

Use of firewood in an indigenous community from the Sierra Norte de Puebla: a gender perspective on the access to natural resources

Rosas-Mancilla, María E.¹; Pérez-Ramírez, R.²

¹ Universidad Autónoma Chapingo, Carretera Federal México - Texcoco Km 38.5, Texcoco, Estado de México, C.P. 56235, Mexico.

² Colegio de Postgraduados Campus Montecillo, Carretera México -Texcoco km 36, Montecillo, Texcoco, Estado de México, C. P. 56264, Mexico.

* Correspondence: rodrigo_perez_r@yahoo.com

ABSTRACT

Objective: To analyze several key elements in order to understand the rights of use, access, and ownership of natural resources, based on the social roles assigned to each gender in the community of Reyeshogpan, Puebla, Mexico.

Design/Methodology/Approach: A participant observation methodology was used, complemented by the application of 24 semi-structured interviews in local households.

Results: The surface ranges of the plots are 0.25 ± 3.0 ha. Out of all the interviewees, 40.79% own less than 0.5 ha, which is not enough to cover their annual energy needs ($10,752 \text{ m}^3$ per household). Therefore, they rent and loan their land, as well as purchase of firewood. Regarding the access to land category, 82.14% is owned by men and 17.86% by women. However, this percentage of female holders does not imply that they can exercise their rights as owners, because the land is generally administered by men. This situation confirms that the access to land influences the availability of firewood and its energy use.

Study Limitations/Implications: The information provided by the interviewees was the basis for the analysis of the use and amount of firewood used by households; however, the interviewees may have underestimated or overestimated the amounts.

Findings/Conclusions: In the Reyeshogpan community, the gathering of firewood is carried out according to gender, based on the physical differences between men and women. Tasks specifically assigned to men are related to their physical strength, while the tasks performed by women are considered complementary and are not given any economic value.

Keywords: Gender, dendroenergy, household energy use.

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INTRODUCTION

Firewood is one of the main energy sources for the rural population in Mexico. According to data from the Instituto Nacional de Estadística y Geografía (INEGI, 2017), 20% of the population uses firewood to cook their food and heat their homes. Over time, the

use of firewood has caused pressure on forest resources, generating availability issues and increasing the time that people spend gathering it. Studies carried out in two communities in Chiapas by Santos *et al.* (2012) conclude that the search and gathering of firewood falls mainly on women, since men only participate in this activity when they are not otherwise engaged. However, Escobar *et al.* (2009) indicate that the task of collecting firewood falls mainly on adult men; therefore, they conclude that this activity does not seem to be linked to gender.

Likewise, Soussan (1991) mentions that the use of this resource depends on the amount of firewood to which the population has access and the level of control they have over its sources. For rural households, land constitutes the main asset and is the means for food production, housing, and income generation. Access to land encompasses access to other natural resources; therefore, having rights to the former implies having rights to the latter. In this context, this research focused on the gender dynamics of the firewood use in the community of Reyeshogpan, Puebla, Mexico, in order to determine to which degree do the rights of use, access, and ownership of natural resources influence the consumption of firewood.

MATERIALS AND METHODS

During the field work of this qualitative research, a descriptive and interpretative analysis was carried out from the gender perspective, using the participant observation methodology, complemented with semi-structured interviews. This tool collects social, economic, access, resource use, and sexual division of labor data in households. During this stage of the research, four temporary stays were also carried out in the community (1st quarter of 2020). In the first visit, participant observation was carried out as a qualitative method and, in the remaining stays, n=24 semi-structured interviews were applied (12 women and 12 men) from a total of n=91 households in the community. A purposive sampling was used, based on the willingness of the inhabitants to participate in the research. Two complementary semi-structured interviews were applied to key informants, to determine the forest species used as fuel in the community and to establish its organizational structure.

Description of the study site

Reyeshogpan de Hidalgo is a Nahua community, located in the municipality of Cuetzalan, Puebla (20° 00' N and 97° 29' W). It is part of the Sierra Norte de Puebla region and the northeastern socioeconomic region of the state. According to the INEGI (2020), its population is made up of 487 inhabitants, out of which 224 and 263 are men and women, respectively. In average, every household has five members.

The predominant economic activity of the community is agriculture in small agricultural units. There are no common areas for the use of natural resources or for land endowment. To obtain additional income, the inhabitants engage in several activities: trade, embroidery, firewood gathering, food production, and raising backyard animals for self-consumption. In addition, wage labor, subsidies, and remittances have become important income sources that satisfy household needs.

RESULTS AND DISCUSSION

The community uses firewood to carry out most of the domestic tasks (*e.g.*, cooking and making tortillas and drinks). It is used mainly for its local availability, apparent free access, and the difficulty in acquiring other energy sources. The average household owns 0.25–3.0 hectares, although most of the population (40.74%) owns less than 0.5 hectares, 37% has 0.5 to one hectare, 7.4% has one to two hectares, and only 14.8% has more than two hectares.

Regarding property ownership, 82.14% of the land belongs to men and only 17.86% is owned by women, who mostly acquire property as an inheritance.

The interviews revealed that 83.3% of the total households use firewood as the main and only source of fuel, while 16.7% combine it with liquefied petroleum (LP) gas. Regarding the technology used, 75% use a traditional stove as the only device or combine it others, 58.3% have an efficient stove, and 12.5% have a gas stove (Table 1).

The households that still use a traditional stove as the only device mention that the main reason why they have not changed this technology is that they do not have the financial resources to build an efficient stove, while others consider that cooking takes longer in other stoves and that food tastes different. Finally, households that have both traditional and efficient stoves combine their use to save time. Based on the sample, the average monthly consumption per household is 0.5 *tareas* (local measure consisting of thin firewood or firewood splits) equivalent to 10.752 m³. The maximum monthly consumption per household is 1.5 *tareas*, which represents a volume of 32.25 m³.

Identification of combustible species

To determine which species are the best for generating energy, the quality criteria used by the residents is “firewood that makes embers”, which means that the best quality firewood is the one that burns quickly and completely, leaving no unburned residues. Based on this characteristic, Table 2 shows a list of 26 local species used as fuel.

Six out of the 16 most used species are in greater demand as quality fuel: *chalahuite* (24%), allspice (*pimienta*) and coffee (*café*) (19%), orange (*naranja*) (13%), and *cedro bambú* (6%). Since there are no common use areas in Reyeshogpan, firewood can only be obtained from their own plots, from rented plots or bought. Inhabitants who do not own land or whose plots do not cover their needs choose to make informal arrangements —such as *trato a medias*, a lease-like agreement on the use of natural resources. In this research, 57.14%

Table 1. Wood burning technologies used in the study community.

Type of technology	Use (%)
Traditional stove	44
Efficient stove	16
Traditional stove and efficient stove	28
Efficient stove and gas stove	12
Gas stove	12.5

Source: table developed by the authors.

Table 2. List of species used as firewood with good ember quality.

Spanish name	Scientific name	Nahuatl name	Quality of the ember
Pimienta	<i>Pimienta dioca</i> (L.) Merril	Unidentified	Good
Caoba	<i>Swietenia macropylla</i> King	Ayacach	Good
Huaje	<i>Leucaena leucocephala</i> (Lam)	Huaxi	Good
Café	<i>Coffea arabica</i> L.	Unidentified	Good
Encino	<i>Quercus</i> spp.	Ahuatl	Good
Guayaba	<i>Psidium guajava</i> L.	Xalxokolt	Good
Chalahuite	<i>Inga edulis</i> Mart.	Chalahui	Good
Garrochilla	<i>Cuponia dentata</i> DC	Koetzalouit	Good
Sangregrado	<i>Crotón draco</i> Schl tdl	Eskouitl	Good
Palo mulato	<i>Bursera simaruba</i> (L.) Sarg	Chaca	Good
Cedro	<i>Cedrela odorata</i> (L.)	Tiokouitl	Good
Cocuite	<i>Glyricidia sepium</i> (Jacq.) Konth ex warp.	Couite	Good
Mango	<i>Mangifera indica</i> L.	Unidentified	Good
Xiloxochitl	<i>Pseudobombax ellipticum</i> Dugand	Unidentified	Regular
Jonote blanco	<i>Heliocharpus appendiculatus</i> Turez	Xonot	Regular
Maicillo	<i>Pleuranthodendron Lindenii</i> (Turez) Sleumer	Taolkoutl	Regular
Mamey	<i>Poutena sapota</i> (Jacq) H.B. Moore et Stearn	Koutzapot	Regular
Zapote negro	<i>Diospyrus diyana</i> Jacq	Tiltzapot	Regular
Carboncillo	<i>Persea</i> sp.	Alauak	Regular
Capulín	<i>Conostegia xalapensis</i> (Bonpl)	Capoli	Regular
Hormiguillo	<i>Cecropia ostusifolia</i> Bretol	Chikikis	Regular
Tarro	<i>Bambusoideae</i>	Unidentified	Regular
Xicalcuahuitl	<i>Alchornea latifolia</i> swartz	Xicalcuahuitl	Low
Matacaballo	<i>Trema micrantha</i> (L.) Blume	Totocouitl	Low
Mala mujer	<i>Cridoscolus multilobus</i> (Pax) I.M. Jonhston	Tetzonkilitl	Low
Anayo	<i>Beilsch media anay</i> (S.F. Blake) Kostermans	Anay	Low
Atzizikas	Unidentified	Atzizikas	Low
Zapote corona	Unidentified	Unidentified	Low

Source: table developed by the authors based on the interview with Mr. José Antonio Matamoros Hernández, from the community of Reyeshogpan, on March 21, 2020.

of the interviewees said that they obtain firewood from their own plots, 35.71% combine it with gathering, and 7.14% buy it.

Likewise, households that do not own plots or whose surfaces are insufficient mostly purchase firewood to meet their requirements. They either buy it on retail (bundles of firewood of 30-40 thin logs) or per volume (1,792 m³ as trace or split). Households that buy firewood get it within the community (from their acquaintances and relatives) or from sellers in neighboring communities, including Tecoltepec, Xalcuahuta, Tepetitán, Santa Rosa, Huitziltepec, Amatlán, and Rancho Morelos. The firewood is directly commercialized between the producer and the consumer, who set its price according to supply and demand, the species in question, and the negotiation.

The average price of a *tarea* is MX\$700.00 pesos, with minimum and maximum prices of \$600.00 pesos and \$800.00 pesos, respectively. The maximum price has been reported in periods of scarcity. The firewood that is sold includes a mixture of species; however, the price changes, if a specific type of firewood is required. The most valued species —based on their high potential heat and their quality— are allspice and orange, which report the highest market prices. The price of a *tarea* of either species ranges between MX\$800.00 or MX\$1,000.00 pesos.

The firewood gathering tasks are assigned according to physical strength. In this case, men are responsible for the so-called “heavy work” (*e.g.*, cutting, splitting, and transportation). Therefore, the greatest amount of firewood is gathered by men.

The women take part as “helpers.” They carry out activities that require less physical effort, such as transporting and drying firewood. Occasionally women also gather firewood to complement the household’s firewood demand.

The data found show that, in 86% of households, men responsible for the gathering, in 54% is a shared task, 39% report that other family members also participate, and 25% declare that they hire *jornales* (workers on a daily-wages basis).

Although, based on these percentages, men are directly responsible for the supply of firewood in most households, the participation of other members of the family is not totally passive and they get involved in the supply in some way or another, especially during the gathering season.

However, the increase in the hiring of *jornales* points out the changes that households have undergone as a consequence of the seasonal migration arrangements they make to obtain a higher income. Forty-six-point-six percent of the interviewees reported that they hire *jornales* to carry out activities related to the supply of firewood. The activities they pay for are cutting, splitting, and to a lesser extent transportation. All these paid activities are carried out by men.

The households that hire *jornales* for gathering activities indicate that the lack of a male labor force in the household forces them to take this measure. However, if they do not own the resource or there is a shortage, they must purchase firewood.

Therefore, the availability of resources constitutes a factor that directly interferes with the assignment of tasks within the household. Its composition determines the intensity of the tasks that each of its members must carry out.

The changes that take place when the sources of household income are modified do not only have an impact on the sexual division of labor, but also on the income. García and Dolores (1990) point out that the flexibility in the assignment of tasks proves that the division of labor does not occur naturally or as a consequence of the role that women have in the reproductive sphere. Instead, the forms in which a given social group organizes work are determined by the material and social conditions of the households, as can clearly be seen in the case of Reyeshogpan.

CONCLUSIONS

In the context of a community whose members continually migrate to neighboring towns in search of employment, whose plots are increasingly pulverized and measure less

than 0.5 ha, and where overexploitation of the resources has led to scarcity, the sustained demand for firewood has caused the community's main energy resource to enter a market that assigns a value to it and therefore it no longer is a free resource. The results of this research indicate that the availability of the resource directly depends on the rights of use, access, and ownership of natural resources. Households with less than 0.5 hectares do not meet their energy demand and therefore must buy firewood, which limits the amount they can spend on other basic needs. Regarding the sexual division of labor, "physical strength" is the factor that determines which sex is responsible for gathering firewood. Under this premise, men are responsible for this process and the rest of the household members complement the gathering sporadically. Households that do not have a male presence at the time of gathering must resort to hiring *jornales*. In conclusion, the gathering of firewood in the Reyeshogpan community is carried out according to gender, based on the physical differences between men and women: specific tasks are assigned to men based on their physical strength, while the tasks performed by women are considered complementary and do not have any economic value.

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