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Updated information on this workshop is available at http://www.bioenergy-lamnet.org, http://bioenergia.oikos.unam.mx and http://www.anes.org.

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International Seminar on Bioenergy & Sustainable Rural Development

WORKING GROUP 4: BIOMASS RESOURCES

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FOREST RESOURCES FOR ENERGY: ENVIRONMENTAL AND SOCIAL DIMENSIONS IN FOUR COUNTRIES IN LATIN AMERICA

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ABSTRACT

An analysis is made of the impact on forests due to the extraction of fuelwood and of shortage situations for some users, on the basis of nine case studies carried out between 1998 and 2003 in Honduras, Mexico, Cuba and Argentina. The conclusions are: not all fuelwood extraction causes a negative impact on forests; physical shortage of fuelwood seldom occurs; trees-out-of-the-forest are an important source of fuelwood and should be accounted for when assessing wood supply; and shortage due to inaccessibility occurs at local scales, arising from social causes. To properly assess the impact of fuelwood use on forest resources it is necessary to know the amount of consumed wood, utilized species, ways of extraction, actual sources, and trees growth rates. Local scale studies are needed in order to detect shortage or accessibility situations.

Results from TCP/FAO/HON/6713, TCP/FAO/CUB/8925 from the Food and Agricultural Organization of the United Nations (FAO), Programa de Acción Forestal Tropical in Mexico (PROAFT), and Programa Social Agropecuario in Argentina (PSA) are presented in this paper.

INTRODUCTION

In Latin America the use of wood for energy is of great importance, in urban as well as in rural locations. The high demand of forest fuels, in many cases much higher than that of sawn wood and other industrial woods, has risen great concern regarding the use of woodfuels as a cause of deforestation or forest degradation.

It has also been considered that people using fuelwood and charcoal could suffer from a shortage of these diminishing woodfuels. In this paper, an analysis is made of the impact on forests due to the extraction of fuelwood and of shortage situations for some users, on the basis of nine case studies carried out between 1998 and 2003 in Honduras, Mexico, Cuba and Argentina. All of them were based on the hypothesis that fuelwood extraction caused negative impact on the forests and/or there was a shortage situation.

ENVIRONMENTAL IMPACT

Honduras

The patterns of consumption, extraction and supply of fuelwood indicate that negative impacts on forest resources can vary from medium to low in the three studied cases:

In the case of *Tegucigalpa*, there could exist degradation in *Quercus* forests that are exploited solely for fuelwood (Table 1). Analysing the most consumed fuelwood types it is evident that *Pinus* forests are not greatly affected by fuelwood extraction, as pine fuelwood comes from sawmill residues and thinnings

In *San Lorenzo*, a medium city, there exists a special situation of risk, due to the use of mangroves as a source of fuelwood, above all because live trees are cut from the base. However the supply-demand balance shows that it is a medium risk, as the annual productivity of mangroves is slightly higher than the current consumption of mangrove fuelwood (Table 1). The fuelwood obtained from secondary forests does not produce a reduction of their cover, because of the ways of extraction and also because their rate of growth is higher than the rate of consumption;

In the rural department of *Lempira*, fuelwood use causes a low or null impact on the natural forests, as the amount is low and it is extracted mainly from branches of anthropic vegetation such as coffee plantations and grazing areas.

Table 1. Patterns of consumption, extraction and supply of fuelwood in Honduras[1]

Case	Fuelwood consumption (10^3 m3/year)	Type of Fuelwood	Vegetation type	Supply-demand balance (10^3 m3/year)[2]
Tegucigalpa City (Central District)	**190.5**	• **24% from sawmill residues** • **49% from residues of pine forests thinning**	• **76% *Pinus* and *Quercus* forests**	**No data**
San Lorenzo 66City	**18**	• **Mangrove: 100% from cutting of live trees** • **Secondary forest: mainly from branches**	• **54% mangrove** • **46% secondary forest**	• **Mangrove +2** • **Secondary forest +10**
Four towns in Lempira Department[3]	**3**	• **87% from branches of dead trees**	• **74% anthropic vegetation** • **26% natural forests**	**No data**

1. Source: Arias 1999
2. Supply (m3/yr) = forest area (ha) x medium annual increase [MAI] (m3/ha/yr)
3. Four towns in Lempira are Cololaca, La Virtud, Tambla, and Guajiniquil.

Cuba

The *Guantanamo province* has a very high fuelwood and charcoal consumption, due to the fact that in the last ten years, in Cuba people went back to the use of woodfuels, in the face of Kerosene and LPG shortages (Table 2.). It could be expected that this situation would impact negatively on the natural forest resources. However, 75% of the woodfuels come from anthropic formations, such as live fences, grazing areas, coffee plantations and “marabusales”, and it can be said that the use of woodfuels cause a minor impact. Even more, as the “marabu” is an invasive arbustive species, its use as fuel appears to be an adequate alternative to control it. To sustainably produce the remaining 25% of consumed woodfuel, it should be enough that 46 thousand hectares of native forests, with 3 m3/ha/yr MAI, be dedicated to this type of use, in the vicinity of main centers of consumption.

Analyzing the impact at the municipal scale, in *Cienfuegos*, the pattern is similar to that of Guantanamo, with low to medium impact on natural forests. To produce woodfuels in sustainable manner in this municipality, it would require three thousand ha of forests.

Table 2. Patterns of consumption and extraction of woodfuels in Cuba[1,2]

Case	**Fuelwood consumption (10^3 m^3/year)**	**Type of fuelwood**	**Species used for woodfuel**	**Vegetation type**
Guantanamo Province	• 548	**98% from branches and dead trees**	• **30% *Dichrosthachys cinerea* (Marabú)** • **24% *Gliricidia sepium*** • **8% *Coffea arabica***	• *75% from anthropic vegetation*
Cumanayagua Municipality, Cienfuegos	• **30**	**90% from branches and dead trees**	• 12% *Acacia farnesiana* • **7% *Citrus* sinensis** • **6% *Coffea arabica*** • **5% *Dichrosthachys cinerea***	• **71% from anthropic vegetation**

1. Sources: Núñez et al 2001, Montesino et al 2001
2. Woodfuels are fuelwood and charcoal

Mexico

In the three analyzed areas of the southeast of Mexico, it is apparent that productive capacity exceeds to a large extent the volume of extracted fuelwood (Table 3).

As the fuelwood is obtained from branches and/or dead trees, and, with the exception of Chiapas, the larger part is taken from areas of secondary vegetation, grazing areas, coffee plantations, live fences, it is concluded that fuelwood production does not cause a negative impact neither on natural forests nor over other wooded lands.

Table 3. Patterns of consumption, extraction and supply of fuelwood in Mexico[1]

Case[2]	**Fuelwood consumption (10^3 m^3/year)**	**Type of fuelwood**	**Vegetation type**	**Supply-demand balance (10^3 m^3/year)[3]**
Pajapan Municipality, Veracruz	**8**	• **97% from branches and dead trees**	• **85% anthropic vegetation** • **9% mangrove** • **6% evergreen rain forest**	**+11**
Calakmul Municipality, Campeche	**36**	• **100% from branches and dead trees**	• **61% anthropic vegetation** • **39% semi-deciduous forest**	**+5,500**
Chiapas communities	**2**	• **89% from branches and dead trees**	• 41% anthropic vegetation • 59% natural forest	+21

1. Sources: Arias et al 2000, Arias 2002.
2. Veracruz includes the Pajapan "Ejido" and the Communal Area, Campeche the Calakmul Municipality. Chiapas ommunities are Las Nubes, La Fortuna and Jerusalen.
3. Supply (m3/yr) = forest area (ha) x medium annual increase (m3/ha/yr) [MAI]

❑ Argentina

The analysis of the Argentine case is at village scale, a group of ten families settled on 20 hectares. Their situation is quite paradoxical, for they live in a region of high wood production yet they do not have enough fuelwood of their own (Table 4). Currently, they have just 6.5 ha covered by native secondary forest with a total stock of 1700 m3, enough to supply themselves for ten years, on the basis of a "mining type" exploitation.

Table 4. Patterns of consumption, extraction and supply of fuelwood in Argentina[1]

Zone	**Fuelwood consumption (m^3/year)**	**Vegetation type**	**Supply-demand balance (m^3/year)[2]**
Yacutinga village	• **170**	• **semideciduous forest** • **secondary vegetation**	• **-133**

1. Source: Arias y Bacalini 2003
2. Supply (m3/yr) = forest area (ha) x medium annual increase (m3/ha/yr) [MAI]

FUEL SHORTAGE OR FUEL INACCESSIBILITY

Of the five cases presented, where the productivity of fuelwood was evaluated, only in the Argentine case there exists physical shortage of wood in the scale under analysis. Although in the others there are no limitations in the supply due to insufficient production, in three Mexican locations there are problems of inaccessibility: Pajapan and Jicacal in the Pajapan municipality and X´pujil in the municipality of Calakmul. The problem of inaccessibility in these cases is in account of not owning enough land. Yacutinga village in Argentina, could be added to this group, because the main problem is that the users do not own enough land to produce the fuelwood.

In Pajapan there are 500 families that did not receive land, as the agrarian partition is over. In Jicacal, the larger part of the families did not receive land and have to extract fuelwood from the mangroves, whose use is regulated by other communities. In X´pujil, the recently arrived families do not own land. In Yacutinga village, each family owns less than two hectares of land and people make a living as rural workers with very low income levels, which prevents them from buying fuelwood from the neighbouring areas or paying for its transportation from distant places.

The cases of Pajapan and X´pujil can be analyzed in the context of the classification by "Priority Municipalities for Fuelwood Sustainability in WISDOM" (Masera et al 2002). In this map Pajapan is considered as "high priority municipality", with "largest average fuelwood consumption, the largest number, density and growth of users, the lowest fuelwood balance, and the largest percentage of indigenous population". But the physical balance of supply-demand of our case study places the municipality in a condition of minor priority, since forest productivity is sufficient to sustain twice the current population, which could happen in no less than 25 years (INEGI 1992, INEGI 1997). Taking in account that in Pajapan and Jicacal towns fuelwood is inaccessible for many families, it is correct to place these in a high priority situation, although for a different reason than those considered in WISDOM.

On the other hand, the Calakmul municipality is classified in the map as a "mid-low priority", while in fact 85% of the families of X´pujil have no access to fuelwood resources.

This shows that in detailed studies, situations can be detected that differ from those found with diagnostic methods in a regional or national scale. In all cases effective access to fuelwood resources is restricted by reasons of social nature, that should be attended to in a specific manner.

CONCLUSION

The analysis made at different scales (provincial, municipal, town and village level) in urban as in rural communities leads us to conclude that:

Not all fuelwood extraction causes a negative impact on forests. Only in three cases (Tegucigalpa, San Lorenzo, Yacutinga) there is evidence of negative impact on forest resources. A sizable fraction of the total volume used can be obtained in sustainable ways, while another part can be causing deforestation or forest degradation.

The knowledge of the amount of fuelwood used is not enough to estimate its impact on forest resources. This assessment needs full knowledge of the wood´s origin (vegetation types, species), the way it is extracted and the productivity of the forest resources subject to exploitation.

Physical shortage of fuelwood rarely occurs. In most cases it was found a highly positive supply-demand balance.

Trees-out-of-the-forest are important for fuelwood supply. In nearly all the cases analyzed, a high percentage of fuelwood is obtained from vegetal formations that are not considered "forest" in the forest inventories at regional or national scale. Accordingly, it is essential that these non forest formations be duly evaluated when assessing fuelwood supply.

Shortage due to inaccessibility does occurs at local scale. Although evaluation of fuelwood supply at municipal scale may result in a positive balance, local situations are found where inaccessibility due to social causes generates actual fuelwood shortages for some parts of the population. It is advisable that studies aiming at identifying possible shortage situations be made at local scale.

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