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## Environmental Perception of the Housewives in the Communities of the Alta Sierra Tarahumara, Chihuahua, Mexico

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### Abstract

In order to explore the perceptions of housewives who live in rural communities with large indigenous populations, a study was conducted in a community of the Sierra Madre of Chihuahua, northern Mexico, an area with a high level of marginalization. One hundred and twelve structured interviews were conducted based on a questionnaire that included such aspects as: socio-economic profile, background and basic knowledge about the environment, environmental issues, impacts of economic activities and priority issues for information and training. It was found that the ethnic, age, educational level and status of mothers, are important variables that influence how the environment is perceived. The depletion of vital resources (water and oxygen) is perceived as the most important impact of the overexploitation of natural resources; the Mestizo women showed a greater knowledge of the environment as compared the Indigenous ones.

**Keywords:** environmental perception, housewives, rural communities, Sierra Tarahumara

### 1. Introduction

The inclusion of the environment in the schemes of economic and social development creates a need to monitor the quality and environmental perception of the population (Alcalá et al., 2006). The study of what the inhabitants of a community know, think and feel about their environment is necessary to propose programs and policies that encourage citizen participation (Starr et al., 2000). The community must be consulted, individually, about their values, thinking and behavior, compared to their quality of life and solving its environmental problems (Kos et al., 2003).

Women play key roles in the community, as wives and mothers, many of which are the only providers of home and take an active part in the organization and the community activities. Data presented by the National Institute of Women INM (2008) reinforce the perception that women are managing the provision of services to the household, in greater proportion than men. Despite this, women in rural areas, either mestizo or indigenous, have limitations for inter- and extra-regional communication, so that their views and perceptions of their environment are not commonly heard and considered in community planning (Lazos & Godinez, 2000).

Ruiz & Castro (2011) highlight the difficult situation of Latin American women and their ability to perceive environmental degradation in ecological and social terms. There is an urgent need to include women in areas where communication and decision-making occurs take place (Lazos & Godinez, 2000).

In rural communities of the Sierra Tarahumara, due to its geographical isolation and etnodemographic characteristics, perceptions of social groups on their environment are unknown. Knowledge of the perceptions of women in these communities, in context, brings help to the understanding of their values and attitudes and enables effective interaction among stakeholders in its development.

This study aimed to explore perceptions on the environment of housewives in the municipality of Guadalupe y Calvo, located south of the Alta Sierra Tarahumara in the state of Chihuahua, Mexico.

### 2. Materials and methods

The study was conducted in the municipality of Guadalupe y Calvo, located in the Alta Sierra Tarahumara, 400 km southwest of Chihuahua City, in an area with high deprivation (CONAPO, 2000). The population is divided into three main towns, which together account for 2,371 inhabitants (INEGI, 2005). The minimum sample size was determined using the formula:

$$n = 1 / [r^2 / (z^2 * CV^2)] + 1 / N,$$

where: n = minimum sample size; r = expected potential error of the media; z = confidence interval; CV = coefficient of variation y N = population size (Scheaffer et al., 1987) . To calculate n, a population of 526 households was considered, an expected error to the media of 10 %, a confidence interval of 95 % and a coefficient of variation of 60% in the variable years of schooling.

To the population group made up by housewives, a questionnaire composed of demographic data (gender, age, education, agricultural status), degree of knowledge of its natural resources, economic activities and community services, causes of environmental degradation and strategies for community participation was applied. One hundred and twelve structured interviews were conducted to housewives, through home visits by a female interviewer. Data collection was performed within a five month period in 2010. The SPSS software was used for capturing and analyzing the data. The analysis consisted of a description in numerical frequency and percentage; the results were compared by ethnicity, age, education and children in that are in school.

### 3. Results discussion

#### 3.1 Socioeconomic Profile

Table 1 presents the ethnic and linguistic group of women interviewed. Although most (58%) of respondents said they were indigenous, only 33% of the sample reported speaking Raramuri, the indigenous language. One hundred percent of the women who spoke the language said to be indigenous, although 28 (43%) reported that Spanish was their primary language. This is similar to that published by INEGI (2004), where Mexican rural communities (with less than 2,500 inhabitants), had 41% of their population self presenting as indigenous, though they did not speak the language. More than two thirds of the women interviewed (68%) had children in school, from primary to professional.

The age of respondents ranged between 17 and 82, with an average of 38. Indigenous women were three years younger on average than the mestizo, with 36.8 vs. 39.8 years. The average schooling of all women was of 7.05 years, with 8.9% with no formal instruction. These values were higher than the municipality average in the 2010 Census, where years of schooling and the percentage of women with no schooling was 5.13 and 25%, respectively (INEGI, 2010). Among ethnic groups, indigenous women were shown to have lower schooling, lower average years of schooling (6.7 vs. 7.5) and a greater number of women with no education (12.3 vs. 4.3%). This average for the indigenous group was lower than published by INEGI (2004) for Mexico, 7.7 years for indigenous people 15 years of age or older. Similarly, there is consistency with the 2000 census data from INEGI, in the proportion of indigenous women with no education in Mexico, a group that comprised 11.6% of indigenous women. In this study, age and schooling were inversely and moderately correlated ( $r^2 = -.45$ ), although significantly ( $P < 0.01$ ). It was clear that older women were less educated, the group of women over 50 (16) had an average of 2.8 years.

A minority of women (12%) reported being landowners, as the rest said to be inhabitants in the communities. The main occupation of the interviewed (80%) was house shores. Other activities included professional (6.2%), employed (4.5%) and technical training (3.6%).

#### 3.2 Background / experience

The vast majority of respondents (76%) reported having participated in some community activity focused on protecting the environment. By far the most common tasks were cleaning campaigns (87%), followed by fire brigades (7%) and reforestation (4%).

Just over half the women in the study (60%) reported having attended at least one lecture or course on the environment, while 56 of them (50%) reported having done more than twice. However, to explore the accuracy of their concepts of ecology, the answers to "Have you heard the word ecology?", "Have you heard about climate change?" or have selected the most appropriate definition to the term ecology was not different between groups of women who had not attended a talk and those who had attended at least one. Of the three questions, the percentage of correct answers was 60% for women with and without participation in talks.

Table 2 shows the responses to a series of questions that explored the degree of familiarity of the total population of housewives and their ethnic groups, on concepts and issues associated with the environment. In general, respondents had an acceptable relationship with environmental issues in the community. As shown, the Mestizo women were immersed in the environmental language than the native ones. In all cases, the Mestizo group showed a greater understanding of the basics of the environment. Among the factors included in this study that could explain this difference are on the one hand, less access to education of the indigenous group, which allows the theoretical

knowledge and on the other, housewives in the local ethnic group were younger, leading to the assumption of a lower empirical knowledge.

The data indicate that there is social activity in the community around issues related to protecting the environment. However, the notion of the existence of federal institutions responsible for conservation is relatively low, since less than half of the women interviewed reported knowing at least one of these units. Federal organizations: *Semarnat* (Ministry for the Environment and Natural Resources), *Profepa* (Law Enforcement Agency) and *Conafor* (National Forestry Commission) were the best known, in that order of frequency.

### 3.3 Perception of climate change

At least two of every three women (70%) reported having heard about climate change. Perceived differences in the way in which this phenomenon occurs, are shown in Table 3. Apparently, the effects of climate change were associated with alterations in the patterns of annual or short-term temperature conditions, rather than the moisture.

### 3.5 Perception of productive activities and their impact

The relative importance of productive activities was explored with the question: “Which of the following economic activities is the most important?” In all comparisons of responses by ethnicity, age and education, commerce was identified as the most important. Consistently, the perception of the importance increased with age, from 52% of women in the younger group (30 or younger), up to 100% in the older group (> 50 years). There was no clear trend between the groups analyzed, on what would be the second most important productive employment. It is surprising that the study area, located in a region rich in forest resources, agricultural production operations were perceived with a secondary role in the economy. The fact that 80% of housewives reported being residents in this study, this limits their access to land-use, such as profit sharing of forest use, and access to farmland. Even so, most of the landowners mentioned commerce as the main activity. This context may be associated with a dependence on external revenue product of employment of its workforce outside the study area.

More than two thirds (69%) perceived that production operations caused some damage to the environment (Table 4). Of this group, over half (60%), said logging has the strongest negative impact on the environment. By including the sawmill, as part of this activity, the percentage rises to four units, showing the forest industry as the most damaging to the environment. Although farming was second in impact, it is surprising that commerce, as economic activity is perceived with negative effects on the environment, as shown by 13% of the opinions. This perception may be associated with the generation and dispersion of waste, a fact that is evident in wrappings and disposable containers found throughout the area.

### 3.6 Influence of children attending school

This variable was found to have significant influence on the perception of women about their environment and society. Figure 1 shows the categorization of responses to the question: “What economic activity causes environmental damage?” For this, there was a disparity of opinion about the environmental impact of each of the productive occupations. For women with children, the effects of the forest industry and commerce seem to be very clear, while the group without children in school, although it includes forestry as the most important, points out other activities with significant adverse impacts, such as livestock and sawmills

The perception of women about the effects of human activities that lead to overexploitation of natural resources is shown in Figure 2, where one can see that the respondents perceive a vital resource depletion of primary resources for life (water and oxygen). In much less frequently, the effects are seen globally, as climate change or socio-economic effects such as loss of jobs or social conflicts.

By asking the question “What do you think is the main environmental problem in your community?” Almost 90% of responses were associated with forest, which highlights the excessive logging and forest fires. These perceptions can be seen attached to the reality of Chihuahua state forests. Data from the National Forestry Commission (Conafor, 2011) placed the state with the worst conditions on the national level respect to these events, with 1,687 fires in 2011 that affected 87,920 hectares.

### 3.7 Topics of interest for courses or talks

More than half of women 68 (61%) have received at least one course or talk on environmental education and ecology, although in this group, four out of five (82%) said they had participated in more than two events.

The differences in environmental perception of interest to the community, including housewives who had received or not received talks on environmental issues is presented in Table 5. In both cases, the issue of forest fires was the one who attracted most attention. The respondents with greater exposure to information on environmental issues, thematic interests showed more diverse with a marked preference for the issue of garbage and considered other possible sources

of problems in their community, such as pests, drought and excessive logging. Meanwhile, women with less exposure to environmental information, showed considerably more interest in the issues of forest fires and the use of latrines. As for preferences by age and ethnicity, Table 6 shows that interest in forest fires increased with age, while the issues of river pollution, vegetation and drought of the municipality, had the opposite trend. The differences between ethnic groups are seen in the marked preference for river pollution on indigenous women and vegetation of the municipality in the mestizo group

### *3.8 Relative importance for the public services*

Health was the most outstanding community service in 90% of cases (Table 7). The importance of services, water and electricity, was perceived similarly by the two ethnic groups. The more noticeable differentiated perceptions were the mestizo group preference given to drainage and sewage, while indigenous women assigned greater importance to telecommunications services and urban cleaning.

### *3.9 Interaction with the children*

Two-thirds of housewives, 75 (67%) had children attending school, the majority of them (79%) at primary and secondary levels. Four out of five mothers (83%) claimed to have communication with their children about environmental issues. The topics that children and young people, from different grade levels, comment with parents at home are shown in Table 8. Litter and forest care, together comprise the two-thirds of the issues that children and young people socialize at home, particularly primary and secondary levels. As perceived by the mothers interviewed, the attention of young high school and above, would be oriented in a particular way to the global warming issue.

The theme on the effects of global warming was mentioned only by women who had children studying. This difference in findings might be attributed to communication between mothers and children in school, particularly in the levels of secondary school and higher, since this phenomenon was perceived as one of the main topics.

This aspect of the relationship between parents and children, highlights the potential of the latter as agents of informal education in rural households in the communities of this study. Verbal communication between members of the social group of the study, was the main source of information on the problems of the community in 95% of the cases. An alternative route far less important was the television (5%). The use of this medium was higher in mothers with learners compared with those without (8.2% vs. 2.8%). The presence of children and youth in the homes of the housewives in this study, could be a factor that encourages parents to have a TV and, consequently, to receive information in this way on environmental issues. Strategically it is important to consider the training of students on environmental issues through educational programs in their schools, for it has a multiplier effect in rural communities.

Perceptions of what local authorities should do to care for the environment, also differed between groups with and without children in school. While the latter tended to concentrate their suggestions into one or two activities such as waste management / garbage dump (53 vs 37%) and monitoring (8.3 vs 2.7%), the first had a more distributed opinion among the categories of options. In this case, the differences among the suggestions on talks on environmental education (20% vs. 8.3%) and the care of the forest / reforestation (18.7% vs. 11.1%) could be associated with the interaction that women ought to maintain their children in school.

## **4. Conclusions and recommendations**

The ethnic composition of housewives in the study area, age, education level of mothers and their status were important variables that influence how we perceive the environment. This context gives mountain communities such as the one in this study, a variety of ways to appreciate the area where they live and the processes that affect their environment.

Most women have experience on the environment, either through talks or activities primarily related to street cleaning and care of the forest. The destruction of this resource, excessive logging and fires, were perceived as a major environmental problem.

Mothers with children in school showed to be better informed about current issues on the environment. More than education, ethnicity and age, children as a source of information was the variable that had the most influence on the environmental culture in this part of the female community. This gives a strategic role for regional school systems as a means of environmental awareness in the community, as verbal communication "for talks" is by far the most important means of transferring information.

To improve the effectiveness and scope in environmental awareness and involvement of women in these communities, programs and activities must consider the diversity of socioeconomic circumstances.

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Table 1. Ethnic composition and language spoken in number and percentage of women interviewed (n = 112).

Ethnicity	Language spoken	
	Number	Percentage
Indigenous	65 (58 %)	Spanish 75 (67 %)
Mestizo	47 (42 %)	Raramuri 37 ( 33 %)

Table 2. Level of familiarity of the women interviewed, total, Indigenous and Mestizo, with formal basic elements on the environment (n = 112).

Question	Total of women		Indigeno us		Mestizo	
	Freq.	Freq.	Freq.	Freq.	Freq.	Freq.
	(%)	(%)	(%)	(%)	(%)	(%)
Have you ever heard the word ecology?	69	(62 %)	36	(55 %)	33	(70 %)
Have you heard the Word climate change?	78	(70 %)	41	(63 %)	37	(77 %)
Do you know the name of any agency or institution responsible for the environmental care?	46	(41 %)	22	(34 %)	24	(51 %)
Do you know of any environmental care program implemented in your community?	91	(81 %)	51	(79 %)	40	(85 %)

Table 3. Responses grouped by number and percentage, to the question  
*On your opinion, what is climate change? (n = 78)*

Response	Num (%)
Sudden and unexpected changes in temperature	46 (59 %)
Changes in the seasons of the year	15 (19 %)
Global warming and natural disasters	6 (8 %)
Melting of the poles	3 (4 %)
Other	8 (10 %)
Total	78 (100 %)

Table 4. Responses of the women interviewed to the question:  
*What economic activity causes damages to the environment? (n=77)*

Economic activity	Frequency	Percentage
Timber	46	59.7
Cattle production	11	14.3
Commerce	10	13.0
Agriculture	3	3.9
Livestock in general	4	5.2
Logging	3	3.9
Total	77	100.0

Table 5. Answers to the question: *What topic would you like to be made known in your municipality?* According to the previous experience of participation of women in courses or talks on environmental education.

Topic	Two or more courses or talks		None	
	Num	%	Num	%
Forest fires	17	30.4	19	43.2
Waste	14	25.0	4	9.1
River pollution	12	21.4	8	18.2
Problems of latrines	9	16.1	13	29.5
Plagues	2	3.6	--	--
Excessive logging	1	1.8	--	--
Drought	1	1.8	--	--
Total	56	100.0	44	100



Table 6. Number of women and percentage of thematic options for female respondents, by age group (n = 112)

Theme	Age group (years)			Ethnic group	
	Up to 30	31 to 50	51 or more	Indigenous (n=65)	Mestizo (n=47)
Fires	51%	69 %	75 %	60 %	70 %
Waste	59 %	64 %	56 %	62 %	62 %
Excessive logging	43 %	63 %	44 %	51 %	57 %
River pollution	54 %	36 %	31 %	55 %	21 %
Vegetation of municipality	30 %	24 %	19 %	19 %	34 %
None fertile soils	24 %	24 %	25 %	26 %	23 %
Drought	32 %	15 %	31 %	23 %	23 %
Plagues	5 %	2 %	19 %	5 %	6 %

Table 7. The most important public services in the community by ethnic group of the women interviewed.

Service	Indigenous (%) (n=65)	Mestizo (%) (n=47)
Health	91	89
Drinking water	77	81
Drainage and sewage	39	66
Electricity	34	34
Telecommunications	32	17
Urban sanitation	28	13

Table 8. Frequency and percentage of children perceptions of the main environmental problems, according to the school level being attended.

Topic	School being attended				Freq. Sub total	
	Primary	Secondary	High School	College		
Waste problem	5	12			28	7
Forest care	2	6	3		21	8
Global warming	2	2	4		10	3
Pollution problems	4		4		8	1
Water care	2		1		3	
Hygiene at home	2				2	
Deterioration of the ozone layer					1	
Others		1			2	
Total	38	21	12		75	00

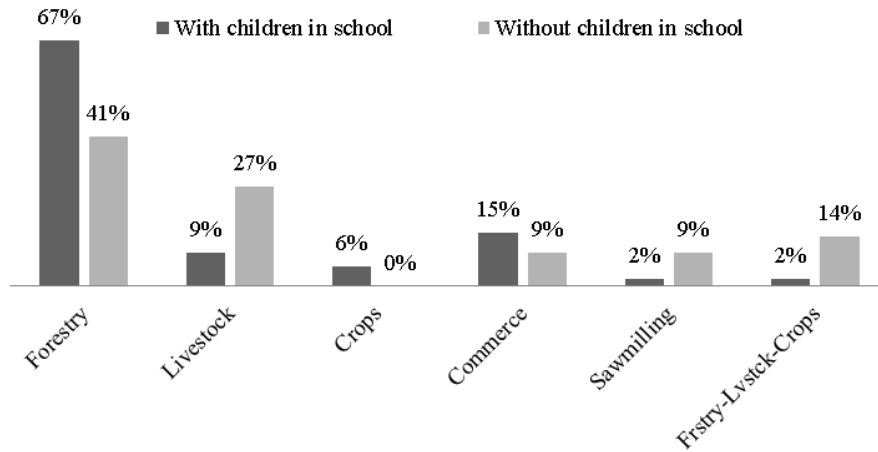


Figure 1. Perceptions of women with and without children in school, of the economic activities with the greatest impact on the environment

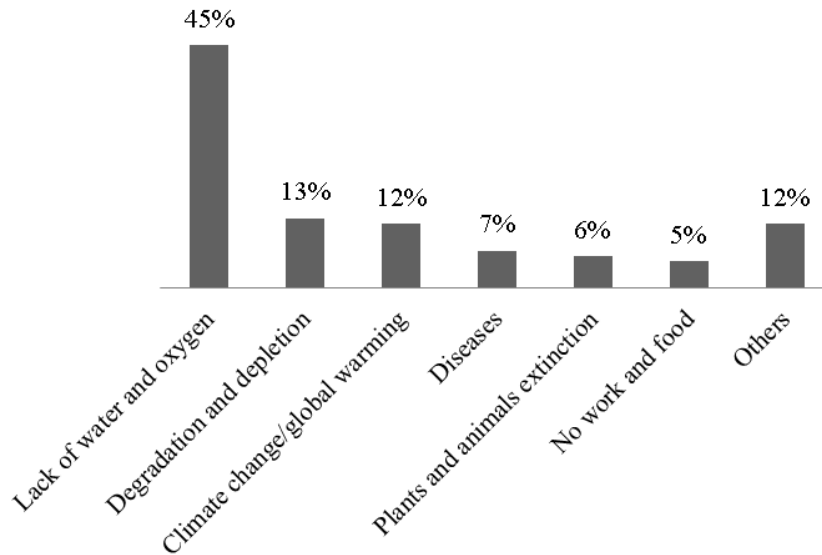


Figure 2. Perception of the total sample of women interviewed about the possible effects of over exploitation of natural resources



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