

Analysis of Fuelwood and Charcoal Sector in Cote d'Ivoire

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ABSTRACT

In developing countries, especially in Africa, energy consumption by households is particularly fuelwood and charcoal. In Cote d'Ivoire, fuelwood and charcoal are mostly used in the rural and urban areas. Therefore, the study on these fuels exploitation and the supply system to households are needed. The data used for the analysis of different primary fuels consumed are from World Bank, Cote d'Ivoire Statistical Institute and face to face interviews. The average energy household consumption for cooking is approximately 66% for fuelwood and 20% for charcoal. However, it was realized from the study that urban and rural population prefers to fall back on fuelwood and charcoal because of accessibility and price. An analysis of the wood energy sector in Cote d'Ivoire has been carried out in order to propose appropriate policies for efficient supply. This new policy will prevent environmental degradation.

Keywords: *Accessibility, Charcoal, Cote d'Ivoire, Fuelwood, Households*

1. INTRODUCTION

People in Asia and Africa depend solely on fuelwood and charcoal as a primary energy source for cooking and heating, which accounts for 75% of global wood production and consumption [1]. However, half of the world's population depends on biomass as their main source of energy supply [2]. In Côte d'Ivoire, biomass represents 73% of global energy household consumption. About 90% of households use fuelwood or charcoal for cooking in Cote d'Ivoire [3]. The lack of availability and high cost of other fuels such as LPG are the primary factors that lead to urban and rural population to use charcoal and fuelwood. On the other hand, production of charcoal and fuelwood are made in the rural areas and then supplied to the consumers in the urban areas for consumption. This situation reveals the depletion of forest resources and is also attributed to the increased needs of the human population [4] and has drawn the attention of several authors from different countries.

Some authors have shown the importance of fuelwood and charcoal in the African households. For example, [5] made a point that the consumption rate of charcoal in Africa is twice compared to the usage on other continents and made a projection that fuelwood usage will increase by 24% from 2000 to 2030. Furthermore, commercialization of forest products can lead to the degradation of forest resources in the absence of regeneration or resource management. Growing demand for wood fuel in urban areas have increased pressure on the forest resources, which is especially problematic in the absence of incentives to restore or manage these resources sustainably [6]. Nevertheless, the over dependence on forest resources is due to the living level of the population. As an example, in the capital of Burkina Faso, the utilization of fuelwood is reduced by increasing household income [7].

A survey conducted in a poor rural area of China also showed that households with more educated members consume less fuelwood [4]. Also, a paradox exists in the sense that poor people often pay a higher price in energy field for lighting and cooking. On average in urban areas, a poor household spends

almost 20% of its income mainly on traditional fuels [8]

In Cote d'Ivoire, fuelwood and charcoal activity is represented by the informal sector. In the city of DABOU, the production of charcoal and fuelwood are done by local producers and plays a dual role thus, socio-economic and cultural roles [9]. This research seeks to analyze the fuelwood production sector to livelihoods of producers engaged in the urban fuelwood supply in Cote d'Ivoire. To better understand this informal sector, an analysis from production to distribution of charcoal and fuelwood was made in this work and a better organization of the sector has been proposed.

2. FUELWOOD AND CHARCOAL PRODUCTION

2.1 Forest status in Cote d'Ivoire

Côte d'Ivoire currently has 253 major forest areas including 8 National Parks with a total area of 1,742 hectares, 5 reserves of fauna and flora which have a total area of about 248,000 hectares and 240 classified forests which have an area of about 3.6 million hectares [10]. According to the FAO [11], among the remaining forests in Cote d'Ivoire, only an extremely limited share of 625,000 ha or 6 % of the forested area is primary forest and, 9.4 million ha, or 91 percent of the country's forests, are modified in natural forests. Plantations comprise the remaining 3 percent of the forest cover. These data are summarized in figure 1 below.

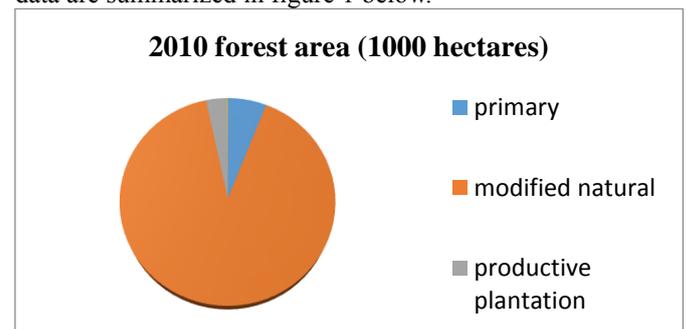


Figure 1 Forest characteristics of Cote d'Ivoire

It is projected that, at current rates of deforestation, Côte d'Ivoire would have lost 83 % of its virgin forest [12]. From 2005, the forest cover has begun to steadily decrease with 0.4% of the forest loosens each year. If this rate is maintained without government action the forest cover will disappear. Nonetheless this deforestation is due to several factors as shown in figure 2 below.

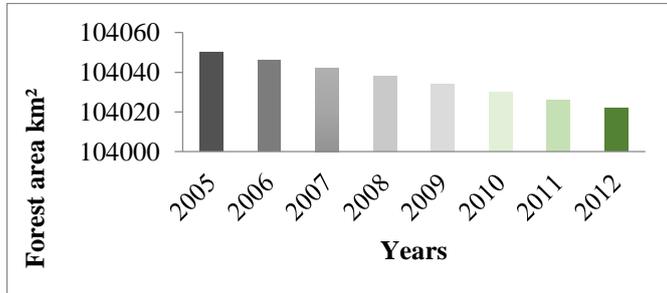


Fig2: Forest cover of Cote d'Ivoire between 2005 and 2012 (World Bank, 2012)

Although, deforestation is due to extensive agriculture, abuse of timber and brush fires, it must be recognized that the exploitation of forest resources for cooking also causes deforestation in Cote d'Ivoire. This country does not export or import fuelwood and charcoal as result having sufficient supply for domestic energy needs [12]. From 2000-2007, the consumption rate has increased nearly to 34,000 m³ in 2007. From 2008, the fuelwood production began to decrease slightly as shown in figure 2 above.

2.2 Fuelwood production

The production of timber was one time a major importance to the Ivorian economy. In 1993, total Ivorian exports were \$2.7 billion. Tropical wood products accounted for 11 percent (or \$297 million) of export revenue, falling behind cocoa at 30 percent (or \$810 million) and coffee at 20 percent (\$540 million). The area under SODEFOR management in 1993 was 2.6 million hectares from a project total area of 3.6 million hectares, consisting of 3.5 million hectares of classified forests and 93,000 hectares of plantation forests [13]. In Cote d'Ivoire, wood energy (charcoal and fuelwood) are classified as unregulated. They are considered as 'free common properties' that can be collected at any time anywhere. There is no wood fuel production management by the government, and no regulation exists in this sector. Sometimes, the charcoal producers or wood fuel distributors, uses the old rubber plantations trees and in so doing pay the plantation owners at prices ranging between \$400 to \$500 after which the final products are then distributed to the urban areas. There are no comprehensive and consistent data on the stocks of wood fuels available in the country by each ecological zone neither are there any data on the levels of wood fuel consumption by the various sectors of the national economy. However, data from the World Bank has been used [14] as shown in figure 3 below. This curve shows the production evolution of fuelwood in Cote d'Ivoire. It can be clearly seen from figure 3 that there is an increase in fuelwood production from 8,521.0³ m³ to 34,761.0³ m³ between 2000 and 2007. After 2007, production decreased slightly and this was probably due to deforestation.

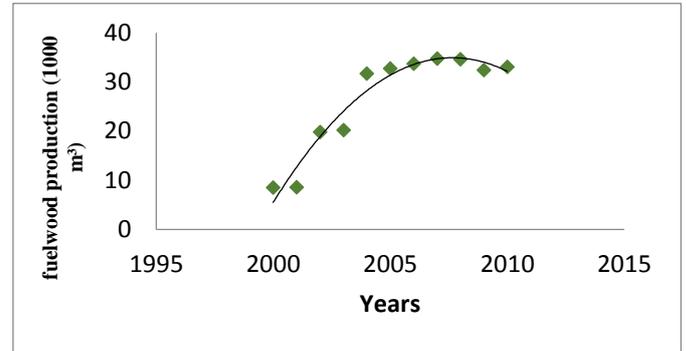


Fig 3 Fuelwood production in Cote d'Ivoire (thousand m³)

2.3 Charcoal Production

2.3.1 Charcoal kiln process

In Africa, the main type of charcoal production carried out in the rural areas is the traditional kiln production. The ideal season for making charcoal is the dry season. The use of dry woods was better to the manufacturer, because it is essential to reduce the amount of water content in the wood in order to minimize the amount of heat energy that would be needed during the drying process; so woods are cut days prior to charging the kiln. Before charging the kiln, the dug pit is covered with a layer of leaves. This layer was put between soil and wood as it had the importance of collecting charcoal from clear ground. Those openings could be judiciously opened and closed and new ones could be made to control the introduction of air (see Figure 4 below). The wood to be carbonized is then stacked in a pile and covered with a layer of leaves and earth. This is needed during carbonization process because the soil takes the heat and continues to burn the charcoal. The charcoal then burns completely and produces a high amount ash and carbon content in the air.



Figure 4: source by Author: Charcoal formation in Cote d'Ivoire

Once the combustion process is underway the kiln is sealed, and when the process is complete and cooling has taken place the charcoal is removed. However, this process has some disadvantages as they often produce very low yields typically 1 kg of charcoal from 8 to 12 kg of wood or more and it is difficult to maintain uniform carbonization and environmental pollution from the release of poisonous gases.

2.3.2 Charcoal production analysis

The production of charcoal has known a net change from 370,872 tons to 274,203 tons between 1990 and 1999. A bowl shape was observed between 1999 and 2003 (figure 4): firstly, a drop in production from 370,872 tons to 327,000 tons between 1999 and 2000 then a constant production between

2000 and 2002 and finally, increase in production from 327,000 tons to 400,850 tons between 2002 and 2003. The bowl shape described here is also attributed to the political crisis in Cote d'Ivoire between 1999 and 2002. The charcoal production sector also suffered the consequences of this war.

Charcoal production has been increasing in the last 10 years after this war, rising by 22 percent from 400,850 tons in 2003 to 488,128 tons in 2010, in order to meet the demands of a growing, and increasingly urbanized population. The production of wood fuel has also been increasing, although at a slower rate over the last ten years, from 8,699,979 m³ to 9,034,617 m³, almost a 4 percent rise.

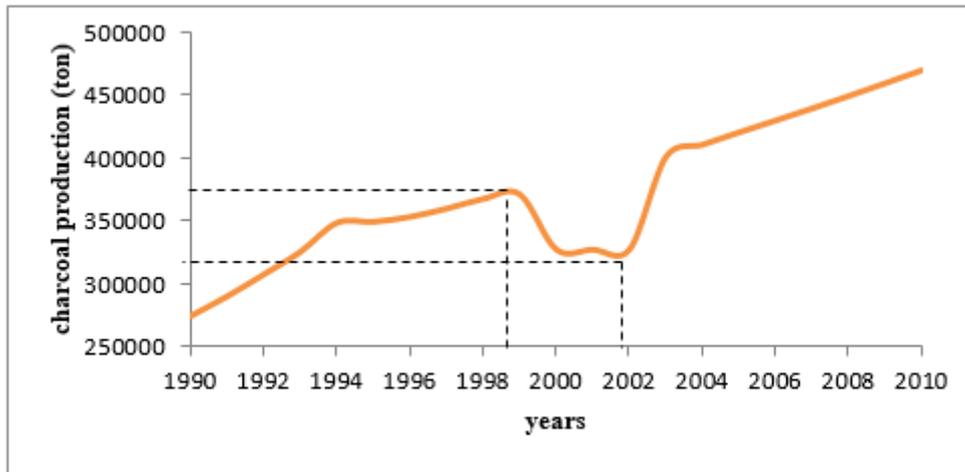


Fig4: Charcoal production in Cote d'Ivoire

Charcoal is typically a fuel used in urban areas as it is seen as having fewer of the negative side effects of cooking with wood (i.e. dangerous, smoky) while being more cost-efficient than petroleum products [15]. The increasing urbanization rate an average increase of 1.49 percent per year [16] may help to explain why charcoal production is increasing at a far faster rate than wood fuel production.

In 1996, households consumed on average approximately 2 kg of charcoal and 4.6 kg of wood fuel per day [17]. This level of charcoal consumption equals to 0.73 tons of charcoal per household by year.

used by households. In general, biomass energy is the main source for cooking in Ivorian households. Indeed, nearly 86% of the population uses biomass to satisfy its needs for cooking. Specifically, we note that the urban environment is characterized by a strong dependence on charcoal (47% of urban population) while the rural has a high rate of consumption of fuelwood (about 95% of rural population). The population shares using modern fuel (butane gas) is low at the national level (7%) than in urban areas is higher (18% of urban population). It can be recalled that urban population tends to use modern cleaner energy while the rural sector depends exclusively on biomass energy (polluting source) see table 1. It was noted that fuel in Abidjan, charcoal and butane gas are concurrently used by the population. About 52% of the Abidjan population uses charcoal and about 40% of the population uses butane gas considered as clean fuel.

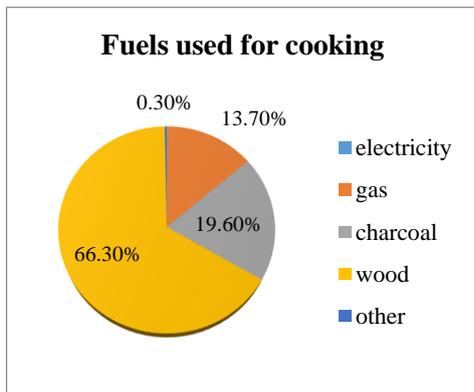


Fig 5 Fuels used by households

Table 1: Fuel consumption by area

Fuels type	Urban	Rural	Total
Wood	35%	95%	73%
Charcoal	47%	4%	20%
Others	18%	1%	7%
Total	100%	100%	100%

Source: Republic of Cote d'Ivoire National Institute of Statistics, 2002 [18]

The resulting diagram above shows the distribution of fuel type

3. FUELWOOD AND CHARCOAL SUPPLY CHAIN

Wood harvesting is done in rural areas. In general, rural population use fallen wood, dead branches and twigs picked off from the ground. Some of the wood harvesting is used to make charcoal and the other part is used directly as fuelwood.

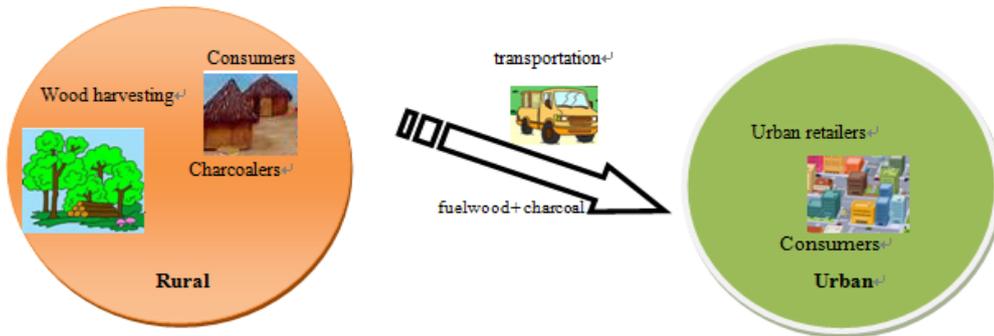


Fig7 Charcoal and Fuelwood supply chain in Cote d’Ivoire-Source Author

At first, the dealers negotiate with forest owners to come into an agreement to cut the wood or land owners demanding “drinks” before trees are harvested. On the other hand, owners can sometimes sell obsolete rubber trees between \$ 450 to \$500. Sawyers are then employed to cut down the trees and the dealers rent trucks to park the pieces of cut trees from 10 tons to 15 tons which are transported to Abidjan. Urban retailers buy wood or charcoal from the transporters or suppliers. When

the transport arrives at the urban area, wood breakers are then responsible for splitting the wood into smaller pieces (see right figure 8). For the distribution of charcoal, once the charcoal is produced they are placed in channeled bags and transported to the urban areas. Charcoal retailers sell charcoal to consumers. There are retailers at all the major markets in urban areas as well as many small retailers that sell at kiosks. Charcoal is sold by either bag or bucket as shown in figure 8.



Fig 8 Selling charcoal (left) and fuelwood(right) by retailers in Urban

The conclusion to be drawn here is that rural population only uses fuelwood and charcoal for cooking while the urban population uses charcoal and LPG (gas). It is worth noting that most women in both the Urban and rural areas engage in activities such as the sale of smoked fish and bakeries that uses fuelwood. These women are in constant contact with fuelwood and overtime will be detrimental to their health.

4. CONCLUSIONS AND RECOMMENDATIONS

The primary goal of this study is to analyze the production, distribution and consumption of charcoal and fuelwood in Cote d’Ivoire. It has been established that energy is a basic need for an individual or community just as water, education and health. It is one of the means of income generating activities in a community and national development industries. However, after analyzing the consumption of wood resources in Cote d’Ivoire and given the current preponderance of charcoal and

fuelwood consumption, low income households and the rising cost of substitute products, seems very difficult to envisage in the short or even medium term without this energy resource. The consumption of fuelwood has real adverse effect on manufacturers of charcoal and its consumers (users). This study therefore raises awareness that clean energy such as gas should be used in households. Based on our research it was realized that the usage of gas is not within the reach of all household because of its cost. Therefore, since most Ivorian households use wood fuel (charcoal, firewood etc.), the authors are proposing that there should be a legislature that will be implemented and monitored by the Department of Energy in collaboration with the Ministry of Water and Forest Side. This legislature would regulate and enhance the standards and quality of the final product in the wood fuel industry, the opinion that this would increase the tradability of the charcoal product in the formal market, including supermarkets and shops. This process would contribute to more jobs in the industry such as “tree seed, seedlings trade, extension, production process, marketing and promotions, sales and

marketing, use of energy saving techniques” and gain interest .

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