–338. [CrossRef]
68. Rodríguez-Aguilar, O.; Trench, T. Análisis de los actores sociales en la implementación de políticas forestales: El caso de la Asirmi. *Madera Bosques* **2020**, *26*, e2621961. Available online: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-047120200000200202&nrm=iso (accessed on 15 January 2022). [CrossRef]
69. Trench, T.; Larson, A.M.; Libert-Amico, A.; Ravikumar, A. *Análisis de la Gobernanza Multinivel en México: Lecciones Para REDD+ de un Estudio Sobre Cambio de uso del Suelo y Distribución de Beneficios en Chiapas y Yucatán*; CIFOR: Bogor, Indonesia, 2018.
70. Calle, Z.; Bloomfield, G.S.; Santamaría, S.; Brancalion, P.; Ribeiro-Pinto, S.; González, G.; Campos, M.; Garen, E.; Slusser, J.; Estrada, C. Experiencias de fortalecimiento de capacidades para la restauración ecológica en América Latina. In *Más allá de la Ecología de la Restauración: Perspectivas Sociales en América Latina y el Caribe*; Ceccon, E., Pérez, R., Eds.; Vazquez Mazzini Editores: Buenos Aires, Argentina, 2016; pp. 355–367.

71. Ceccon, E. Forest restoration in times of crisis: Opportunities and challenges in the human dimension. In *Forest Lansdscape Restoration Social Opportunities in a Tropical World*; Pinto, S.R.R., Santos, F.C., Prescott, C., Eds.; Centro de Pesquisas Ambientais do Nordeste—Cepan: Recife, Brazil, 2020; pp. 11–28.
72. Garzón, N.V.; Rodríguez León, C.H.; Ceccon, E.; Pérez, D.R. Ecological restoration-based education in the Colombian Amazon: Toward a new society—Nature relationship. *Restor. Ecol.* **2020**, *28*, 1053–1060. [CrossRef]
73. Arias, D.M.; Baróna, C.; Dorado, O. *Una Mirada a la Biodiversidad y Conservación de Morelos Desde un Enfoque Educativo*; Pablos, J., Ed.; Univrsidad Nacional Autónoma del México: Morelia, Mexico, 2014; p. 142.
74. Merino, L. Social Deterioration and Environmental Degradation of Four Woodland Regions in Guerrero State, Mexico. Constituting the Commons. In Proceedings of the Common Property Conference Paper, Bloomington, IN, USA, 31 May–4 June 2000.
75. Reyes Orta, M.; Cardozo Brum, M.I.; Arredondo García, C.; Méndez Fierro, H.; Espejel, I. Análisis del sistema de evaluación de un programa ambiental de la política mexicana: El PRODERS y su transformación al PROCODES. *Investig. Ambiental. Cienc. Y Política Pública.* **2013**, *5*, 44–61.
76. CONANP. *Programa de Conservación para el Desarrollo Sostenible (PROCODES)*; CONANP: Mexico City, Mexico, 2022.
77. CONANP. *Programa para la Protección y Restauración de Ecosistemas y Especies Prioritarias (PROREST)*; CONANP: Mexico City, Mexico, 2022.
78. Méndez-Toribio, M.; Martínez-Garza, C.; Ceccon, E.; Guariguata, M.R. Planes actuales de restauración ecológica en Latinoamérica: Avances y omisiones. *Rev. Cienc. Ambient.* **2017**, *51*, 30. [CrossRef]
79. Gupta, J.; Vegelin, C. Sustainable development goals and inclusive development. *Int. Environ. Agreem. Politics Law Econ.* **2016**, *16*, 433–448. [CrossRef]
80. Gobierno-de-México. *Plan Nacional de Desarrollo 2019–2024*; Gobierno-de-México: Mexico City, Mexico, 2019.
81. CONANP. Comisión Nacional de Áreas Naturales Protegidas. Diagnóstico. In *Programa para la Protección y Restauración de Ecosistemas y Especies Prioritarias (PROREST) 2020*; Gobierno de México: Ciudad de México, Mexico, 2020; p. 58.
82. Bonfil, C.; Barrales-Alcalá, B.; Mendoza-Hernández, P.E.; Alavez, M.; García-Barrios, R. Capítulo 14 Los límites sociales del manejo y la restauración de ecosistemas: Una historia en Morelos. In *Experiencias Mexicanas en la Restauración de los Ecosistemas*; Ceccon, E., Martinez-Garza, C., Coords, Eds.; Universidad Nacional Autónoma de México, Centro Regional de Investigaciones Multidisciplinarias: Ciudad de México, Mexico, 2016; pp. 323–345.
83. Ceccon, E. *The connection between university research and education/teaching and a rural community in Mexico: The case study of the Barrancas Environmental Restoration Research Station, Morelos, Mexico, In Principles and Practice of Forest Landscape Restoration: Case Studies from the Drylands of Latin America*; Newton, A.C., Tejedor, N., Eds.; IUCN: Gland, Switzerland; Cambridge, UK, 2011; Box 10.9; pp. 339–342.
84. Ceccon, E.; Toledo, I.; García-Barrios, R. Estación de Restauración Aambiental del Rio Tembembe: Lecciones aprendidas. In *Territorios y Sociedades en un Mundo en Cambio, Miradas desde Iberoamerica.Tomo II*; Guadarrama-García, J., Delgadillo-Macías, J., Fonseca-Figueiredo, F., Coords, Eds.; Universidad de Barcelona: Barcelona, España, 2014; pp. 129–147.
85. Cervantes-Gutiérrez, V.; Gama-Castro, J.E.; Roldán-Aragón, I.E.; Hernández-Cárdenas, G. Basis for implementing restoration strategies: San Nicolás Zoyatlan social-ecological system (Guerrero, Mexico). *Terra Latinoam.* **2014**, *32*, 143–159.
86. Cordero-Cueva, P. Percepciones sociales sobre el deterioro ambiental y la restauracion ecologica: Un estudio de caso en la region de Chamela-Cuixmala, Jalisco. Master's Thesis, Universidad Autonoma de Mexico, Facultad de Ciencias, Ciudad de México, Mexico, 2005.
87. Durand, L. Pensar positivo no basta. Actitudes en torno a la conservación en la Reserva de la Biosfera Sierra de Huautla, México. *Interciencia* **2010**, *35*, 430–436.
88. Gallardo, A.P.G.; Ceccon, E.; Castillo, A.; González-Esquivel, C.E. Resisting socio-ecological vulnerability: Agroecology and indigenous cooperativism in La Montaña, Guerrero, Mexico. *Agroecol. Sustain. Food Syst.* **2021**, *45*, 65–85. [CrossRef]
89. García-Barrios, L.; González-Espinosa, M. Investigación ecológica participativa como apoyo de procesos de manejo y restauración forestal, agroforestal y silvopastoril en territorios campesinos. Experiencias recientes y retos en la sierra Madre de Chiapas, México. *Rev. Mex. De Biodivers.* **2017**, *88*, 129–140. [CrossRef]
90. García-Flores, J.; González-Espinosa, M.; Lindig-Cisneros, R.; Casas, A. Traditional medicinal knowledge of tropical trees and its value for restoration of tropical forests. *Bot. Sci.* **2019**, *97*, 336–354. [CrossRef]
91. García-Flores, J. Estudio del modo de apropiación campesino de la naturaleza en Pitzotlán, Tepalcingo, Morelos. Master's Thesis, Universidad Autónoma del Estado De Morelos Centro de Investigaciones Biológicas, Cuernavaca, Mexico, 2020.
92. Gómez-Pineda, E.; González-Espinosa, M.; Parra-Vázquez, M.R.; Díaz-Hernández, B.M.; Musálem-Castillejos, K.; Ramírez-Marcial, N. Medios de vida y condicionantes que enfrenta la restauración forestal: Experiencias en la cuenca alta del río Grijalva, Chiapas. In *Montañas, Pueblos y Agua. Dimensiones y Realidades de la Cuenca Grijalva*; González-Espinosa, M., Brunel Manse, M.C., Coords, Pablos, J., Eds.; Ecosur: Chipas, Mexico, 2014; pp. 257–282.
93. Hernández-Muciño, D.; Borda-Niño, B.; Santiago, R.; Rodríguez, A.; Rodríguez, M.; Muciño, M.; Ceccon, E. La comunidad me'phaa construye su futuro: Agroecología y restauración como herramientas de desarrollo rural sustentable. In *Experiencias de Colaboración Transdisciplinaria para la Sustentabilidad*; Merçon, J., Ayala-Orozco, B., Rosell, J.A., Coords, Eds.; CopIt-arXives: Ciudad de Mexico, Mexico, 2018; pp. 66–76.

94. Lazos-Chavero, E.; Zinda, J.; Bennett-Curry, A.; Balvanera, P.; Bloomfield, G.; Lindell, C.; Negra, C. Stakeholders and tropical reforestation: Challenges, trade-offs, and strategies in dynamic environments. *Biotropica* **2016**, *48*, 900–914. [CrossRef]
95. Ramirez-Lozano, M. El manejo forestal comunitario en el municipio de huehuetlán el grande, anp sierra del Tentzo, Puebla. Master's Thesis, Facultad de Ciencias Biológicas Benemérita Universidad Autónoma de Puebla, Puebla, Mexico, 2020.
96. Rocas, A.N. Las diásporas de los árboles y arbustos nativos de México: Posibilidades y limitaciones de uso en programas de reforestación y desarrollo agroforestal. *Madera Y Bosques* **2001**, *7*, 3–11. [CrossRef]
97. Schroeder, N.M.; Castillo, A. Collective Action in the Management of a Tropical Dry Forest Ecosystem: Effects of Mexico's Property Rights Regime. *Environ. Manag.* **2013**, *51*, 850–861. [CrossRef] [PubMed]
98. Trujillo-Santisteban, M.d.L.; López-Medellín, X. ¿Qué es la conservación desde el punto de vista de los campesinos? Condiciones productivas en un área natural protegida, Morelos, México. *Etnobiología* **2018**, *16*, 58–72.
99. Villa-Herrera, A.; Nava-Tablada, M.E.; López-Ortiz, S.; Vargas-López, S.; Ortega-Jimenez, E.; López, F.G. Utilización del guácimo (*Guazuma ulmifolia* Lam.) como fuente de forraje en la ganadería bovina extensiva del trópico mexicano. *Trop. Subtrop. Agroecosystems* **2009**, *10*, 253–261.
100. Allen, M.F.; Allen, E.B.; Gomez-Pompa, A. Effects of Mycorrhizae and Nontarget Organisms on Restoration of a Seasonal Tropical Forest in Quintana Roo, Mexico: Factors Limiting Tree Establishment. *Restor. Ecol.* **2005**, *13*, 325–333. [CrossRef]
101. Alvarado-López, S.; Soriano, D.; Velázquez, N.; Orozco-Segovia, A.; Gamboa-Debuen, A. Priming effects on seed germination in Tecoma stans (Bignoniaceae) and Cordia megalantha (Boraginaceae), two tropical deciduous tree species. *Acta Oecologica-Int. J. Ecol.* **2014**, *61*, 65–70. [CrossRef]
102. Alvarez-Anorve, M.Y.; Quesada, M.; Sanchez-Azofeifa, G.A.; Avila-Cabadilla, L.D.; Gamon, J.A. Functional Regeneration and Spectral Reflectance of Trees During Succession in a Highly Diverse Tropical Dry Forest Ecosystem. *Am. J. Bot.* **2012**, *99*, 816–826. [CrossRef]
103. Arias-Medellin, L.A.; Flores-Palacios, A.; Martinez-Garza, C. Cacti community structure in a tropical Mexican dry forest under chronic disturbance. *Bot. Sci.* **2014**, *92*, 405–415.
104. Arias-Medellín, L.A.; Bonfil, C.; Valverde, T. Demographic analysis of Agave angustifolia (Agavaceae) with an emphasis on ecological restoration. *Bot. Sci.* **2016**, *94*, 513. [CrossRef]
105. Ballina-Gomez, H.S.; Ruiz-Sanchez, E.; Ambriz-Parra, E.; Alvarado-Lopez, C.J. Efecto de la luz y micorrizas en la germinación de semillas de árboles de selvas secas. *Madera Y Bosques* **2017**, *23*, 29–36. [CrossRef]
106. Beltran-Rodriguez, L.; Romero-Manzanares, A.; Luna-Cavazos, M.; Garcia-Moya, E. Architectural and morphological variation of Hintonia latiflora (Rubiaceae) in relation to bark harvest and environmental factors. *Rev. De Biol. Trop.* **2017**, *65*, 900–916.
107. Bolívar-Cimé, B.; Gallina, S. An optimal habitat model for the white-tailed deer (*Odocoileus virginianus*) in central Veracruz, Mexico. *Anim. Prod. Sci.* **2012**, *52*, 707–713. [CrossRef]
108. Bonfil, C.; Cajero-Lazaro, I.; Evans, R.Y. Seed germination of six Bursera species from central Mexico. *Agrociencia* **2008**, *42*, 827–834.
109. Bonilla-Moheno, M.; Aide, T.M. Beyond deforestation: Land cover transitions in Mexico. *Agric. Syst.* **2020**, *178*, 102734. [CrossRef]
110. Burke, R.A.; Frey, J.K.; Stoner, K.E. Using Species Distribution Modeling to Delineate Richness Patterns of Chiropterophilic Plants and Allocate Conservation Efforts in Mexico and the Southwestern United States. *Nat. Areas J.* **2021**, *41*, 85–92. [CrossRef]
111. Burgos, A. *Estrategia para el Abordaje Ecosistémico de una Investigación en Restauración Ecológica, Aplicada al Caso del Bosque Tropical Seco de la Región de Chamela*; Universidad Nacional Autónoma de México: Morelia, Mexico, 2004.
112. Camargo-Ricalde, S.; Dhillion, S.S.; Jiménez-González, C. Mycorrhizal perennials of the "matorral xerófilo" and the "selva baja caducifolia" communities in the semiarid Tehuacán-Cuicatlán Valley, Mexico. *Mycorrhiza* **2003**, *13*, 77–83. [CrossRef]
113. Carrasco-Carballido, V.; Martínez-Garza, C.; Jiménez-Hernández, H.; Márquez-Torres, F.; Campo, J. Effects of Initial Soil Properties on Three-Year Performance of Six Tree Species in Tropical Dry Forest Restoration Plantings. *Forests* **2019**, *10*, 428. [CrossRef]
114. Caso, M.; González-Abraham, C.; Ezcurra, E. Divergent ecological effects of oceanographic anomalies on terrestrial ecosystems of the Mexican Pacific coast. *Proc. Natl. Acad. Sci. USA* **2007**, *104*, 10530–10535. [CrossRef]
115. Ceccon, E.; Hernández, P. Seed rain dynamics following disturbance exclusion in a secondary tropical dry forest in Morelos, Mexico. *Rev. Biol. Trop.* **2013**, *57*, 257–269. [CrossRef]
116. Ceccon, E.; Almazo-Rogel, A.; Martinez-Romero, E.; Toledo, I. The effect of inoculation of an indigenous bacteria on the early growth of Acacia farnesiana in a degraded area. *CERNE* **2012**, *18*, 49–57. [CrossRef]
117. Ceccon, E.; Sánchez, I.; Powers, J.S. Biological potential of four indigenous tree species from seasonally dry tropical forest for soil restoration. *Agrofor. Syst.* **2014**, *89*, 455–467. [CrossRef]
118. Cervantes, V.; Arriaga, V.; Meave, J.; Carabias, J. Growth analysis of nine multipurpose woody legumes native from southern Mexico. *For. Ecol. Manag.* **1998**, *110*, 329–341. [CrossRef]
119. Cervantes-Gutiérrez, V.; Méndez-Ramírez, I.; Roldán-Aragón, I.E.; Chimal-Hernández, A.; Arriaga-Martínez, V.; Carabias-Lillo, J. Vegetation of a tropical dry forest in a landscape with chronic disturbance: The case of the indigenous community of San Nicolás Zoyatlan (Guerrero, Mexico). *Bot. Sci.* **2017**, *95*, 433. [CrossRef]
120. Corona-Núñez, R.O.; Mendoza-Ponce, A.V.; Campo, J. Assessment of above-ground biomass and carbon loss from a tropical dry forest in Mexico. *J. Environ. Manag.* **2021**, *282*, 111973. [CrossRef]
121. Encino-Ruiz, L.; Lindig-Cisneros, R.; Gómez-Romero, M.; Blanco-Garcia, A. Desempeño de tres especies arbóreas del bosque tropical caducifolio en un ensayo de restauración ecológica. *Bot. Sci.* **2014**, *91*, 107. [CrossRef]

122. Fehling-Fraser, T.C.; Ceccon, E. Macropropagation of Erythrina americana in a greenhouse: A potential tool for seasonally dry tropical forest restoration. *Rev. Chapingo Ser. Cienc. For. Y Del Ambient.* **2015**, *21*, 5. [CrossRef]
123. Gavito, M.E.; Pérez-Castillo, D.; González-Monterrubio, C.F.; Vieyra-Hernández, T.; Martínez-Trujillo, M. High compatibility between arbuscular mycorrhizal fungal communities and seedlings of different land use types in a tropical dry ecosystem. *Mycorrhiza* **2008**, *19*, 47–60. [CrossRef]
124. Gómez-Ruiz, P.A.; Sáenz-Romero, C.; Lindig-Cisneros, R. Early performance of two tropical dry forest species after assisted migration to pine–oak forests at different altitudes: Strategic response to climate change. *J. For. Res.* **2020**, *31*, 1215–1223. [CrossRef]
125. González-Díaz, G. *Restauración de la Selva Baja Caducifolia en la Reserva de la Biosfera Chamela-Cuixmala, Jalisco: Un Enfoque Experimental Usando Comunidades Sintéticas*; UNAM: Mexico City, Mexico, 2002.
126. Gonzalez-Tokman, D.; Barradas, V.L.; Boege, K.; Dominguez, C.; Del-Val, E.; Saucedo, E.; Martínez-Garza, C. Performance of 11 tree species under different management treatments in restoration plantings in a tropical dry forest. *Restor. Ecol.* **2018**, *26*, 642–649. [CrossRef]
127. Gove, A.D.; Majer, J.D.; Rico-Gray, V. Methods for conservation outside of formal reserve systems: The case of ants in the seasonally dry tropics of Veracruz, Mexico. *Biol. Conserv.* **2005**, *126*, 328–338. [CrossRef]
128. Gove, A.D.; Majer, J.D.; Rico-Gray, V. Ant assemblages in isolated trees are more sensitive to species loss and replacement than their woodland counterparts. *Basic Appl. Ecol.* **2009**, *10*, 187–195. [CrossRef]
129. Griscom, H.P.; Ashton, M.S. Restoration of dry tropical forests in Central America: A review of pattern and process. *For. Ecol. Manag.* **2011**, *261*, 1564–1579. [CrossRef]
130. Guevara-Escobar, A.; Gonzalez-Sosa, E.; Suzan-Azpiri, H.; Malda-Barrera, G.; Diaz, M.M.Y.; Gomez-Sanchez, M.; Hernandez-Sandoval, L.; Pantoja-Hernandez, Y.; Olvera-Valerio, D. Potential distribution of some leguminous shrubs in the Central Highlands of Mexico. *Agrociencia* **2008**, *42*, 703–716.
131. Hernández, Y.; Boege, K.; Lindig-Cisneros, R.; Del-Val, E. Lepidopteran herbivory in restored and successional sites in a tropical dry forest. *Southwest. Nat.* **2014**, *59*, 66–74. [CrossRef]
132. Hernandez-Muciño, D.; Sosa-Montes, E.; Ceccon, E. Leucaena macrophylla: An ecosystem services provider? *Agrofor. Syst.* **2015**, *89*, 163–174. [CrossRef]
133. Huante, P.; Ceccon, E.; Orozco-Segovia, A.; Sánchez-Coronado, M.E.; Acosta, I.; Rincón, E. The role of arbuscular mycorrhizal fungi on the early-stage restoration of seasonally dry tropical forest in Chamela, Mexico. *Rev. Árvore* **2012**, *36*, 279–289. [CrossRef]
134. Juan-Baeza, I.; Martínez-Garza, C.; Del-Val, E. Recovering More than Tree Cover: Herbivores and Herbivory in a Restored Tropical Dry Forest. *PLoS ONE* **2015**, *10*, e0128583. [CrossRef]
135. Laborde, J.; Corrales-Ferrayola, I. Direct seeding of *Brosimum alicastrum* Sw. (Moraceae) and *Enterolobium cyclocarpum* (Jacq.) Griseb. (Mimosaceae) in different habitats in the dry tropics of Central Veracruz. *Acta Botánica Mex.* **2012**, *100*, 107–134. [CrossRef]
136. Lira-Caballero, V.G.; Martínez-Menez, M.R.; Romero-Manzanares, A.; García-Moya, E. Initial floristic composition of rehabilitated gullies through bioengineering in the Mixteca Region, Sierra Madre del Sur, Mexico. *J. Mt. Sci.* **2018**, *15*, 2120–2135. [CrossRef]
137. López-Barrera, F.; Manson, R.H.; Landgrave, R. Identifying deforestation attractors and patterns of fragmentation for seasonally dry tropical forest in central Veracruz, Mexico. *Land Use Policy* **2014**, *41*, 274–283. [CrossRef]
138. Lopez-Jimenez, L.N.; Duran-Garcia, R.; Dupuy-Rada, J.M. Recuperación de la estructura, diversidad y composición de una selva mediana subperennifolia en Yucatán, México. *Madera Y Bosques* **2019**, *25*, 17. [CrossRef]
139. Lopez-Toledo, L.; Horn, C.; Endress, B.A. Distribution and population patterns of the threatened palm Brahea aculeata in a tropical dry forest in Sonora, Mexico. *For. Ecol. Manag.* **2011**, *261*, 1901–1910. [CrossRef]
140. Meave, J.A.; Flores-Rodríguez, C.; Pérez-García, E.A.; Romero-Romero, M.A. Edaphic and Seasonal Heterogeneity of Seed Banks in Agricultural Fields of a Tropical Dry Forest Region in Southern Mexico. *Bot. Sci.* **2012**, *90*, 287. [CrossRef]
141. Méndez-Toribio, M.; Benítez-Malvido, J.; Zermeño-Hernández, I.E.; Castillo-Mandujano, J. Removal of Climbing Plants and Soil Plowing as a Strategy to Enhance Forest Recovery in Tropical Dry Forests Old Fields. *Ecol. Restor.* **2019**, *37*, 113–122. [CrossRef]
142. Monterrubio-Rico, T.C.; Renton, K.; Ortega-Rodríguez, J.M.; Pérez-Arteaga, A.; Cancino-Murillo, R. The Endangered yellow-headed parrot Amazona oratrix along the Pacific coast of Mexico. *Oryx* **2010**, *44*, 602–609. [CrossRef]
143. Monterrubio-Rico, T.C.; Álvarez-Jara, M.; Tellez-Garcia, L.; Tena-Morelos, C. Nesting habitat characterization for *Amazona oratrix* (Psittaciformes: Psittacidae) in the Central Pacific, Mexico. *Rev. Biol. Trop.* **2014**, *62*, 1053–1072. [CrossRef]
144. Moreno-Casasola, P.; Paradowska, K. Especies útiles de la selva baja caducifolia en las dunas costeras del centro de Veracruz. *Madera Y Bosques* **2009**, *15*, 21–44. [CrossRef]
145. Negreros-Castillo, P.; Apodaca-Martinez, M.; Mize, C.W. Efecto de sustrato y densidad en la calidad de plántulas de cedro, caoba y roble. *Madera Y Bosques* **2010**, *16*, 7–18. [CrossRef]
146. Osorio-Beristain, M.; Rodríguez, A.; Martínez-Garza, C.; Alcalá, R.E. Relating flight initiation distance in birds to tropical dry forest restoration. *Zoologia* **2018**, *35*, 1–6. [CrossRef]
147. Renton, K.; Salinas-Melgoza, A.; Rueda-Hernández, R.; Vázquez-Reyes, L.D. Differential resilience to extreme climate events of tree phenology and cavity resources in tropical dry forest: Cascading effects on a threatened species. *For. Ecol. Manag.* **2018**, *426*, 164–175. [CrossRef]

148. Reyes-Reyes, G.; Baron-Ocampo, L.; Cuali-Alvarez, I.; Frias-Hernandez, J.; Olalde-Portugal, V.; Fregoso, L.V.; Dendooven, L. C and N dynamics in soil from the central higlands of Mexico as affected by mesquite (*Prosopis* spp.) and huizache (*Acacia tortuoso*): A laboratory investigation. *Appl. Soil Ecol.* **2002**, *19*, 27–34. [CrossRef]
149. Rodríguez-Larramendi, L.A.; Cortes, M.S.S.; Ruiz, M.C.G. Useful trees of the secondary deciduous tropical forest in Villa Allende Forest Reserve, Chiapas, Mexico. *Acta Bot. Mex.* **2018**, *125*, 189–214. [CrossRef]
150. Sanchez-Soto, B.H.; Pacheco-Aispuro, E.; Reyes-Olivas, A.; Lugo-Garcia, G.A.; Casillas-Alvarez, P.; Sauceda-Acosta, C.P. Ruptura de latencia física en semillas de Caesalpinia platyloba S. Watson. *Interciencia* **2016**, *41*, 691–695.
151. Sánchez-Velásquez, L.; Quintero-Gradilla, S.; Aragón-Cruz, F.; Pineda-López, M. Nurses for Brosimum alicastrum reintroduction in secondary tropical dry forest. *For. Ecol. Manag.* **2004**, *198*, 401–404. [CrossRef]
152. Sanfiorenzo-Barnhard, C.; García-Barrios, L.; Meléndez-Ackerman, E.; Trujillo-Vásquez, R. Woody Cover and Local Farmers' Perceptions of Active Pasturelands in La Sepultura Biosphere Reserve Buffer Zone, Mexico. *Mt. Res. Dev.* **2009**, *29*, 320–327. [CrossRef]
153. Saynes, V.; Hidalgo, C.; Etchevers, J.D.; Campo, J.E. Soil C and N dynamics in primary and secondary seasonally dry tropical forests in Mexico. *Appl. Soil Ecol.* **2005**, *29*, 282–289. [CrossRef]
154. Siddique, I.; Gavito, M.; Mora, F.; Godínez Contreras, M.d.C.; Arreola, F.; Pérez-Salicrup, D.; Martínez-Ramos, M.; Balvanera, P. Woody species richness drives synergistic recovery of socio-ecological multifunctionality along early tropical dry forest regeneration. *For. Ecol. Manag.* **2021**, *482*, 118848. [CrossRef]
155. Solis-Gabriel, L.; Mendoza-Arroyo, W.; Boege, K.; Del-Val, E. Restoring lepidopteran diversity in a tropical dry forest: Relative importance of restoration treatment, tree identity and predator pressure. *PeerJ* **2017**, *5*, e3344. [CrossRef]
156. Soto-Correa, J.C.; Cambron-Sandoval, V.H.; Renaud-Rangel, R. Atributos de las especies arbóreas y su carbono almacenado en la vegetación del municipio de Querétaro, México. *Madera Y Bosques* **2019**, *25*, 18. [CrossRef]
157. Suarez, A.; Williams-Linera, G.; Trejo, C.; Valdez-Hernández, J.I.; Cetina-Alcalá, V.M.; Vibrans, H. Local knowledge helps select species for forest restoration in a tropical dry forest of central Veracruz, Mexico. *Agrofor. Syst.* **2012**, *85*, 35–55. [CrossRef]
158. Valdez-Hernández, M.; Gil-Medina, R.; López-Martínez, J.O.; Torrescano-Valle, N.; Cabanillas-Terán, N.; Islebe, G.A. Succession and the Relationship between Vegetation and Soil in the Marl Quarries of the Yucatan Peninsula, Mexico. *Forests* **2019**, *10*, 116. [CrossRef]
159. Williams, D.R.; Alvarado, F.; E Green, R.; Manica, A.; Phalan, B.; Balmford, A. Land-use strategies to balance livestock production, biodiversity conservation and carbon storage in Yucatán, Mexico. *Glob. Chang. Biol.* **2017**, *23*, 5260–5272. [CrossRef] [PubMed]
160. Williams-Linera, G.; Alvarez-Aquino, C.; Hernández-Ascención, E.; Toledo, M. Early successional sites and the recovery of vegetation structure and tree species of the tropical dry forest in Veracruz, Mexico. *New For.* **2011**, *42*, 131–148. [CrossRef]
161. Yáñez-Espinosa, L.; Flores, J.; Millán, P.S.R.; Méndez, G.R. Influence of germination date on *Dioon edule* (Zamiaceae) seedling tolerance to water stress. *J. Plant Res.* **2014**, *127*, 413–422. [CrossRef]
162. Zepeda-Gómez, C.; Burrola-Aguilar, C.; White-Olascoaga, L.; Rodríguez-Soto, C. Especies leñosas útiles de la selva baja caducifolia en la Sierra de Nanchititla, México. *Madera Y Bosques* **2017**, *23*, 101–119. [CrossRef]
163. Zulueta-Rodriguez, R.; Hernandez-Montiel, L.G.; Murillo-Amador, B.; Cordoba-Matson, M.V.; Lara, L.; Chavez, I.A. Survival and growth of *Jacaratia mexicana* seedlings inoculated with arbuscular mycorrhizal fungi in a tropical dry forest. *Madera Y Bosques* **2015**, *21*, 161–167.