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# Social Well-Being and the challenges in the Sustainable Development Goals

Perspectives from Mexico

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# Sustainability of Communal Enterprises in the New Institutional Economics in Mexico

# 12

Juan Regino Maldonado , Marco Ricardo Téllez Cabrera ,  
Verónica Hernández Mendoza ,  
and María Guadalupe Obregón Sánchez 

## Abstract

The research examines forest sustainability in the timber production of communal enterprises of the new institutional economics (NIE), from the perspective of socio-ecological systems (SESs), considering 8 categories or first-order variables, of which 6 are internal and 2 are external to the forest system. The research was designed under the methodological requirements of case studies on two enterprises. The Communal Forestry and Agricultural Services Unit of Ixtlán de Juárez, Oaxaca (UCFAS by its acronym in Spanish) and the Forestry Utilization and Integral Development Unit of Nuevo San Juan Parangari-

cutiro, Michoacán (UAFyDI by its acronym in Spanish). Through a structured questionnaire applied to the owners of the enterprises in 2023, the information from the categories included in the research is collected, recorded, and qualitatively analyzed. The study finds that forest sustainability in both cases is related to the interaction between the ecological and social systems present in the communities. It is concluded that the communal forest enterprises have advanced toward forest sustainability mainly related to forest governance with positive implications on the Agenda of the Sustainable Development Goals (SDGs).

## Keywords

New institutional economics · Socio-ecological systems · Communal enterprises · Community forest enterprises · Sustainability

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## 12.1 Introduction

In the last decades of the twentieth century, the institutional approach regained importance because, through the new institutional economics (NIE), a theoretical framework was constructed that places institutions in the mainstream economic discourse and incorporates concepts from social, environmental, business organization, history, and law sciences. The NIE

aims to clarify the role that institutions play in the design and implementation of the rules of the game for the management of productive, technical, mainly natural resources, and how these impact the economy, population, and environment (Alston 2018; Vega and Keenan 2016).

In the economics, formal and informal institutions establish rules, norms, and incentives for the creation and proliferation of conventional enterprises. However, in rural areas, there is empirical evidence that the institutions that make up the community governance system based on autonomy, self-management, and self-organization also establish rules (operational, collective and constitutional), norms, incentives, and sanctions to create and develop communal enterprises (Loreggian et al. 2023; Merino-Pérez 2018; Ostrom 2000; Garibay 2007).

Communal enterprises, mainly in rural areas, emerge in an open economic context with economic crisis, inflation, environmental degradation, and poverty (Peredo and Chrisman 2006). Typically emerging in rural areas, in peasant and indigenous communities, their activities are related to the production, transformation, and marketing of sustainable agricultural and forestry products; in this sense, they respond with proposals on alternative production systems to positive economics, surviving in market niches with low market shares, but with certain income (Oberlack et al. 2015; Engbring and Hajjar 2021; Cabbage 2015).

Communal enterprises of the new institutional economics (CENIE)—the theoretical perspective adopted in this research, given the institutional arrangement presented by the social and productive organization system of these enterprises, can be studied from this approach—emerge as a response to various problems faced by communities settled in rural areas. They have the particularity of organizing around communal land ownership, their own forms of organization, and common objectives (Toledo and Ortíz-Espejel 2014). For example, the slow and limited development of economic activities and the persistence of social deficiencies in the population can lead to an increase in emigration, diseases, and consequently, the mortality of vulnerable populations

(Abrahams and Peredo 1996). Exacerbating their problems, uncontrolled and unregulated anthropogenic activities such as changes in land use due to intensive monoculture practices and population growth, expansion of the agricultural and livestock frontier (SEMARNAT 2003; Gómez-Mendoza et al. 2006). Due to climate change, some communities face serious environmental problems such as loss of forest cover, soil loss, reduction and contamination of water bodies, among the most mentioned in the literature (Azqueta et al. 2007).

In Mexico, as in other countries, one way to address environmental problems was to return the lands to the peasants (White and Martin 2002; Zhang et al. 2000). In 1992, with the reform of Article 27 of the Constitution, land ownership was regulated as private, ejidal, and communal; the latter two known as social property (Muñoz-Piña et al. 2003; Madrid et al. 2009). While ejidal property allows the land to be subdivided into private lots and sold, communal property only allows the land to be subdivided for use, but not sold (Agrarian Law 2002). Changes in agrarian legislation encouraged the creation of forestry enterprises initially known as “work groups” made up of individual owners, under the legal category of Rural Farmers’ Production Societies (Wilshusen 2003). Currently called community forestry enterprises (CFEs) (Antinori and Bray 2005), which in this study we refer to as CENIE. In this sense, these enterprises have tried to contribute to the resolution of environmental problems in communities by developing community governance systems to strengthen collective action in biodiversity conservation and sustainable use of natural resources for local development based on natural sustainability (Tetreault 2004). Therefore, the positive contribution of this business model to the Agenda of the SDGs can be proposed. For example, in addition to the production and marketing of wood, some of these enterprises generate income from the sustainable use of non-timber forest products, ecotourism, water capture and carbon, conservation of wild flora and fauna, among others (Engbring and Hajjar 2021; 2022; Zhang et al. 2021; Toledo et al. 2014). Due to government support through programs such as the program environmental services (PES) and recently “Sem-

brando Vida” in Spanish (Fuente and Marin 2024; Cabbage et al. 2015). Therefore, in this research with a case study design, the forest sustainability of timber production of two communal enterprises located in Oaxaca and Michoacán is examined from the perspective of the NIE based on the SSEs framework (McGinnis and Ostrom 2014).

## 12.2 CENIE

This business model arises from the collective initiative, productive, and environmental experience of communities for sustainable local and regional economic development (Bray et al. 2006; Antinori and Bray 2005). With broad possibilities to positively contribute to achieving several SDGs, particularly 15, on life of terrestrial ecosystems where sustainable forest management under the responsibility of communities is paramount in sustainable development (Tetreault 2004). However, to analyze the CENIE, it is necessary to address the emergence of this type of enterprise, identify the necessary conditions and at the same time, the key factors enhancing their growth. Finally, identify the distinctive features they present compared to conventional enterprises.

### 12.2.1 Emergence of the CENIE

In Mexico between 1940 and 1970, the government authorized concessions to private and parastatal enterprises for forest extraction, which contributed to the proliferation of sawmills and illegal logging (Bray et al. 2006). Between 1974 and 1986, several of the forest extraction concessions granted by the state to private and parastatal enterprises expired, a situation that was taken advantage of by the communities to begin the fight for forest rights. In this way, in Oaxaca, a group of farmers emerged known as the Organization in Defense of Natural Resources and Social Development of the Sierra Juárez (ODRENASIJ by its acronym in Spanish), who proposed the restoration of forest rights in favor of CFEs, and not in the hands of private enterprises and the state (Merino-Pérez and

Segura-Warnholtz 2005). In 1986, the Law ended the concessions to private enterprises for forest extraction and began the dismantling of parastatal forest enterprises. Since then, communities have obtained land ownership rights and, therefore, the management of forest resources for the extraction of timber (Bray et al. 2006). The 1997 Law established the support program for the development of commercial forest plantations (PRODEPLAN by its acronym in Spanish) and the forest development program (PRODEFOR by its acronym in Spanish). The first program aimed to develop productive projects, and the second, to promote the sustainable extraction of natural ecosystems. In 2001, the program for the conservation and sustainable management of forest resources (PROCYMAF by its acronym in Spanish) was created, with the aim of promoting the strengthening of ejido and community organizations, as well as the creation and operation of CFEs, which in this study are referred to as CENIE. In 2009, the same program created the framework to classify them into 4 types, according to the development of their organizational capabilities for the management of natural resources, capitalization, and vertical integration in the forest production chain (Segura-Warnholtz 2014). Type I enterprises, those that have forest resources but do not carry out management activities; Type II enterprises, those that sell their logging rights to private or communal enterprises; Type III enterprises have some forest lands and sell their roundwood, and Type IV enterprises are those that transform forest resources and add value to timber products. From 2011 to the present, this same program was renamed the community forest development program, which promoted the technical training of forest advisors, community organization processes, and continues to support the CFEs (CONAFOR 2013).

### 12.2.2 Necessary Conditions and Growth Enhancers of the CENIE

Communities understood in the space—collectivity relationship must have at least four necessary conditions for the emergence and flourishing

of the CENIE: (i) common-pool resources, (ii) governance system, (iii) social capital, and (iv) development of technological production capabilities.

#### (i) Common-Pool Resources

Large common-pool resources such as oceans and atmosphere are difficult to manage due to the difficulty of establishing limits and property rights (Ostrom and Hess 2007). In this sense, communities with small- and medium-sized pool resources have an advantage over the larger ones. Empirical evidence shows that the sustainability of natural common pool resources in communal property is possible when property rights in communities are clear (access, extraction, management, exclusion, and alienation), and institutional design principles (clearly defined boundaries, coherence between appropriation and provision rules with local conditions, collective choice arrangements, supervision, graduated sanctions, conflict resolution mechanisms, minimum recognition of organizational rights, and nested entities) (Jurjonas et al. 2023; Ostrom 2000; Bassi and Carestiatto 2016).

#### (ii) Governance System

The governance structure in communities for the extraction of common-pool resources is an integration of the indigenous normative system (system of uses and customs represented by the General Assembly of Commoners (GAC)), with the business system of transformation of natural resources (Bray et al. 2006). Under vertical hierarchy, the highest authority is the GAC, which has territorial control and autocratic control of resources and the enterprise (Garibay 2007).

#### (iii) Social Capital

The organization and active involvement of community members is essential for achieving short-, medium-, and long-term objectives and goals set by the community through coordinated and collective actions (Ostrom 1998). This participation ranges from collective work to conserve

or extract natural areas to collective organization for the defense of territory and natural resources.

#### (iv) Development of Technological Production Capabilities

Evidence shows that the productive activities developed by the community are related to the skills and collective experiences acquired by the members of the community before the creation of the enterprise (Peredo and Chrisman 2006; Peredo and McLean 2006). The population of indigenous communities possesses and passes on to future generations ancestral knowledge, which forms part of the culture and worldview of native peoples, related to cultivating the land and sustainable extraction of natural resources. In Mexico since the forties, the farmers as employees of parastatal and private enterprises have developed skills and abilities in the extraction and transformation of timber. The 1986 Law, which transferred the property rights of land and forest resources to the farmers, and the reform to article 27 of the constitution in 1992 forced the commoners to develop technological capabilities to produce timber. Since 2001, programs have been developed to strengthen the management, institutional, and technological capabilities of the enterprises (Cubbage et al. 2015).

### 12.2.3 Distinctive Features of the CENIE

The CENIE based on communal property and management of common-pool resources (Agrawal 2001; Engbring and Hajjar 2021, 2022; Regino et al. 2017). The owners with a humanistic business ethic (Zhang et al. 2021), have the right to extract natural resources, they are families that make up a corporate economic unit based on values of autonomy, self-organization, trust, cooperation, and reciprocity (Ostrom 2009; Garibay 2007). In order of importance, they generally have the following three objectives: sustainability of common-pool resources, social welfare, and economic benefits (Lueck 1994; Regino et al. 2017).

According to Garibay (2007), in Mexico the CFEs or the CENIE are the result of five features that characterize them: (i) the members are descendants of farmers from indigenous cultures of small communities; (ii) they own large extensions of communal territory and forest resources that are managed and extracted by a single

economic unit for forest extraction; (iii) they have a centralized and hierarchical administration; they organize the extraction and transformation of wood into timber products that are sold in local, regional, and global market networks; (iv) they develop strong local systems of self-government, and self-organization with a certain

**Table 12.1** Distinctive sustainability features of CENIE

Features	CENIE	Positive economic enterprises	Social and solidarity economic enterprises
Owner	Community members who are entrepreneurs and workers at the same time	Entrepreneur, shareholders, private cooperative partners	Entrepreneur, private cooperative partners
Main objective	Sustainability of common pool resources	Maximization of profits	Social welfare
Secondary objectives	Social welfare Economic welfare	Competitiveness	Environmental care Economic welfare
Distribution of benefits	Profits for community members Reinvestment in physical and productive capital Social infrastructure Culture Sustainability of common pool resources	Entrepreneur, shareholder, partners	Entrepreneur, partners, community, and environment
Values	Autonomy Self-management Trust Cooperation Reciprocity	Leadership Individualism	Autonomy Self-management Solidarity Cooperation
Land tenure	Communal	Private	Private Ejidal
Property rights	Access Extraction Management Exclusion Alienation (No sale-transfer)	Access Extraction Management Exclusion Alienation (Sale)	Access Extraction Management Exclusion Alienation (Sale)
Organizational structure	Hierarchical-vertical-autocratic Indigenous normative systems Business system	Hierarchical-horizontal-democratic	Hierarchical-vertical-autocratic Indigenous normative systems Business system
Productive activities	Timber forest products Non-timber forest products Ecotourism Biodiversity Conservation Water capture Carbon capture	Agroindustry	Agriculture Livestock Artisanal Cultural Food and beverage production

Source Prepared by the authors based Ostrom (2000), Garibay (2007), Peredo and Chrisman (2006), Barkin et al. (2009), Hernández et al. (2020)

degree of autonomy from external powers; and (v) they construct the community ethos of values and practices according to their social order. Table 12.1 presents the main distinctive features of CENIE that distinguish it from conventional enterprises and the model of social and solidarity economicenterprises.

### 12.3 Sustainability of the CENIE

Recently, the NIE has delved into the institutional approach for the management of common pool resources (Caballero and Garza 2010; Leslie et al. 2015). An example of this is the academic work of Elinor Ostrom regarding the role of governance of common pool resources, and the importance of developing a framework for assessing the sustainability of socio-ecological systems (SESs) (McGinnis and Ostrom 2014; Ostrom 2009, 2000). Where the social system is interdependent with human organisms, while the ecological system is interdependent with biophysical organisms or units (Berkes and Folke 1998). That is, both

contain organisms that interact interdependently, and may contain individually interactive subsystems. Anderies et al. (2004) define SESs as a subset of social systems in which some of the interdependent relationships between human organisms are mediated through interactions with non-human biophysical units. Ostrom developed a framework of social and ecological variables for the analysis of the sustainability of SESs (McGinnis and Ostrom 2014). In Fig. 12.1, Ostrom proposes to focus the analysis on 8 categories or first-order variables, of which 6 are internal: Focal action situations composed of interactions (I) and outcomes (O); resource system (RS), resource units (RU), governance system (GS), and actors (A)), and 2 are external to the system (social, economic, and political environment (SEPE) and related ecosystems (RE)). In the focal action situations, the multi-linked interactions between the 4 main variables of the framework (RS, RU, GS, and A) take place; on management practices and different aspects related to the preservation, conservation, extraction, and sustainability assessment of common pool resources. In which, the impact and modifica-

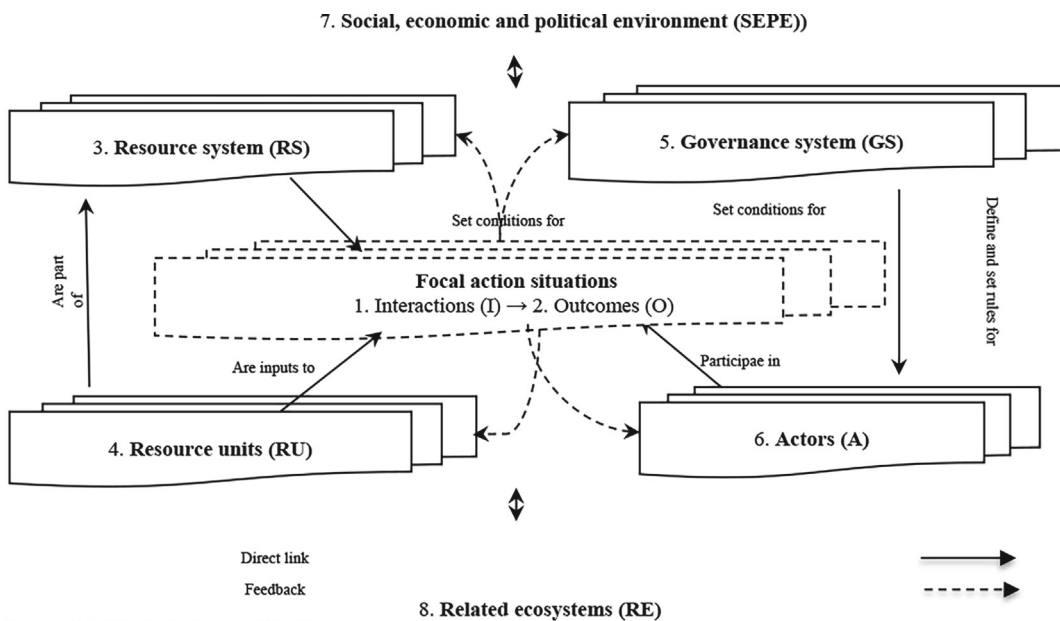


Fig. 12.1 Sustainability of SSEs. Source McGinnis and Ostrom (2014)

tion of the outcomes from external factors (SEPE, RE) are also considered.

## 12.4 Methodology

### 12.4.1 Type of Study

As this is an exploratory but in-depth study of the sustainability of the CENIE in Mexico. It begins with a qualitative study designed under the requirements of a case study (Caulley and Dowdy 1987; Yin n.d.). As indicated in Table 12.2, based on the SESs framework (McGinnis and Ostrom 2014), out of a total of 8 categories, 22 dimensions with 48 indicators are identified, of which only information on some of these was obtained, which is presented in the results. However, they proved quite useful for analyzing the forest sustainability of timber production of the two case studies in 2023.

### 12.4.2 Measurement Instrument, Information Analysis, and Results Presentation

A structured questionnaire in two parts was designed as an instrument for data collection, targeting community members and enterprise directors. The first part collected socioeconomic information about the enterprise (enterprise name and address, municipality, number of community members, education, gender and age of community members, main products, and timber volumes). The second part contains specific questions about the 48 sustainability indicators. The study is complemented with qualitative information from community visits and direct observation (Flick 2007), open interviews with key informants from the enterprises (Guber 2011). The information obtained from the main indicators was concentrated in each of the 22 dimensions that correspond to each of the 8 categories of sustainability analysis of the enterprises. The qualitative research evaluated its scientific rigor through different criteria, such as saturation that were validated in the methodological procedure of the study

(Palacios-Izcarra 2014; Denzin and Lincoln 2012). Finally, the results are presented by enterprise cases in two sections. The first presents socioeconomic information about the enterprise, and the second presents the main results of each of the 8 categories.

## 12.5 Results

### 12.5.1 Emergence of the UCFAS

The UCFAS is located in the municipality of Ixtlán de Juárez, belonging to the Central-North Region of the state of Oaxaca, in the foothills of the Sierra Madre known as Sierra Juárez. The communities of Santiago Textitlán, Ixtlán de Juárez, and Pueblos Mancomunados located in the Sierra Sur and Norte de Oaxaca are grouped in the Integradora Comunal Forestal de Oaxaca, S.A. de C.V. (ICOFOSA by its acronym in Spanish); with a trajectory of more than 25 years, they are evidence that organized communities achieve sustainable schemes for the management of common extraction forest resources. The integrator promotes the manufacture, industrialization, and marketing of wooden furniture. The Communal Forestry Agricultural and Services Unit (UCFAS by its acronym in Spanish) of Ixtlán de Juárez is one of the economic units of ICOFOSA, which started its operations in July 1988, with the objective of generating added value to wood through sustainable industrial transformation (Regino et al. 2015).

#### 12.5.1.1 Forest Sustainability

Focal action situations:

1. *I. 1. Production, transformation, and sale of wood.* During the 24 months of the study, they extracted 15,328.86 m<sup>3</sup> of roundwood, from which they obtained 7,917.05 m<sup>3</sup> of sawn wood. A portion of the wood was sold to the construction sector, and the other part was used in the manufacture of furniture for homes, schools, and offices. This wood went

**Table 12.2** Forest sustainability of UCFAS-Oaxaca and UAFyDI-Michoacán

Category	Dimension	Indicator
1. Interactions (I)	1. Production, transformation, and sale of timber	1. Roundwood (m <sup>3</sup> )
		2. Sawn wood (m <sup>3</sup> )
		3. Kiln-dried wood (m <sup>3</sup> )
		4. Finger joint board (m <sup>2</sup> )
2. Outcomes (O)	2. Forest sustainability	5. Certified wood (m <sup>3</sup> )
3. Forest Resource System (FRS)	3. Forest resource extraction limits	6. Area for timber extraction (ha)
	4. Size of the forest resource system	7. Total forest area (ha)
4. Forest Resource Units (FRU)	5. Tree species growth	8. Tree height (m)
		9. Tree crown diameter (m)
		10. Harvested pine volume (m <sup>3</sup> )
	6. Economic values	11. Technological assets (\$)
		12. Finished products (\$)
5. Forest Governance System (FGS)	7. Governmental organizations	13. Number of federal organizations
		14. Number of state, municipal, and local organizations
	8. Non-governmental organizations	15. Number of international non-governmental organizations
		16. Number of national non-governmental organizations
		17. Number of state, municipal, and local non-governmental organizations
	9. Network structure	18. Links with financial institutions
		19. Links with raw material suppliers
		20. Links with technology providers
		21. Links with local, state, national, and international customers
		22. Links with other communities for knowledge exchange and transfer
	10. Property regime	23. Private property (ha)
		24. Ejido property (ha)
		25. Communal property (ha)
	11. Forest management operation rules	26. Forest cultivation rules
27. Forest extraction rules		
28. Forest transformation rules		
12. Collective rules	29. Collective rules for conservation, management, and forest extraction in the communal statute	
	30. Collective rules for conservation, management, and forest extraction in territorial planning	
13. Constitutional rules	31. Collective rules for conservation, management, and extraction in the National Forest Program	
14. Monitoring and sanction rules	32. Forest monitoring rules in the communal statute	
	33. Rules for social, cultural, economic, and environmental organization in the communal statute	
	34. Rules for sanctions and punishments of community members in the communal statute	

(continued)

**Table 12.2** (continued)

Category	Dimension	Indicator
6. Actors (A)	15. Number of relevant actors	35. Number of community members
		36. Number of ejido members
		37. Number of participating communities
	16. Past experiences	38. Number of years dedicated to cultivation, extraction, and transformation of wood
		39. Number of years in forest management
		40. Number of years in forest certification
	17. Collective leadership	41. Autonomous community organizational structure, self-managed and self-organized
18. Dependence on timber forest resources	42. Income from timber forest resources (%)	
7. Social, economic, and political environment (SEPE)	19. Economic development	43. Area of secondary trees (ha)
	20. Markets	44. Value of timber production (\$)
	21. Technology	45. Use of advanced technology for cultivation, extraction, and transformation of wood (%)
46. Use of basic technology for cultivation, extraction, and transformation of wood (%)		
8. Related ecosystems (RE)	22. Climate patterns	47. Temperature ( ° C)
		48. Precipitation (mm)

Source Prepared by the authors based on McGinnis and Ostrom (2014)

- through a drying process and transformation into *finger-joint* boards for furniture making.
2. **R. 2. Forest sustainability.** The roundwood comes from their forests under forest management with the clearcutting method and includes pine species *Patula*, *Seuodtrobus*, *Ayacahuite*, and *Oaxacana*, the latter being the most extracted species. In 2000, the enterprise received the national forestry merit award from the Ministry of the Environment and Natural Resources (SEMARNAT by its acronym in Spanish) for sustainable forest management. Years later, it obtained the certification for good forest management from the Forest Stewardship Council through Rain Forest and Smartwood in 2001 and 2006. It also obtained the chain of custody certification from the same institution in 2006 and 2011.
  3. **FRS. 3. Limits of forest resource extraction, 4. Size of the forest resource system.** The enterprise belongs to the primary forestry sector, with a forest resource system size of 19,280 ha, of which 6,890.64 ha are montane cloud forest and jungles, and 12,389.50 ha are tropical forests (Technical Services 2010). According to the forest management program in 2006, 3,492.25 ha were allocated for forest extraction, with an extraction limit of up to a third of 6,832 ha.
  4. **FRU. 5. Growth of tree species and harvested pine volume ( $m^3$ ).** The average annual harvested pine volume mainly ranges between 20,000 and 22,000  $m^3$  of log-board-tree.
  6. **Economic values.** The enterprise has an industrial area of 9,000  $m^2$ , technological assets valued at 50.7 million of Mexican pesos, and a production capacity of 9,500 pieces of furniture per month in its three factories. The enterprise has made significant contracts with the Oaxaca State Public Education Institute; in 2006 it had a contract for 1.5 million dollars for the manufacture of school furniture.
  5. **FGS. 7. Governmental organizations, 8. Non-governmental organizations, 9. Network struc-**

- ture, 10. Property regime, 11. Forest management operation rules, 12. Collective rules, 13. Constitutional rules, 14. Sanction and monitoring rules.* The community's sustainable timber production is largely due to the forest governance system, which consists of a normative system of customs and a business system that organizes production under a communal land tenure regime. The forest governance system presents a series of information and knowledge transfer links to the communities and enterprise by federal institutions (CONABIO, SEDESOL, SEMARNAT, COINBIO, CONAFOR all of them, by their acronyms in Spanish), international non-governmental organizations (USAID, WWF, Forest Stewardship Council, Smartwood), municipal governmental institutions, local and communal authorities. The municipality of Ixtlán de Juárez has a communal statute in force since 2005, where the highest authority is the General Assembly of Commoners (GAC), composed of the Communal Property Commissariat (CPC), Surveillance Council (SC), and Communal Council (CC), positions that are renewed every three years, and the GAC is responsible for making decisions about forest management, establishing operational rules for cultivation, extraction, and transformation of wood, and collective rules for conservation, management, and forest extraction, within the framework of current environmental laws. The SC coordinates the forest rangers and technicians who are in charge of monitoring the forest resources; in addition to overseeing the actions of the commoners, they establish sanctions and punishments for commoners who do not participate in the activities inherent to forest management, which can range from the collection of monetary fines to expulsion from the community.
6. **A.** *15. Number of relevant actors, 16. Past experiences, 17. Collective leadership, 18. Dependence on timber forest resources.* The municipality has 4,500 inhabitants, of which 372 are commoners, of these 70 commoners hold positions in the GAC related to forest management, with leadership and experience of more than 25 years in silviculture. In the enterprise, 117 commoners work who are also partners of the enterprise, of which 44 are women and 73 are men.
7. **SEPE.** *19. Economic development, 20. Markets, 21. Technology.* The enterprise operates in market niches of medium and high-income customers who demand certified wood from sustainably managed forests. The enterprise's main markets are in the states of Oaxaca, Puebla, Guanajuato, and Mexico City. The sawmill has state-of-the-art technological equipment from Germany, and the wood-drying facility has stoves of Italian origin.
8. **RE.** *22. Climate patterns.* In Ixtlán, four types of climates are present that favor forest ecosystems and biodiversity: (i) intermediate humidity subhumid-temperate (oak-pine forest, pine-oak); (ii) high humidity subhumid-temperate (oak-pine forest, pine-oak forest, pine-fir); (iii) humid temperate (pine-oak forest, cloud forest); and (iv) warm humid (high evergreen jungle) (Aquino et al. 2012).
- Therefore, the UCFAS is primarily dedicated to tree cultivation, logging, sawing, and furniture manufacturing for sale in the local market. The wood comes from forests under forest management programs that have delimited extraction and forestry use areas, such as the control of the annual harvested volume of roundwood. Ixtlán de Juárez has a communal statute in which the GAC establishes the operational rules, collective in congruence with the constitutional ones to which the commoners are subject to carry out forest management in accordance with forest development programs, and current environmental laws. The community has developed a system of forest governance of uses and customs, and business with a large number of links and collaboration networks with institutions at their different spatial scales for the generation and transfer of silvicultural knowledge. A third of the commoners with the most experience in silviculture work in the enterprise, with high participation of women. The growing demand for

sawn wood and furniture has been met by good forestry practices and favorable climatic conditions, which has led to the expansion of their market niches at the national level, without undermining the sustainability of the forests.

## 12.5.2 UAFyDI

### 12.5.2.1 Emergence of the UAFyDI

The origin of the P'urhépecha community of San Juan Parangaricutiro dates back to the colonial era. Following the eruption of the Paricutín volcano in 1943, the community relocated to a place called Nuevo San Juan Parangaricutiro (NSJP), currently the head of the Parangaricutiro municipality (CONAFOR 2022). Legally recognized by presidential resolution in 1991, in accordance with the Agrarian Law (Chamber of Deputies 2023). In this sense, NSJP maintains the inalienability, imprescriptibility, and unseizability of communal lands, and the CPC as the representative and administrative management body of the GAC (UNDP 2012, 2023).

In 1981, the indigenous community of NSJP, while implementing the communal regime, began the implementation of the forestry enterprise with two separate economic units, the Forestry Use Unit and the Integral Development Unit. These were later integrated into a single entity known as the Forestry Use and Integral Development Unit (UAFyDI by its acronym in Spanish), responsible for activities throughout the timber production chain up to the obtaining of finished products (Anguiano-Cuara n.d.).

The community also has other non-timber forest product enterprises such as Mudemar and a resin and polymer distillery; agricultural extraction enterprises (orchards and fertilizer marketing), ecotourism, and service provision to the local population (television and internet, bottled water, and communal store). Other projects that could also be considered communal enterprises are related to urban transport service, agricultural improvement for the management and conservation of springs and the water cycle (Del-Castillo 2020), and sale of forest carbon (Climatereserve 2023).

### 12.5.2.2 Forest Sustainability

Focal action situations:

1. **I. 1. Production, transformation, and sale of wood.** The communal enterprise produces wooden floors, pallets for the agri-food industry, moldings for the carpentry industry, and sawn wood for construction.
2. **R. 2. Forest sustainability.** The roundwood comes from their forests under forest management certified by Forest Stewardship Council through Rain Forest and Smartwood. In 90% of the area, they apply the silvicultural development method, with a cutting cycle of 10 years. In the other 10% of the area, they apply the conservation method; where only 20% of the wood is extracted, as the objective is to maintain the natural and preserved forest. Notable pine species include *Pseudostrobus*, *Montezumae*, *leiophylla*, and *Michoacana*, in fir, *A. Religiosa*, and among the oaks, *Q. Candicans*, *Q. Rugosa*, and *Q. Laurina*; and among the Betulaceae, the alder (*Alnus jorulensis*) stands out.
3. **FRS. 3. Limits of forest resource extraction, 4. Size of the forest resource system.** The enterprise, belonging to the primary forest sector, has a forest resource system of 18,138 ha, of which 10,500 ha are pine surfaces (Fir, Oak, Quercus, and Alder). With the current forest management program in 2024, around 9,500 ha are under an intensive extraction method, another 1,000 ha are commercial forest plantations, and 382 ha are forests with high conservation value and are under strict protection by the community.
4. **FRU. 5. Growth of tree species and harvested volume of pine ( $m^3$ ).** From its inception to the present, the average annual volume of authorized forest extraction is 65,000  $m^3$ .
6. **Economic values.** The enterprise has two sawmills, one with traditional technology and another with automated technology. It also has a sharpening workshop and a maintenance workshop, a spare-parts warehouse, a drying stove area, a secondary area, and a furniture factory.

5. **FGS.** 7. *Governmental organizations*, 8. *Non-governmental organizations*, 9. *Network structure*, 10. *Property regime*, 11. *Operational rules of forest management*, 12. *Collective rules*, 13. *Constitutional rules*, 14. *Sanction and monitoring rules*. The community maintains a system of family possession in a communal regime dating back to 1981. The forest has been common property since 1991. Forest governance is made up of an internal government system of customs and traditions, and a business system. In the former, the highest decision-making body is the GAC. The board appointed by GAC is made up of the CPC, SC, and CC, whose board is renewed every three years and is responsible for making decisions about the community and with respect to the enterprise. In the latter, the enterprise's management is subordinate to the GAC and reports to the CPC and the SC. The communal statute in force since 2006 specifies the functional structure and the organs of enterprise administration. For forest management, the economic unit maintains a collaboration network with federal organizations (CONAFOR, INAES—all them by their acronym in Spanish), non-governmental organizations (Forest Stewardship Council, WWF), educational and research institutions (Autonomous University of Mexico, Autonomous University of Chapingo; Michoacana University of San Nicolás de Hidalgo), and local organizations (Alliance of Ejidos and Certified Forest Communities of Mexico). The communal statute of the community indicates that, based on the territorial planning study, customs and traditions and current legislation (Agrarian Law, General Law of Sustainable Forest Development and Law of the Social and Solidarity Economy); both the operational rules for the cultivation, extraction and transformation of the wood, and collective rules of conservation, management and forest extraction are established by the GAC, who must consider the needs of the commoners, communal enterprises, agreements signed with external organizations and other actors involved in forest management.
- Also, in said statute it is established that the SC is responsible not only for monitoring the actions of the enterprise's member commoners but also for forest monitoring.
6. **A.** 15. *Number of relevant actors*, 16. *Past experiences*, 17. *Collective leadership*, 18. *Dependence on timber forest resources*. In 2020 NSJP had a total population of 16,745 inhabitants, of which approximately 7,500 were directly related to forest management, and 1,254 commoners were landowners of agricultural and forest lands. In this year, the UAFyDI provided 57% of the jobs generated by NSJP (approximately 680 people between permanent and temporary). Since the enterprise was founded to the present, for more than 50 years the commoners have accumulated knowledge about cultivation, extraction, transformation, and marketing of wood. Experiences and learnings from forest management that range from the struggle for the recognition of their communal lands, recognitions of merit and forest certification, to the drafting of the communal statute in 2006. Where, collective leadership has been fundamental to the achievement of their goals, based on the strengthening of indigenous identity, in which belonging to the territory, trust, reciprocity, and cooperation have played a fundamental role in the strengthening of the collective action of the NSJP commoners.
7. **SEPE.** 19. *Economic development*, 20. *Markets*, 21. *Technology*. The main timber products such as wooden floors, pallets, sawn wood, and wooden moldings are mainly sold in Michoacán and Mexico City. However, the demand for their timber products is growing in the markets of the United States, Belgium, and Spain. For this, the enterprise has an automated sawmill that optimizes production processes and uses solar energy. It also employs new digital technologies in the development of forest management plans to georeference the places of wood extraction.
8. **ER.** 22. *Climate patterns*. The forests of NSJP are at an average height of 2,550 masl under a temperate humid climate. Average temperature

of 18 °C and abundant rains in summer, which favor forest resources.

The UAFyDI is mainly dedicated to the cultivation, extraction of certified round and sawn wood from forests under forest management. It also transforms the wood for the marketing of wooden floors, pallets, and moldings. They have around 10,500 ha of pines, of which 9,500 ha are under intensive extraction, with an average annual volume of 65,000 m<sup>3</sup> of round wood. The forest governance system is made up of an internal government system of customs and traditions, and a business system, where the GAC is the main control and decision-making body. Decisions are made in accordance with its communal statute of 2006. It also establishes the operational and collective rules for forest monitoring. The enterprise, with over 50 years of experience in community forestry and around 20 years in forest management, has managed to develop a wide network of collaborations with local to international institutions. In 2020, the enterprise had 1,254 community members, many of whom have many years of experience in forest management, production, transformation, and marketing of timber products. The use of digital technologies for georeferencing timber extraction areas and automated machinery for its transformation has contributed to meeting national and foreign demand. Finally, favorable weather conditions have aided in the conservation and utilization of forests.

of forest resources based on the presence, relationships, and interactions between these two system elements. This analysis primarily differs from conventional sustainability assessments of food agroecosystems such as the MESMIS (by its acronym in Spanish) framework (Masera et al. 1999), comprehensive tools for evaluating the multidimensional performance of agroecosystems in terms of sustainability (Mottet et al. 2020), or the sustainability assessment of traditional agroecosystems (Palestina-González et al. 2021).

The study results show that, in the two cases of the enterprises studied, forest sustainability is related on one hand to the ecological systems present in the community, such as the large expanses of common-use forests that provide humans with ecosystem services of provision (wood, water, etc.), regulation (carbon capture, climate regulation, etc.), cultural (recreational), and support (nutrient recycling, soil formation, etc.) (Kandziora et al. 2013). It should be noted that, under pressure from peasant organizations, the Mexican state has played a fundamental role in creating the regulatory legal framework through land tenure reforms in 1992, which gave peasants certainty about the ownership of their communal lands (Bray et al. 2006). It placed the management of forest resources under their responsibility and opened the possibility of managing them for their conservation and utilization through the diversification of productive activities, strengthening, and creation of CENIE. On the other hand, forest sustainability is related to social systems. As mentioned earlier, following the land tenure reform, with the aim of extracting forest resources, communities strengthened their collective production organization system based on customs and traditions, which was recognized, for example, in the Political Constitution of the Free and Sovereign State of Oaxaca, in accordance with the principles of Article 115 of the Federal Constitution (Recondo 2001). Where the GAC is the institution responsible for establishing operational and collective rules in accordance with the constitutional ones for the management of forest resources. Over time, this social organization system of timber production evolved into a forest governance system, in

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## 12.6 Discussions

### 12.6.1 Forest Sustainability of CENIE

The study analyzes the forest sustainability of CENIE based on the production of timber from forests certified under the SSEs framework (McGinnis and Ostrom 2014), which studies the relationship between the social and ecological elements of a community under communal land tenure. The aim is to examine the sustainability

which community members and other organizations related to forest conservation and extraction actively and collectively participate, creating and strengthening collaboration networks with different national and international organizations to incorporate new knowledge of forest management, sustainable technologies, and access to new market niches.

### 12.6.2 CENIE and the SDGs

Addressing the economic dimension of the SDGs, CENIE benefits communities by creating jobs and generating income for community members, contributing to the achievement of SDG 8 (decent work and economic growth) and SDG 1 (end of poverty). Regarding the social dimension, some enterprises have provided various services to the population (educational and technological), such as social infrastructure to communities, contributing to SDG 4 (quality education) and SDG 9 (industry, innovation, and infrastructure).

As for the ecological dimension, the enterprises have not only allowed the sustainable extraction of forest resources but have even increased the quantity and improved the quality of natural resources, contributing to SDG 13 (climate action) and SDG 15 (life on land). In response to criticisms of the SDGs, in the sense that they do not incorporate alternatives to development that are not based on conventional economic growth (considering the planet's limits), and that they also do not incorporate the cultural element (Hidalgo-Capitán et al. 2019). The results of this study show that promoting this type of communal business model is very convenient to reduce environmental problems, due to their contribution to the conservation and extraction of common-use natural resources. However, it is necessary to go beyond the SDGs. Indeed, due to the indigenous characteristic present in the two enterprises, which show a greater concern for nature care, they even let go of more profitable exploitation opportunities for the sustainability of forest resources. It should include the cultural component of indigenous peoples closely related to natural resources.

## 12.7 Conclusions

The purpose of the study was to examine the forest sustainability of two communal enterprises, UCFAS and UAFyDI located in Oaxaca and Michoacán, respectively. To achieve this, the SSEs framework was used, which aims to qualitatively evaluate the sustainability of common pool resources through the relationships and interactions found between the ecological and social systems of the system forestry. The two enterprises studied are engaged in the cultivation, extraction, transformation, and marketing of roundwood, saw timber, and finished products such as furniture, pallets, wooden floors, and moldings. They own large forest areas, averaging 18,000 ha. However, UCFAS allocates only 20% of its area to forestry, while UAFyDI allocates about 50% of its area to intensive forestry. UCFAS obtains an average annual harvested volume of pine wood of 20,000–22,000 m<sup>3</sup> of round-table-tree, and UAFyDI 65,000 m<sup>3</sup> of round-table-tree. This indicates that the Michoacan enterprise is highly extractive of its forest resources. However, in both cases, the wood comes from forests certified under forest management, in which extraction and forestry areas are delimited. The large extent of forests owned by the Michoacan enterprise may explain the higher extraction, another being the longevity and greater experience in cultivation and wood production. Given that, UAFyDI began operations in the first decade and UCFAS in the second decade of the eighties. Since then, the communities have been strengthening their forest governance systems, composed of the system of uses and customs, and the business system. Where the GAC is the highest consultative body and decision-making related to forestry and communal enterprises. Both communities had their communal statutes until the first decade of 2000 and are in force. From which, the GACs establish the operational and collective rules related to forest management and wood transformation. Both enterprises have around 50 years of experience in silviculture, and approximately 20 years in forest management. Over their trajectories, they have developed strong ties of collaboration with local to international

institutions, for the transfer of knowledge and technologies.

Finally, in this study being a qualitative study, the analysis of the sustainability of common forest resources based on the 8 categories proposed by McGinnis and Ostrom (2014) was limited to the description of the relationships and interactions between the categories, and convincing explanations of the forest sustainability of the communal enterprises are found. Therefore, the study concludes that the CENIE have advanced toward the forest sustainability of timber production mainly related to forest governance system. However, the study's methodology does not allow a quantitative evaluation of the forest sustainability of each of the enterprises and jointly. Therefore, for future studies, it is suggested to construct an index to evaluate the sustainability of common forest resources, as has been done in some studies in Mexico (Leslie et al. 2015).

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