RURAL-URBAN DEPENDENCE ON WOOD ENERGY IN A SELECTED AREA IN LAGUNA PROVINCE, PHILIPPINES A RAPID RURAL APPRAISAL

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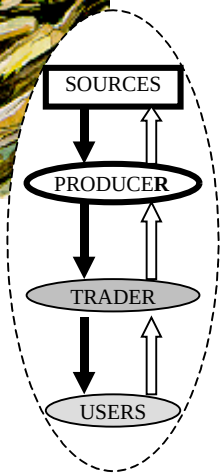

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1. INTRODUCTION

The demand for wood fuels at the national level is increasing, and an oil shortage may exaggerate this trend. The intense political situation in the Middle East, which is already making fuel more expensive, is also highlighting the significant positive contribution of woodfuels to the country's total energy consumption and supply. While this crisis may place the country's economy in peril, it may also provide the impetus for this commodity to get the long overdue serious attention that it deserves.

1.1 Household Fuelwood Consumption

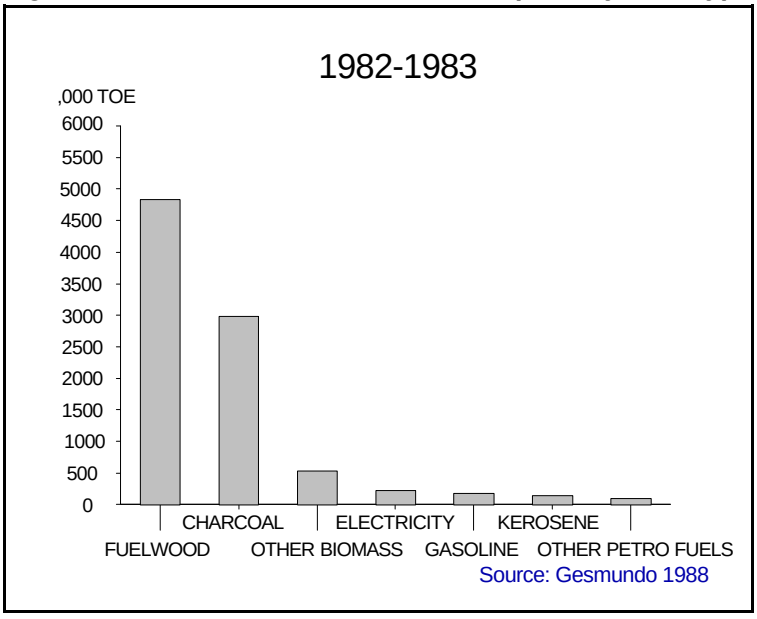
Energy studies have shown that household fuelwood consumption accounts for 14% of the total energy consumption of the country. But since the users of wood fuels are basically an array of small-scale industries and households that have never been accurately quantified, the true percentage of energy derived from fuelwood may be as much as 30 percent higher (Bawagan 1989).

A Rural Energy Needs survey conducted in 1982-1983 to determine energy consumption patterns of rural households estimated that the total energy consumption of rural households is 5,479 thousand TOE (tons of oil equivalents) per year (Figure 1). Of these, 88 percent of total consumption comes from fuelwood, charcoal and other traditional fuels. Fuelwood accounts for 54.4 percent of the total energy consumption of rural households and charcoal another 24.1 percent.

Cooking is the predominant use for fuelwood and charcoal. Estimates of the percentage of household energy used for cooking range from 50 percent (Hughart 1979, as cited by Hyman, 1987) to 80 percent (Cecelski *et al*. 1979, in Hyman, *op.cit.*) and 93 percent (Siner 1961, in Hyman, *op.cit.*). Households also use charcoal for ironing clothes and both fuelwood and charcoal for heating water.

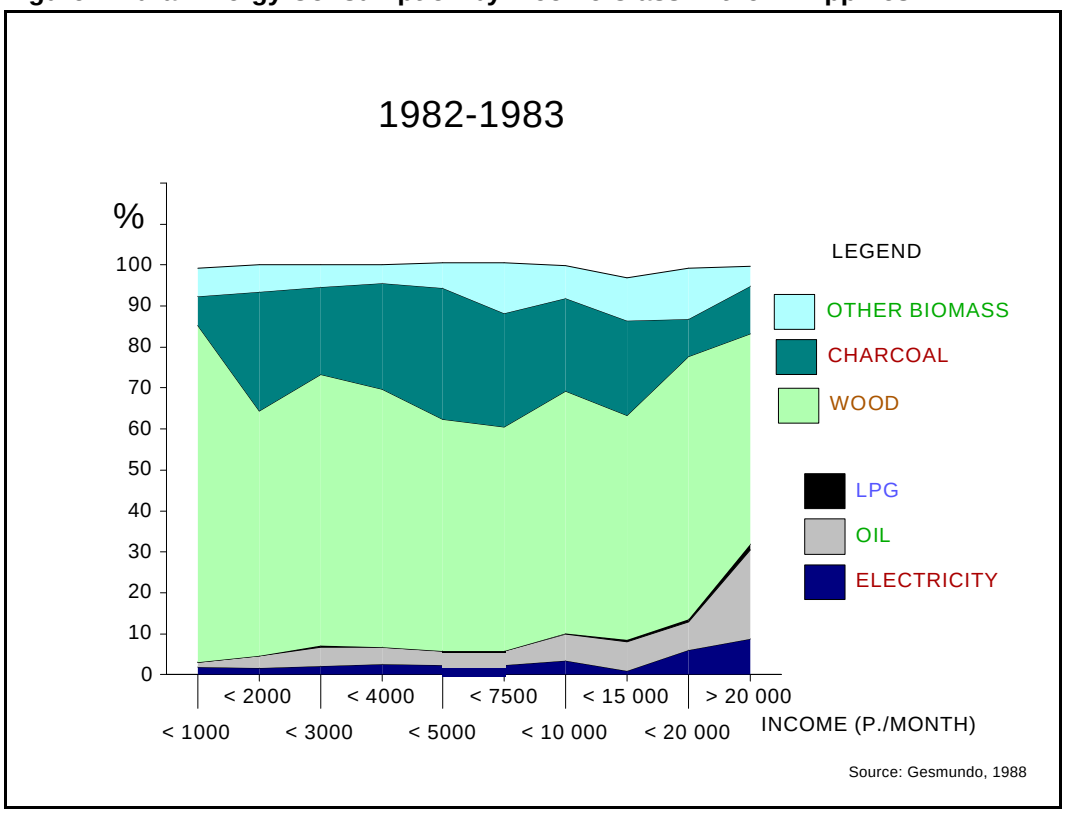
The survey also showed that the amount of fossil fuels used increases with income (Figure 2). The low and middle income households use more indigenous fuels such as wood, charcoal, coconut shell/husks/fronds/midribs.

Figure 1 Total Rural Household Consumption by Fuel Type



A more recent survey conducted by the National Statistics Office (NSO) showed that 67 percent of Philippine households use wood fuel. This clearly reveals the significant contribution of wood energy to the total energy consumption in the country.

Figure 2 Rural Energy Consumption by Income Class in the Philippines



1.2. Fuelwood consumption by industry

In the Philippines, wood fuel is utilized by many industries and commercial establishments. The current level of consumption is about 7.5 to 8.0 million m^3 per year (Figure 3).

Table 1 shows the way major uses of wood energy vary from region to region within the country. In addition to large scale industries, small scale and home industries are also significant users of wood fuels. Users include bakeries, restaurants, home food processing industries, blacksmiths, eateries and many others. Bakeries are assumed to be the most important fuelwood consumers in this category. It was estimated that the average fuelwood use of 46 fuelwood-using bakeries is 195 m^3/bakery/year. Wiersum used an equivalent ratio of one fuelwood-using bakery per 13,000 persons to arrive at an estimate of fuelwood use by bakeries each year at 700,000 m^3. No data are available on the numbers of or rates of consumption for other small-scale industries. Wiersum assumed, however, that bakeries may account for about half of the total energy consumption of small-scale industries in the Philippines. As a rough estimate, the annual fuelwood need of small-scale industries is about one million m^3.

Figure 3 Estimates of Industrial Wood Fuel Consumption

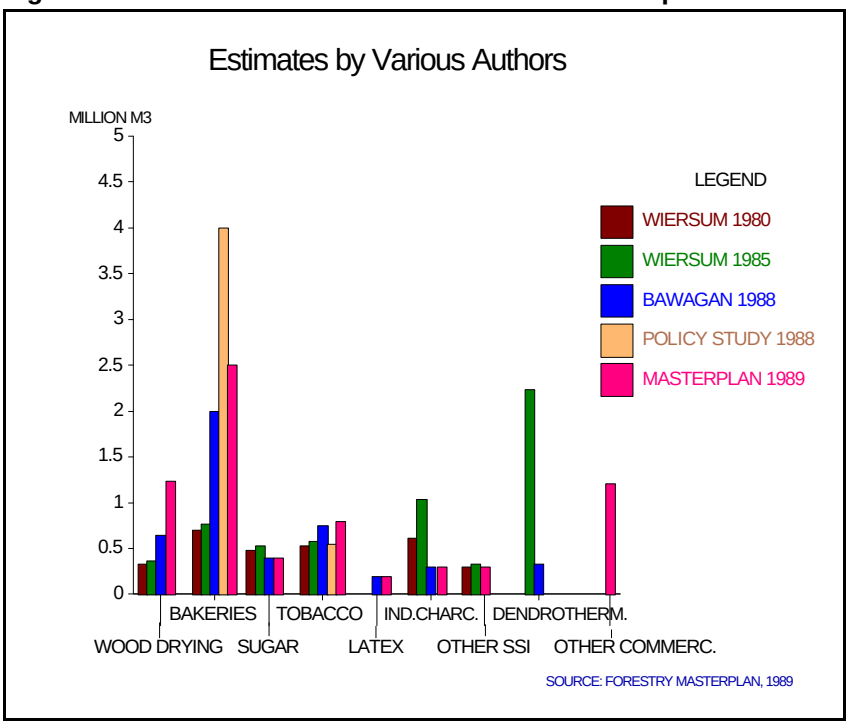


Table 1 Wood Energy Using Industries in Different Regions (Bawagan, 1989)

Region	Use / Type of Industry
1. Ilocos Region	Predominantly tobacco industry
2. Cagayan Valley	Logging and wood processing; furniture making; basketry; loom weaving; shellcraft; wood carving; nipa wine and vinegar; food processing; bakeries.
3. Central Luzon	Rice industry; furniture; ceramics; metalcraft; bakeries; food processing.
4. Southern Tagalog	Food processing; furniture making
5. Bicol	Furniture making
6. Western Visayas	Sugar centrals; refineries; lime manufacturing.
7. Central Visayas	Rattan furniture industry
8. Eastern Visayas	Cottage and medium industries
9. Western Mindanao	Garments industry; food processing; furniture making; metalcraft; handicraft; shellcraft; ceramics; rubber.
10. Northern Mindanao	Furniture making; ceramics.
11. Southern Mindanao	Furniture industry
12. Central Mindanao	Furniture making
National Capital Region	Bakeries; food vending; restaurants.

1.3 Review of Existing Information

Not much data were obtained specifically on the production and distribution of wood fuels. The data on wood energy consumption are voluminous, but they are often expressed in national or regional aggregates. Nevertheless, we were able to identify various types of industries using wood fuels.

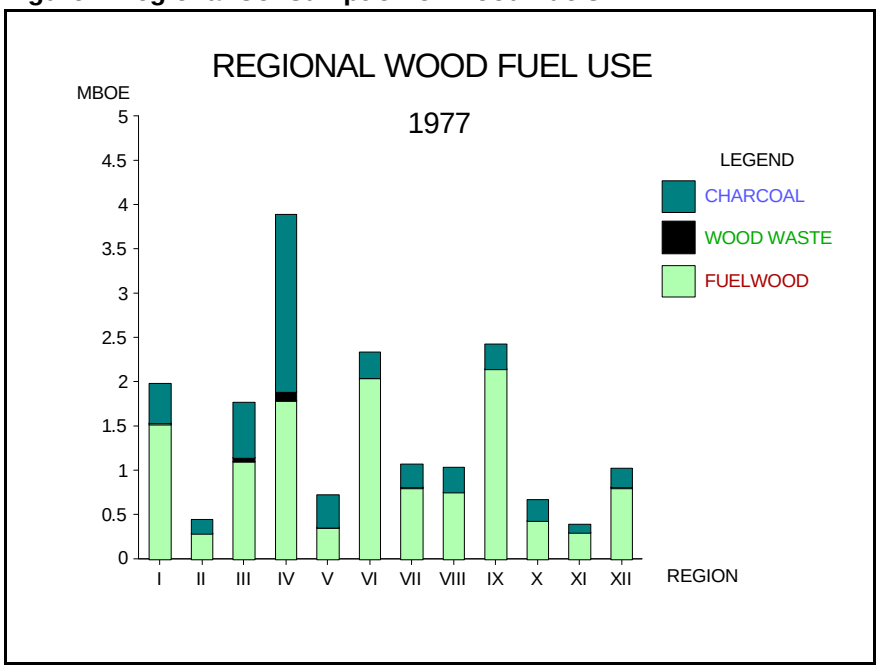
1.4 Site Selection

1.4.1 Urban/User site

We initially considered accessibility as our primary criterion in the selection of study site, but then broadened the scope of the selection process at the regional, provincial and town levels using dependence, degree of urbanization and accessibility as the major criteria. This necessitated the formulation of a new set of criteria to be used as basis for the different stages of site assessment and selection. The first stage was the national screening. Of the 12 regions of the Philippines (excluding Manila and Rizal), the top three wood fuel-using regions are Regions 4, 9 and 6. Using high dependence and accessibility as criteria for selection, Region 4 was chosen.

Region 4 is composed of 11 provinces. Aside from accessibility and high dependence, degree of urbanization, sources of wood fuels and types of wood energy consumed were added as criteria for provincial selection, leading us to choose the province of Laguna, eastern Laguna specifically.

Figure 4 Regional Consumption of Wood Fuels



After an initial reconnaissance of five prospective urban study areas that enabled us to compare roughly wood energy consumption patterns (Table 2) we decided to concentrate on the town of Siniloan as an urban user of wood fuels.

Table 2. Comparison of Prospective Towns Based on Different Criteria (Results of Initial Reconnaissance and Interviews).

Criteria	Sta. Cruz	Lumban	Paete	Pangil	Siniloan
1. Accessibility	OK	OK	OK	OK	OK
2. High Dependence					
a. Restaurants	many	few	few	few	many
b. Bakeries	5-6	few	few	-	6
c. Food Vending	many	many	many	-	many
d. Households	many	-	many	many	many
e. Small Scale Industry					
* Candies & Sweets	-	?	not common	?	many
* Rice Cakes	-	?	?		many
* Blacksmithing	1	8 HH	?	?	2
* Slaughterhouse	1	1	1	1	1
* Copradrying	-	?	?	?	some
* Furniture/Wood Carving	-	-	most HH	-	some
3. Degree of Urbanization					
a. Town Market	Biggest	Smallest	Average	Small	Big
b. Total Population	35th	22nd	19th	12th	23rd
4. Sources					
* Sawmill	Magdalena	Pagsanjan	Scrap Wood	Within Forest	Llavac
* Backyard	Cavinti	Kalayaan	-	-	Kapatalan
* Forest	Pagsanjan	-	-	-	Mabitac/Sta. Maria
* Private Farms	-	-	-	-	-
5. Types of Users					
a. Restaurants	many	few	few		many
b. Bakeries	5-6	few	few		many
c. Food Vending	many	-	many		many
d.Household Use	-	-	many		
5. Types of Fuel	firewood; cococharcoal; wood charcoal	coco-shell firewood	scrap wood	coco-shell	firewood/ charcoal

1.4.2 Rural/Producer Site

We obtained data about the different types of wood energy users within the town as well as the major sources of wood fuels being transported to Siniloan. The upland barangays of Siniloan--namely Kapatalan, Magsaysay and Llavac--were identified as the primary source of wood energy directly used in Siniloan. We decided to concentrate mainly on the dominant source of fuelwood.

Key informants reported that fuelwood is the dominant form of wood energy produced here and that charcoal making is now much less than it was some five years ago. There was said to be more activity in the upper Barangays of Magsaysay and Llavac than in barangay Kapatalan. We originally planned to triangulate on the three barangays as sources of wood fuels (production areas) based on the relative distance to the town center (Kapatalan is 12 km away from the town; Magsaysay, 17 km; and Llavac, 21 km) and the relative amount of wood fuels produced. Finally, we chose Barangay Magsaysay as the primary site for study of the production system, especially for charcoal production.

We first gathered general information on the situation of the barangay, especially about the wood energy production system. A big portion of barangay Magsaysay is a part of the University of the Philippines-Quezon Land Grant (UPQLG). We requested the help of a former officer-in-charge of UPQLG in identifying persons or entities involved in charcoal and fuelwood production. One staff member accompanied the team in interviewing persons involved in charcoal and fuelwood trade. Initially, we categorized charcoal makers based on ownership of land, but we soon discovered that most farmers have a piece of land. Next, we tried to classify charcoal makers in terms of volume produced. But we learned that this is not a good way of classification because of variability of production due to season, availability of wood and the relative need for cash. After several rounds of interviews and a series of group meetings and workshops, we decided to classify charcoal producers based on purpose. These are:

a. Making charcoal to open, maintain and expand the area they cultivate;

b. Making charcoal as a primary source of income;

c. Making charcoal as an emergency source of income; and

d. Making charcoal to augment income while waiting for the upland pioneer (*kaingin*) farm to become productive.

We learned that fuelwood production was not prevalent in barangay Magsaysay, so we shifted operations to barangay Kapatalan, which was reported to have more fuelwood producers.

Middlemen involved in the charcoal and fuelwood trade were identified and interviewed. We examined their "flows" and tried to determine end users. Market retailers related that aside from the Kapatalan-Magsaysay, Llavac area, there were other sources of the charcoal and fuelwood sold in Siniloan. These were Pangil, Sta. Maria, Mabitac and the Casinsin-Bagombon area.

A list of users, particularly small-scale industries, was gathered from traders and producers in the upland barangays. Interviews with food processors (as one of the small-scale industry users) verified that there were other sources of wood used for cooking, i.e., the Mabitac area and the Casinsin-Bagombon area where *Leucaena leucocephala (ipil-ipil)* and *Gliricidia sepium (kakawate)* are widely sold. Respondents from small-scale industries using wood energy--like blacksmithing and paper mache-making, restaurant/eatery, carinderia, bakery and poultry raising--were interviewed.

For urban household users, we located possible concentrations of households based on economic standing using the town map. Areas dominated by low income and high income groups were identified. We classified household users based on income because from previous knowledge--and as one of the hypotheses of the study--income and wood energy usage/consumption are closely related.

We then drove around the town and, using the type of house as an indicator, conducted household interviews. Prior to this, information from key informants had been obtained to use in selecting household respondents.

Another workshop was held after urban user interviews were completed and a tentative outline of the report was made. We decided we should visit other, less important sources supplying charcoal and fuelwood to Siniloan to compare the systems or flows of other areas. Due to time constraints, these studies were not as detailed as those at major production sites. Immediately after the last day of fieldwork, group meetings were held to draft the final outline of the report and for the last round of discussions of the research results.

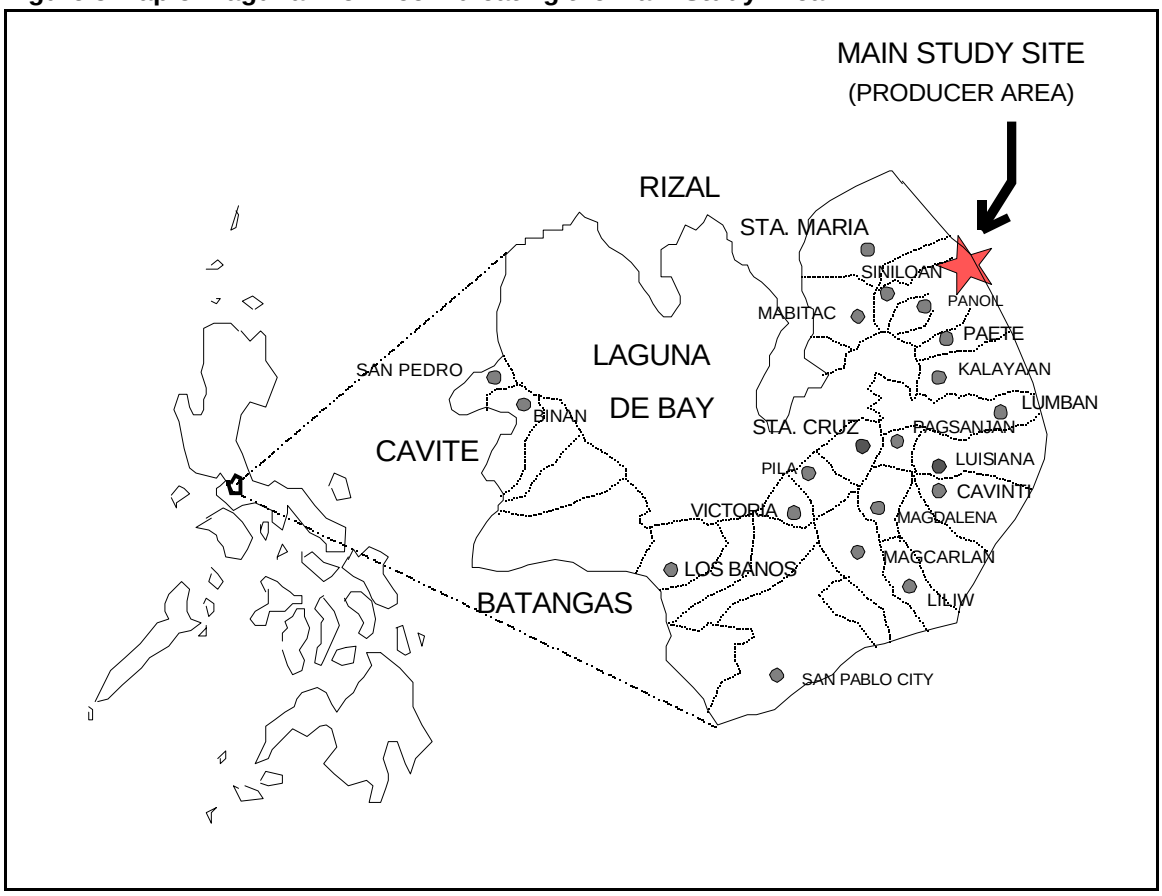
Overview of the Study Area (4 km from highway)

2. OVERVIEW OF THE STUDY AREA

2.1 The Province

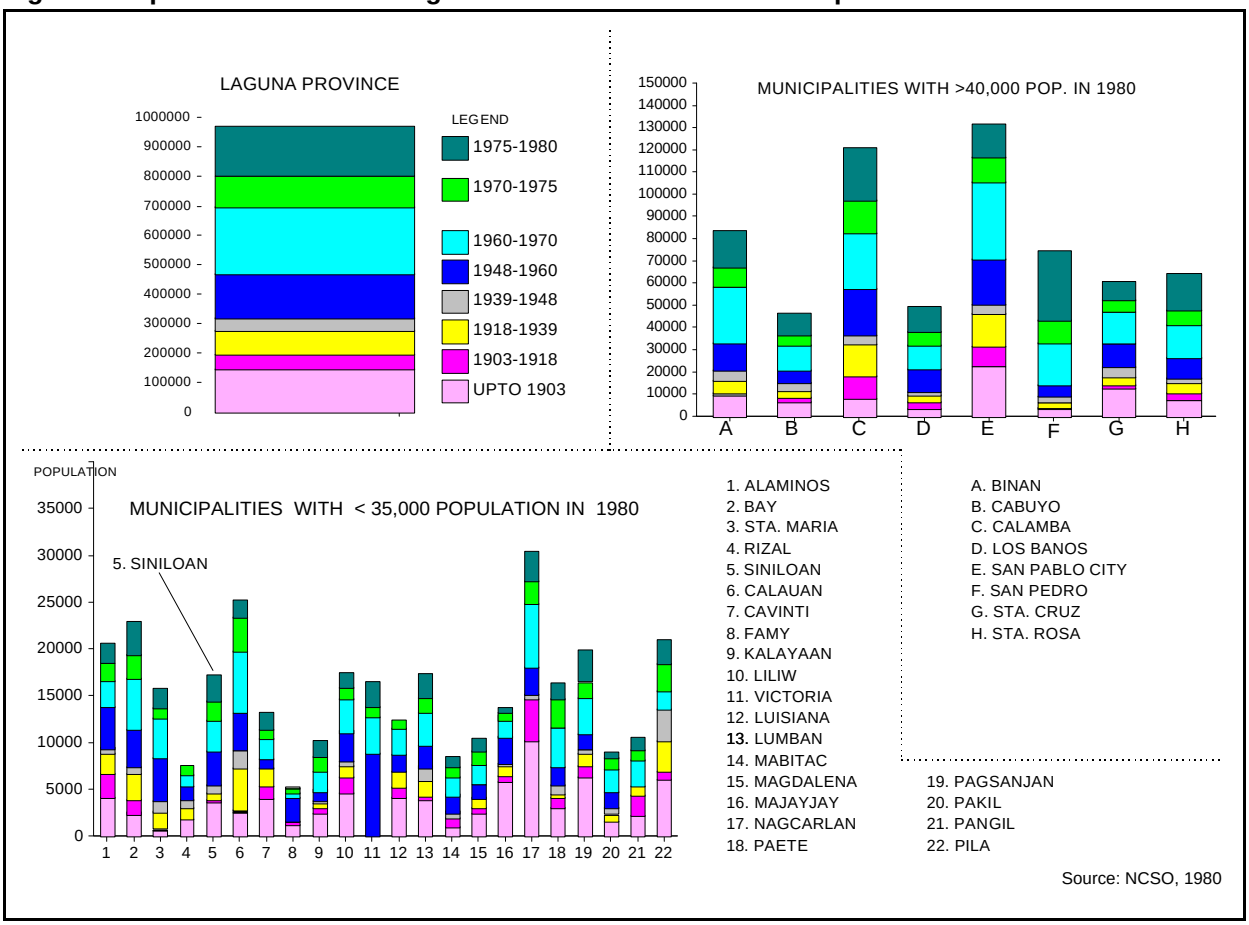
Laguna is one of the 11 provinces in Region 4, the number one consumer of fuelwood in the country. It has a land area of 1,799.7 km^2, representing 0.60 percent of the total land area of the country. It is 30 km south of Manila and is located at the southern end of Rizal province, bounded on the east by the Sierra Madre mountain range, on the south by Quezon province and on the west, by the provinces of Batangas and Cavite (Figure 5).

Figure 5 Map of Laguna Province Indicating the Main Study Area



The province is composed of a city and 29 municipalities, 13 of which are situated at the base of the mountains of Makiling, Banahaw and Cristobal. In 1980, the population was only 973,204. It rose to 1,210,942 by 1985, an increase of 24.42 percent in five years (Figure 6). In 1988, the population was estimated at 1,379,604 with an annual average growth rate of 3.9 percent. In 1980, population density was 553 persons per km^2, an increase of 96.2 persons per km^2 from 1975; then 687.61 in 1985 and to 783.99 in 1988.

Figure 6 Population Growth in Laguna Province and its 30 Municipalities: 1903-1980



Of the 229,935 households, 50 percent were in urban areas and 50 percent in rural areas. The population of Laguna Province is predominantly urban; three-fifths of the population reside in urban areas. The upward trend in urban population is due to in-migration either within the province or across provincial boundaries. More than half of the population (56%) aged 15 and over are gainfully employed; of those employed, 29 percent are in agriculture- and forestry-related occupations and 34 percent in production as workers, transport, equipment operators and laborers (NCSO 1980).

2.1.1 Land Use

The terrain consists mainly of narrow rolling plains along the eastern, southern and western shores of Laguna de Bay. A few elevated portions are found along the northwestern part of the province. Provincial records show that 60.61 percent of the total land area is classified and 39.39 percent is still unclassified. The classified area constitutes 49.13 percent alienable/disposable and 11.48 percent forest land.

In 1989, the NCSO reported an increased area considered alienable/disposable (76.56%); and 23.44 percent as forest lands. Of the classified public forest land, 8.8 percent was forest reserve, 83.84 percent timberland, 6.68 percent as national parks, and 0.66 percent as military reservation.

Agriculture, forestry and fisheries provide livelihood for about a fifth of the population aged 15 and above. Different crops are grown in various soil types. Most of the upland areas are planted to coconut, citrus, fruit trees, sugarcane, pineapple, corn, vegetables and upland rice. Lowland areas are generally planted to rice.

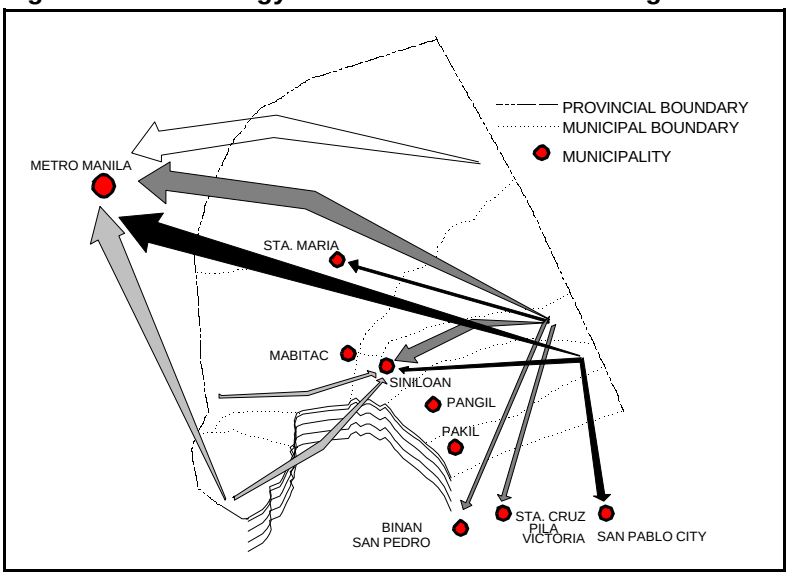
2.1.2 Energy Use

In 1980, fuelwood and charcoal were widely used for cooking. More than half (54.20%) of all households cooked with wood or charcoal; 20.16 percent used liquified petroleum gas (LPG), 16.39 percent, kerosene; 8.37 percent, electricity; and 0.80 percent, other kinds of fuel (NCSO, 1980). Since 1970, the proportion of households using wood, charcoal, and kerosene had decreased, while use of LPG and electricity had increased.

Household use of wood fuels is projected to increase significantly in the 1990s. The supply of non-conventional fuels and the growing demand for energy of rural industries, home industries and services, such as eateries, restaurants, bakeries, poultry industry, etc. will affect the energy requirements of the province.

In 1980 it was estimated that nearly 80 percent of the rural households used fuelwood or charcoal for cooking. In urban areas, 40 percent cooked with fuelwood or charcoal; 30 percent with LPG; 20 percent with kerosene; 10 percent with electricity; and 0.5 percent, used other forms of energy (NCSO 1980).

Figure 7 Wood Energy Sources in Northeastern Laguna



In 1988 50 percent of the households were below the poverty threshold of P 2,832 (US$113.35), the minimum average monthly income for a family of six. Of the 204,922 families in the province 15 percent were barely at that level and 40 percent were above the poverty line.

It is evident that limited resouces and low incomes will force poor households in both urban and rural areas to continue to rely on fuelwood and charcoal as their principal sources of fuel energy.

2.1.3 Sources of biomass energy

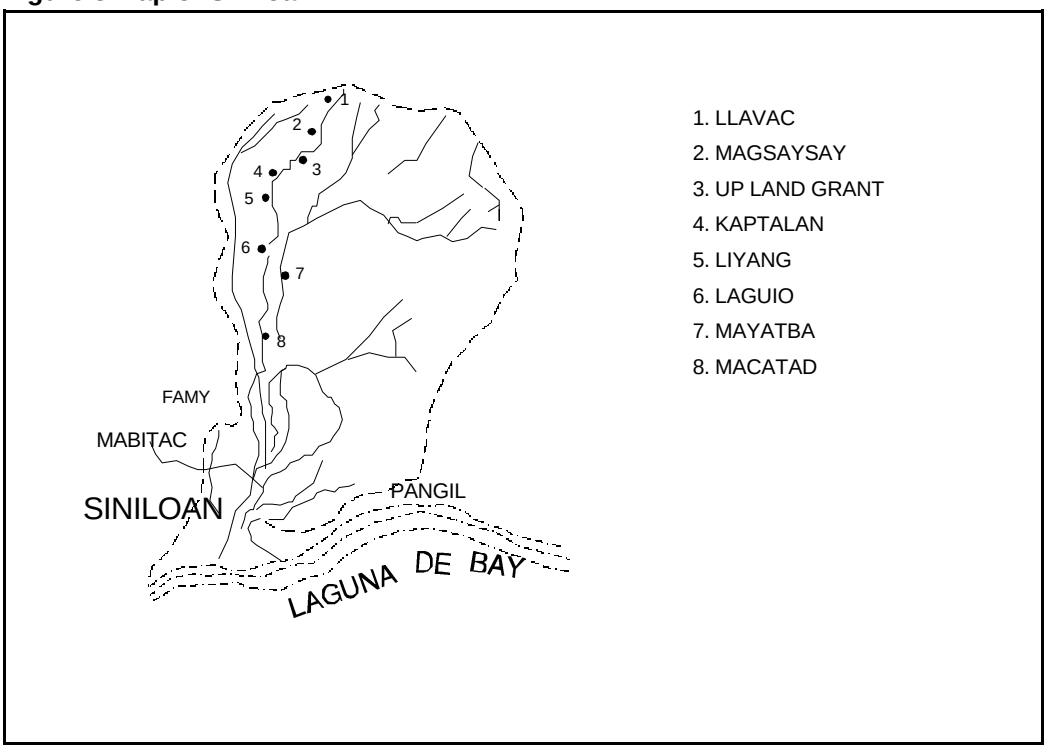
Wood fuels of the province come from two zones: a) the southeastern part of the province, consisting of highland municipalities near the mountain areas of Banahaw and Cristobal, and b) the northeastern part of the province, the municipalities near the Sierra Madre mountain range and on the boundary of Laguna and Quezon, particularly the towns of Real and Infanta (Figure 7).

2.2. The Municipality of Siniloan

The municipality of Siniloan is slowly emerging to be a major trading post in northeastern Laguna. Siniloan was established in 1579 and formally acknowledged as a municipality in 1583. It is about 85 km from Manila via Rizal province route and 123 km passing through the old route going southwest to Sta. Cruz, the capital of Laguna, about 24 km away from Siniloan.

Siniloan has a total land area of 41.1 km^2, making it the third biggest town in the north eastern portion of the province. The municipality is bordered by mountain ranges on the eastern, western and southern sides. On the north is the town of Famy, to the south Pangil, and to the west Mabitac (Figure 8).

Figure 8 Map of Siniloan



There are 20 barangays[1] located in the flatlands across Laguna Lake and another seven mountain barangays eastward toward Quezon province. Rice is the primary crop grown in the lowland areas. Only a small portion (with 8 to 15 percent slope) is grassland. Forest is in the northern part bordering the province of Quezon.

Soil is generally clay to clay loam and some soils are undifferentiated. Hydrosol lands are generally found in the lowest portion along the shore of Laguna Lake while undifferentiated soil is

[1] Villages, the smallest administrative unit in the Philippines.

found on steep and rolling lands. About 43 percent of the total land area is mountainous and covered with forest in exceedingly steep slopes and rough topography (MDPO 1989).

Secondary Forest in the Study Area

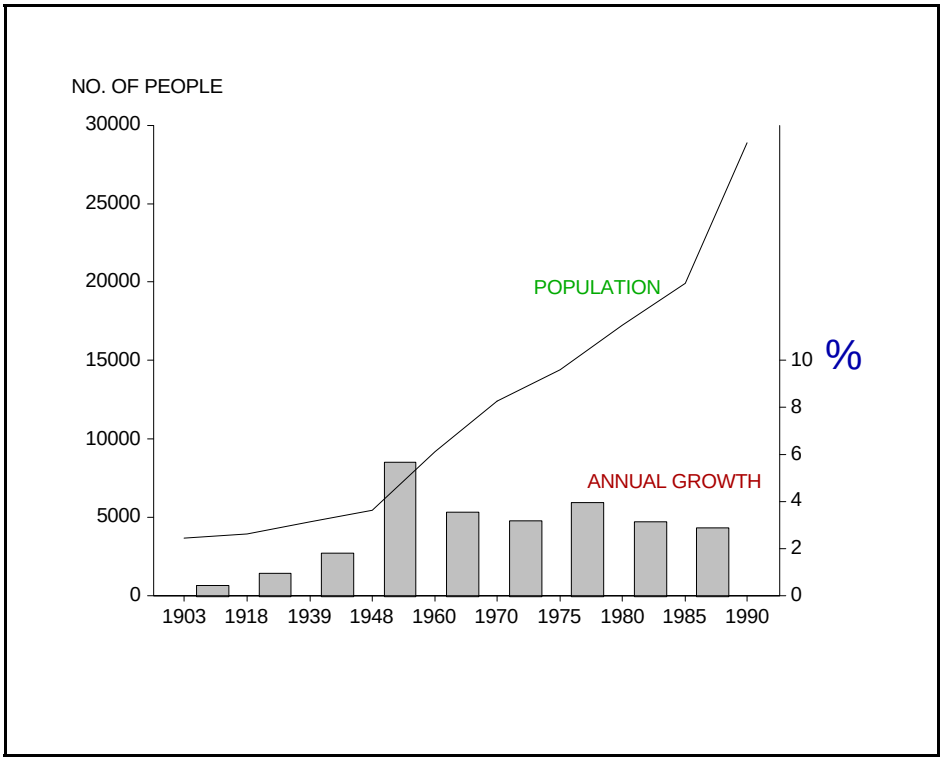
The population of Siniloan was only 3,675 in 1903 and by 1948 it had grown to only 5,450. During the 1940s and 1950 migrants began to come from nearby towns in Laguna to become pioneer settlers in upland villages in Siniloan. During the 1960s and 1970s dramatic growth occurred as migrants from other provinces poured into the recently established upland villages of Kapatalan, Magsaysay, and Llavac in response to logging operations that opened the area to human settlement and land transformation in logged over areas and the ensuing kaingin development. By 1975 the population of Siniloan reached 14,386.

Then, during the 1980s, a new wave of migrants arrived, attracted by the potential profits to be made by producing charcoal and fuelwood from the abundant woodland and the extensive conversion of forests to agricultural uses in the pioneer upland settlement areas. Many of the migrants came from other provinces, from Batangas, Mindoro, Quezon, Bicol, Visayas, and Rizal. By 1990, the population had soared to 22,870, a 522 percent increase in 87 years. Figure 9 shows the growth of population of the town.

In 1984, about 9 percent of the total population lived in the urban center, 72 percent in pheripheral villages, and 19 percent in rural upland villages. In 1980 there were a total of 3,355 households, with an average of 5.1 members per household.

Rice farming is the primary source of income in the flatlands of Siniloan. Other sources of livelihood are fishing, coconut, fruit trees, citrus, coffee, vegetables, bananas, livestock, poultry and forest produts such as wood fuel and timber.

Figure 9 Historical Growth of the Population in Siniloan, 1903-1990



About 44 percent of all commercial establishments are wholesale or retail businesses. Other establishments are engaged in construction supply, recreation, cottage industries, financing, transportation and service activities. The majority of establishments are retail stores. Only a few are engaged in wholesale trading. Cottage industries include paper mache, wood carving, food processing (desserts, rice cakes, custard, etc.), iron craft metal works, eateries, restaurants, food vending and other forms of services.

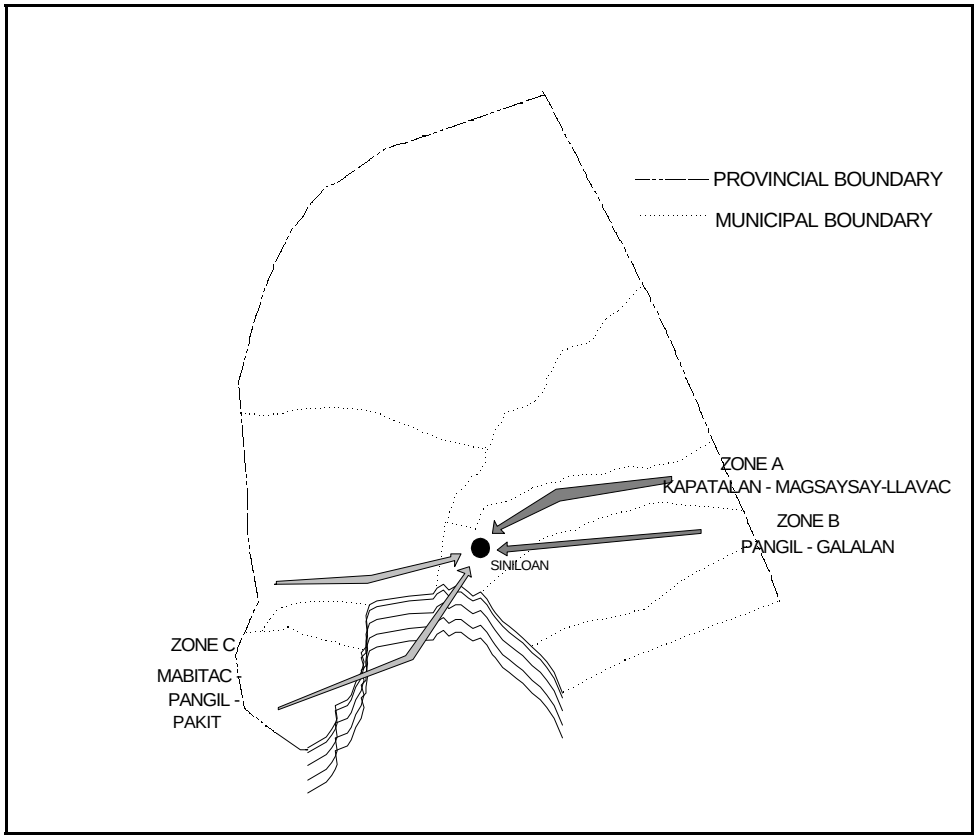
2.2.1 Energy Use

Of the 15 municipalities of eastern Laguna, Siniloan seems to exhibit the highest dependency on wood fuels, considering the range of wood energy users found in the urban center and the large segments of the rural population with various degrees of dependency on wood fuel as a source of income.

Wood fuels come to Siniloan from three major sites, namely the Kapatalan-Magsaysay-Llavac area in the southeast, which we refer to as Zone A, Pangil - (Zone B) and the Mabitac -Pangil-Pakil area (Zone C) (Figure 10). Charcoal production in the municipality of Sta. Maria, a municipality that is contiguous to Mabitac, is primarily for the Metro Manila market. This charcoal is usually made from *Gliricidia sepium* (*kakawate*) or *Leucaena leucocephala* (*ipil-ipil)*. These types of wood are highly preferred by Metro Manila users.

About 60% of the woodfuels for Siniloan, on the other hand, come from the Kapatalan-Magsaysay-Llavac area, while the rest come from the other two sources.

Figure 10 Wood Energy of Siniloan



In the town of Pangil (Zone B), most wood fuels come from the upland villages of Galalan and six other villages located 7-12 km from the town. Five villages are major sources of wood fuel for the town of Pakil. Wood fuels in the town of Pangil come from privately-owned farms, public forest lands, private agricultural lands and backyard fruit trees. On the other hand, in the Mabitac-Pangil-Pakil-Rizal peninsula (Zone C), wood fuel is derived from naturally-growing native *Leucaena leucocephala* and *Gliricidia sepium* on private and kaingin lands.

Wood fuels also come from within the town of Siniloan, including coconut shells, coconut charcoal, sawmill slabs, coco lumber slabs, coconut husks and fronds.

2.3. The Major Producer Area

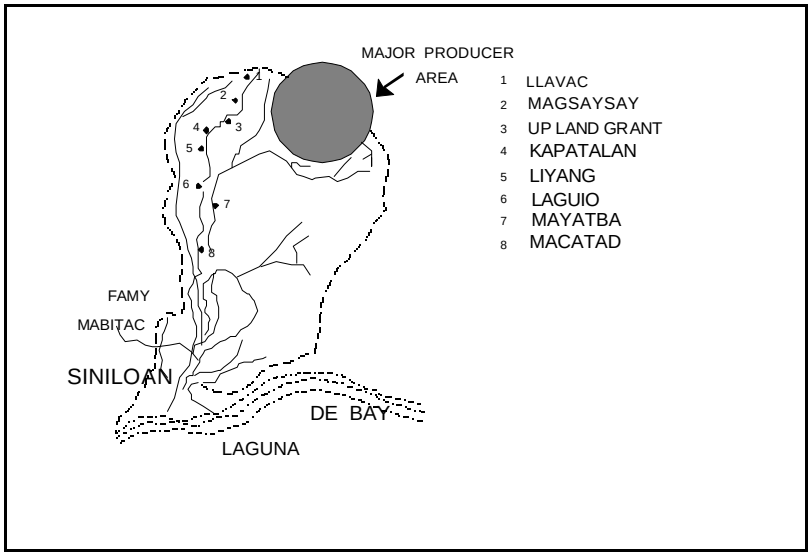
While Siniloan draws its wood fuel from many sources, most of the wood fuel comes from two upland barangays of Siniloan. Barangay Kapatalan is about 12 km northeast of Siniloan, nestled on a relatively wide plateau of the Sierra Madre Mountain Range. In fact, the name was derived from the word "patag," which means "flat". This barangay has a population of 2,000, and many people are still making charcoal. Some farmers are also engaged in *tapil* making (cutting square logs for wood carving purposes) and carabao logging.

According to a key informant, about 20% of the population making charcoal in 1985 were from Bicol and Visayas. Only about 5% of these migrants had been able to buy land and settle in the area. Original residents of the barangay less frequently make charcoal because they have their own land, and when they do it is only for home consumption. Landholdings range from 0.5 ha to 10 ha/farmer. This barangay is classified as a low wood fuel production area.

Barangay Magsaysay, on the other hand, is 17 km away from the town. This barangay is considered the primary source of wood fuel and lies adjacent to a major forest resource--which is the UP Land Grant. This is located at the upper northeast portion of Laguna de Bay within 14°30' north latitude and 121°31' east longitude. The Land Grant is close to 6,000 ha of forest along the boundary of the territorial jurisdiction of the municipalities of Siniloan, Laguna and Real, Quezon (Figure 11).

The settlement of barangay Magsaysay, then known as barangay Binango-nan, was already established in the 1940s. In the 1950s, people from other places settled in the area, but concentrated along the provincial road traversing Laguna going to Quezon province. In 1958, the late President Ramon Magsaysay declared a portion of forest under land reform, and distributed homesteads to those who were interested. This was the pull factor for more people to move into the area. In honor of the President, his name was adopted as the new official name of the barangay.

Figure 11 Map of Major Producer Area



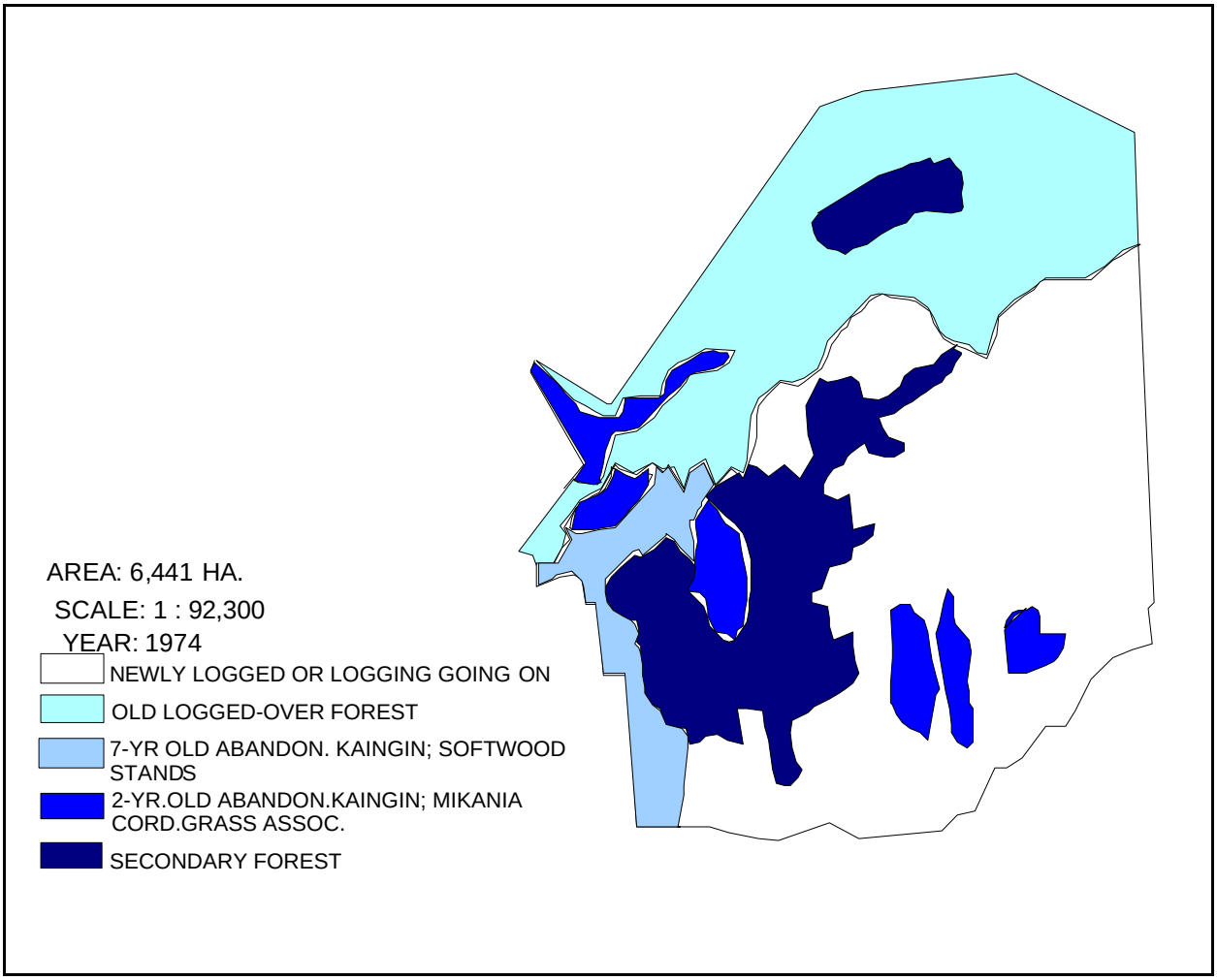
Most pioneers in Magsaysay originated from Nagcarlan, Laguna, and from the lower barangay of Kapatalan. Some farmers still have some lands there, so at first the most common crops grown in the new settlement area were the same cash crops that were grown in the villages of origin, vegetables like tomatoes, squash and sitao. But local soils were found to be unsuitable for these crops, so people switched to coconut, santol, jackfruit, bananas and other fruit trees.

Pioneers of the 1940s recalled that the area was then thickly forested. Rains came almost every day and bright sunny days were very rare. Dipterocarps and other hardwood species were common and charcoal-making was unheard of. Logging activities came first. The first logging company in the area was Interwood; followed by three others between 1962 and 1982. All of them engaged mostly in the extraction of quality lumber for export. Logs were hauled to Bulacan Province in Central Luzon (Region III) for processing.

Figure 12 indicates an abundance of standing biomass in the area in the 1970s. The management was then under UP Diliman.

In 1984, the UP entered into agreement with the National Development Corporation (NDC), a quasi-government entity engaged in industrial tree plantation development. The development program has two components: clear-cutting the Land Grant and developing plantations. The whole program was designed "to rationalize the integrated use of land resources which takes into account a thorough utilization of existing forest products.

Figure 12 Land Use Map of UP Quezon Land Grant, 1974



This undertaking coincided with the oil crisis of the 1980s, when a search for indigenous sources of energy was in an upswing. Radio programs encouraged people to make wood into charcoal as a gainful occupation. This was the time when people came to realize that wood fuel production could be a profitable business and fuelwood gathering and charcoal making became an important part of the livelihood system of upland people in the study area.

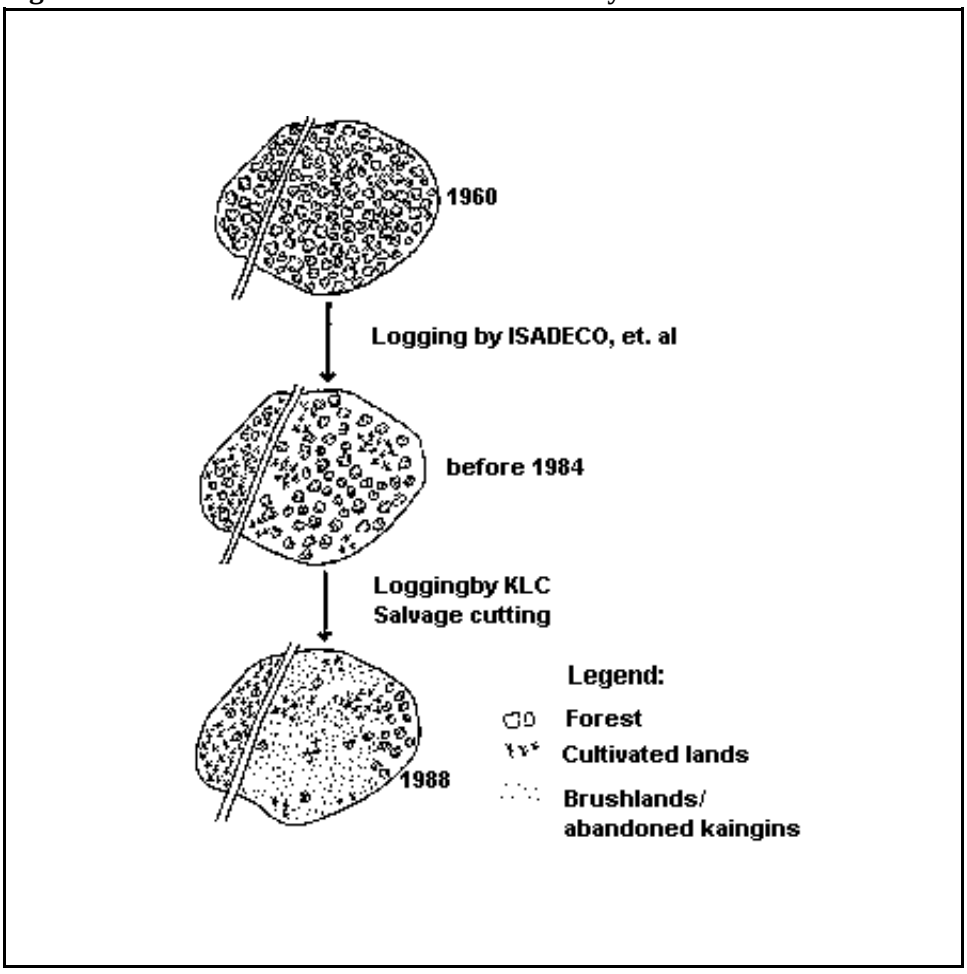
During this period, charcoal makers from a nearby town of Teresa, Rizal moved to the area, attracted by the news of abundant wood available to make charcoal. This group introduced the technology to the locality. Within two years, everybody was making charcoal, and this became part of the salvaging operation. Charcoal makers then gave 10 percent of the revenue to the NDC.

Gradually, people from other provinces as far away as Bicol and Visayas came to earn a living by making charcoal. From 1980 until 1987 production was high, but during the 1989-1990 period charcoal production fell.

Some of the charcoal makers were laborers of the Kasebu Logging Company (KLC) who made charcoal from the sawmill wastes. Some of these laborers were left in the area when the operation stopped. Most of those remaining came from Bicol, which makes it seem like KLC drew its manpower from Bicol.

Scrublands and kaingin farms now dominate the landscape. The secondary forest is about 15 km away from the main road. The transition of the landscape over time is shown graphically in Figure 13.

Figure 13 Land-Use Transformation of the Study Site

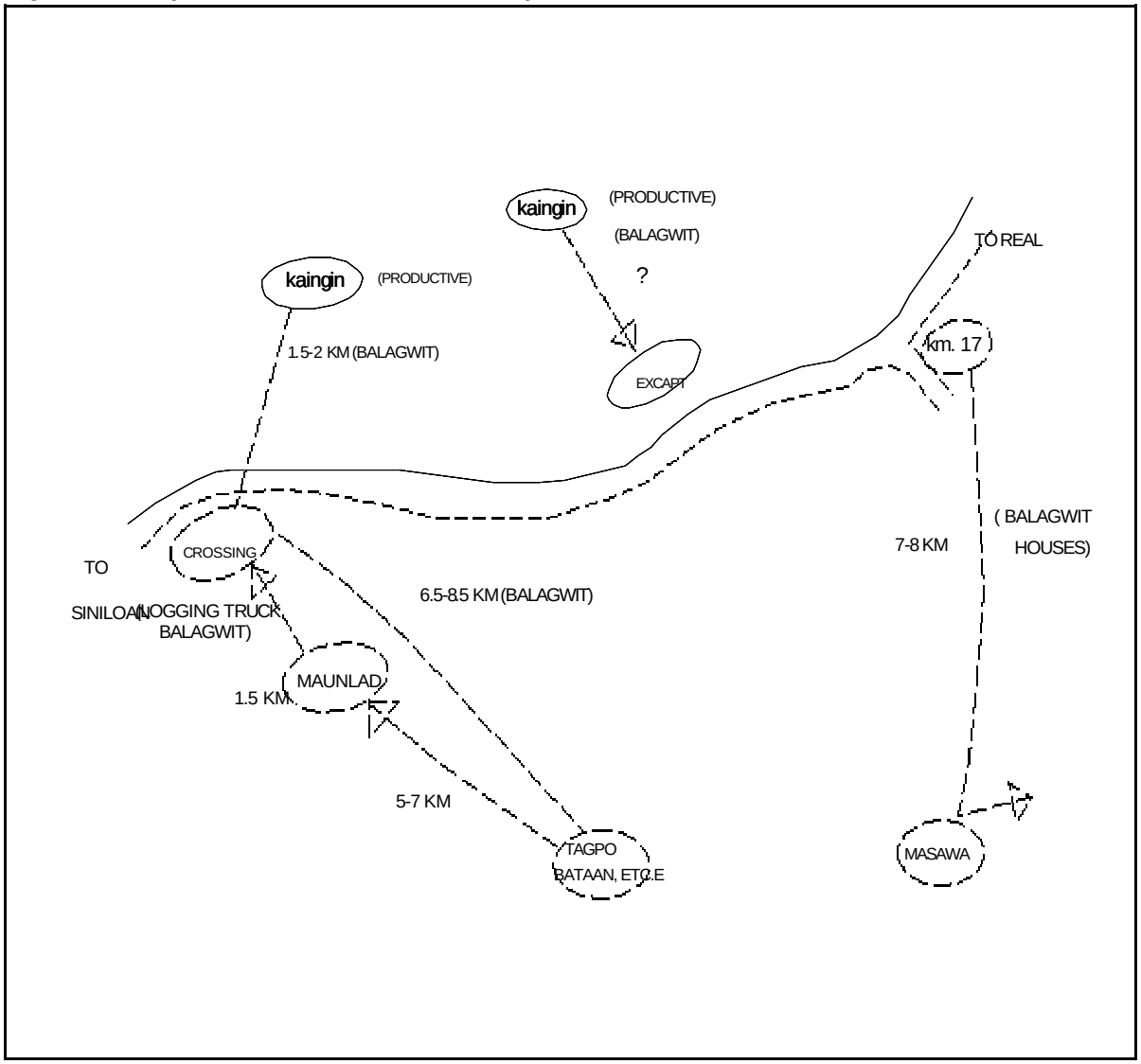


A simple model of current energy flows is shown in Figure 14. The area to the south of the main road is now considered private, as are some areas on the north of the highway. The private farms are a mix of coconut, citrus, jackfruit, banana, and some portions planted with vegetables, and limited areas for upland rice while some portions are still uncultivated. The private farms are one source of charcoal.

On the north side of the road, is the UP Land Grant. The secondary growth is restricted to the portion that is 15 km from the highway. The area about 4-6 km from the highway consists of patches of cultivated and abandoned kaingin and second growth.

The other major source of charcoal is the Masawa area. Masawa is an established settlement which is about 7 km from barangay Magsaysay. About 10 of the roughly 40 households engaged in kaingin are now engaged in wood fuel production. Their wood sources are their kaingin, and sometimes the secondary forest where felled or dying trees are available for making charcoal.

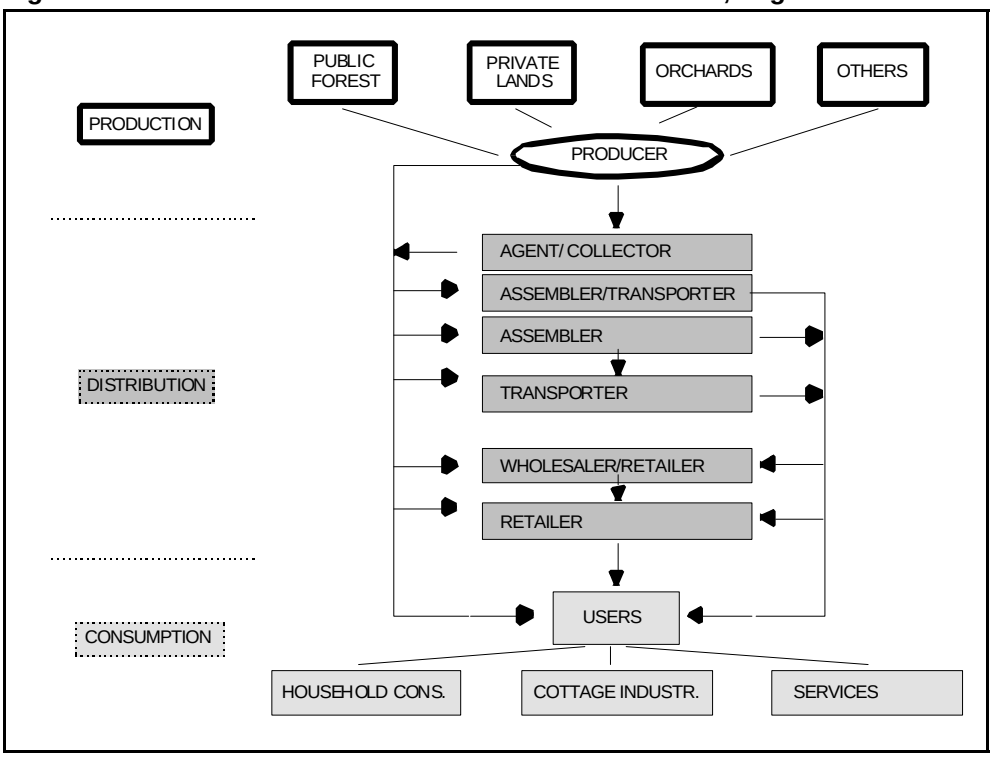
Figure 14 Simple Wood Fuel Flow in the Major Producer Area



3. MAJOR FINDINGS

The wood energy system is conceptually divided into three subsystems: the production, distribution and consumption systems. We studied the flow of wood fuel from the producers to the consumption center, but with a focus on the production system. The flow is shown in Figure 15.

Figure 15 General Flow of Wood in the Town of Sinoloan, Laguna



3.1 Production System

The two major sources of wood energy of Siniloan town are fuelwood and charcoal. Fuelwood can be classified in several ways. There are two categories of commercial fuelwood, based upon common types of bundles in which it is sold, which also correlates with the kind of wood involved.

1. "*Raheta*" consists of 4-5 pieces of split wood about 17 inches (42 cm) long, bundled together and produced in the upland villages of Kapatalan and Magsaysay. This is sold in the market at P 2 (US$0.08) per bundle.

2. "*Babat*," or "*Kahoy-kanin*," is similar to "*raheta*" and produced from *ipil-ipil* and *madre-cacao*, which abound in the hillsides of Mabitac and Rizal province. It is made up of 9 to 10 pieces of split wood bundled together. It is about 17-18 cm in diameter with a length of 52 to 54 cm. It is sold in the market at P 5 (US$0.20) per bundle.

Non-commercial, occasional producers of wood distinguish wood gathered for household use from wood gathered for sale to provide some extra money when necessary. The term "*Kahoy kanin*," literally "food wood," signifies that the wood is sold primarily to earn money to buy food.

3. "*Tuod*" refers to chopped wood stumps, usually *kakawate* or *ipil-ipil*, packed in a sack. It is sold at P 30 (US$1.20) per sack and produced in the upland villages of Mabitac. This type of fuelwood is mostly used in bakeries and for special household occasions.

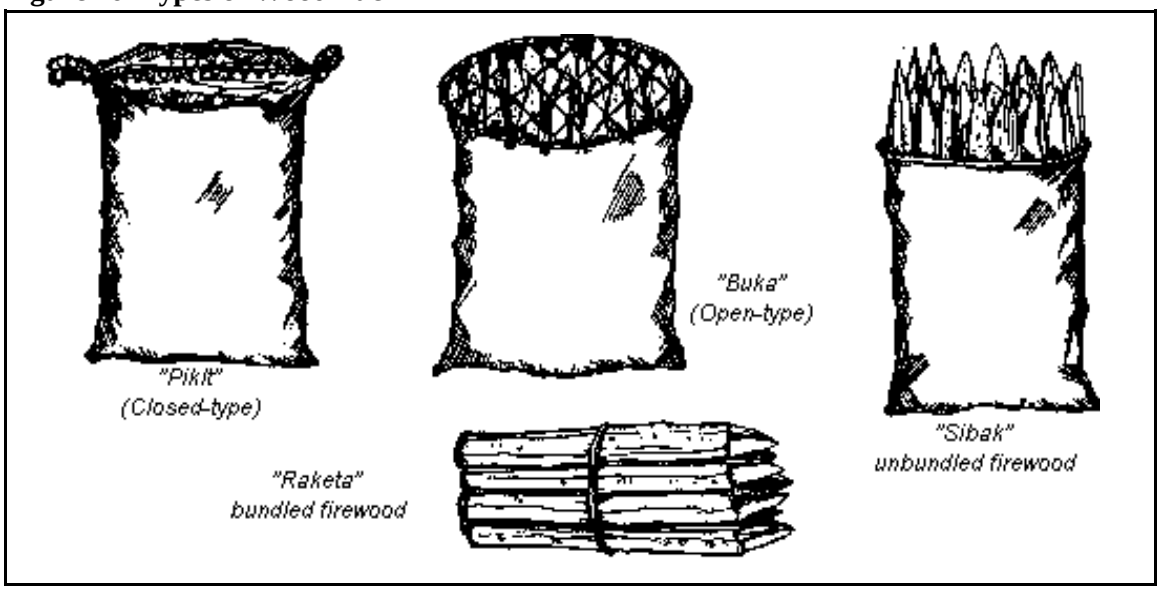
There are generally two major categories of charcoal, based on quality. "Heavy" charcoal (*mabigat*) and "light" charcoal (*magaan*).

1. "Heavy" charcoal, which weighs about 18-20 kg/sack is considered to be good quality charcoal. This is produced from good quality woods, such as *Tristania decorticata* (*Malabayabas*) and *Hopea foxworthyi* (*Dalingdingan*) which are normally without commercial value as lumber. Charcoal of this quality produces a ringing sound when a chunk is dropped to the ground, sparks during cooking, is intact or solid, does not turn to ash easily, has lasting heat and can be stored longer. When sold, this is usually pegged P 2-6 (US$0.08-0.24) more than the light charcoal.

2. "Light" charcoal refers to charcoal from ordinary wood species and is considered to be of lower quality than the "heavy" charcoal. Usually, the sack weighs only about 10-12 kg; and sold cheaper than the "heavy" charcoal.

Two other categories of charcoal are also known to consumers based on the type of packaging: an "open" type (*buka*) and a "closed" type (*tikom*). The open type of charcoal is filled up to the rim of the sack, which is then held together with a forest vine called "*malauway*," sewn in a criss-cross pattern across the top. This type weighs around 25-40 kg, depending on the kind of wood used. The volume is the equivalent of about four cans of charcoal. It is locally called "*buka*", meaning "open" (Figure 16).

Figure 16 Types of Wood Fuel



The closed type, locally known as "*tikom*," is smaller, containing only three kerosene canfuls of charcoal. The top of the sack is closed, the corner ends are tied together, using the same kind of forest vine. The price of the open type is almost double that of the closed type. The price of the former ranges from P 15 to P 25 (US$ 0.60-1.00); the latter, P 25 to P 30 (US$ 1.00-1.20) per sack.

The "open" charcoal usually comes from Llavac, about 20-25 km from the town of Siniloan. The "closed" type is produced mainly in Magsaysay, Kapatalan, and Pangil. Most of the charcoal produced in Llavac and Real is transported to Manila and its suburbs.

The demand for a specific type of charcoal depends on the preferences of household users and the kind of business establishments using the energy resource, its availability, cost, quality, and the level of income of household users.

Table 3 Types of Wood Fuel and Sources Used in Siniloan, Laguna, 1990

Types	Source
1. Fuelwood:	
a. "raheta"	Zone A - Magsaysay - Kapatalan
b. "babat"	Zone C - Mabitac-peninsula
c. "kahoy-kanin"	Zone C - Mabitac-peninsula
d. "tuod"	Zone C - Mabitac-peninsula
2. Charcoal:	
a. "heavy"	Zone A, B
b. "light"	Zone A, B
3. Coconut-based	Zone D (within town)
a. coconut shells	Coconut copra dryers
b. coconut charcoal	Coconut copra dryers
c. coconut husks	Coconut in farms
d. coconut fronds	Cocpnut in farms
e. coconut lumber	Coconut lumber yard
4. Wood trimmings	By-product of wood carvings
5. Rice hull	Rice mills

Other types of wood fuel are coconut charcoal, coconut lumber slabs, husks, fronds and sheaths, rice hull, coconut shells, trimmings from wood carvings, and the "head" portion of timber logs processed into lumber, stumps and sawmill waste (slabs).

Since 4 percent of land area in the municipality of Siniloan (46 percent for Laguna Province) is planted to coconut, coconut by-products are usually available. Coconut charcoal is produced in copra processing plants in the town and sold at P 40-50 (US$1.60-2.00) per sack. Coconut shells are also produced in the copra drying plants, but most of the shells go to Manila and are sold by the truckload at P 5,000 (US$200) per load. Coco shells are also available from the market selling grated coconuts. Coconut fronds, sheaths and other materials, like husks, come mainly from coconut farms and are not usually available in the market.

Coconut lumber slabs are used for fuelwood and are by-products of the coconut lumber industry. The industry has recently gained prominence because coco lumber is a cheap alternative to hardwood. Government coconut replanting programs and the on-going citrus plantation development that is replacing coconut farms in some areas both enhance the coconut lumber industry and are expected to provide even more fuelwood in the future.

Trimmings from wood carving are mostly used for household purposes. They are also burned to dry paper mache products, particularly during cold and rainy months. The paper mache is dried inside a barn to conserve the heat, making the drying process faster.

Rice hull is also a form of biomass energy but not wood-based. This material is available in many rice-producing areas, and also around rice mills along the highway. Some of this is used for energy purposes. Table 3 shows most common types of biomass fuels and their usual sources.

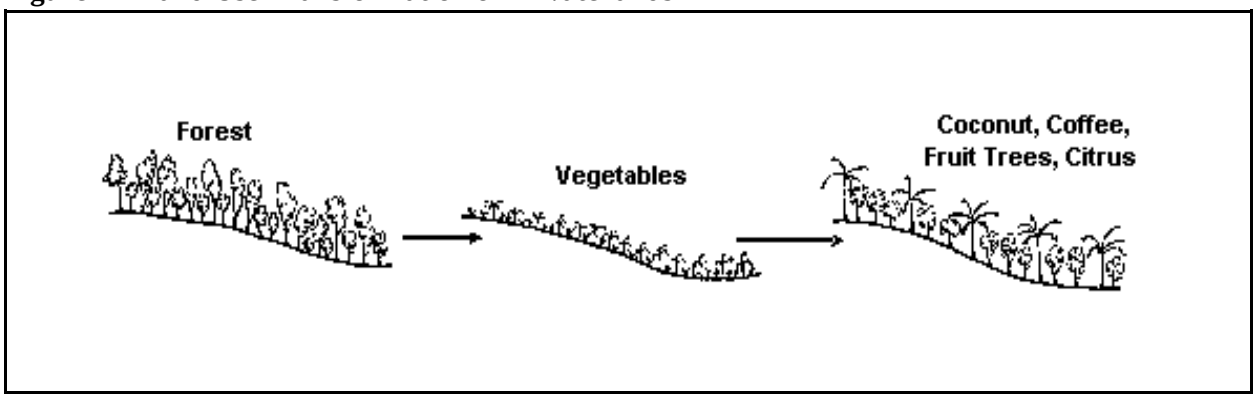
3.1.1 The Charcoal Makers

For most producers, charcoal making is a part of a long-term process of land transformation, the kaingin agricultural cycle. The initial activity is land preparation of the logged-over area. After the area is logged the land becomes accessible to people seeking livelihood opportunities. Normally after the land becomes accessible, farmers start clearing the land to open kaingin. In the process, smaller diameter trees, bushes, shrubs are cleared and then set on fire. For many kaingineros, setting fire is the most efficient way of preparing the land for two reasons, for clearing purposes and reducing the acidity of the soil through the ashes. In this case, however, instead of setting biomass on fire, kaingineros make charcoal to sell.

The earnings from the activity are used to support the family at the outset. And there is that possibility, although nobody admitted doing it, that poaching wood from the nearby forest can help to support the household while waiting for the crops to bear fruit. Earnings from charcoal are also used to purchase inputs needed to develop the kaingin farm.

The agriculture cycle, after land preparation, involves the planting of rice during May-June, harvesting in August; while vegetables like tomatoes are planted in July-August. (Figure 17).

Figure 17 Land Use Transformation of Private lands



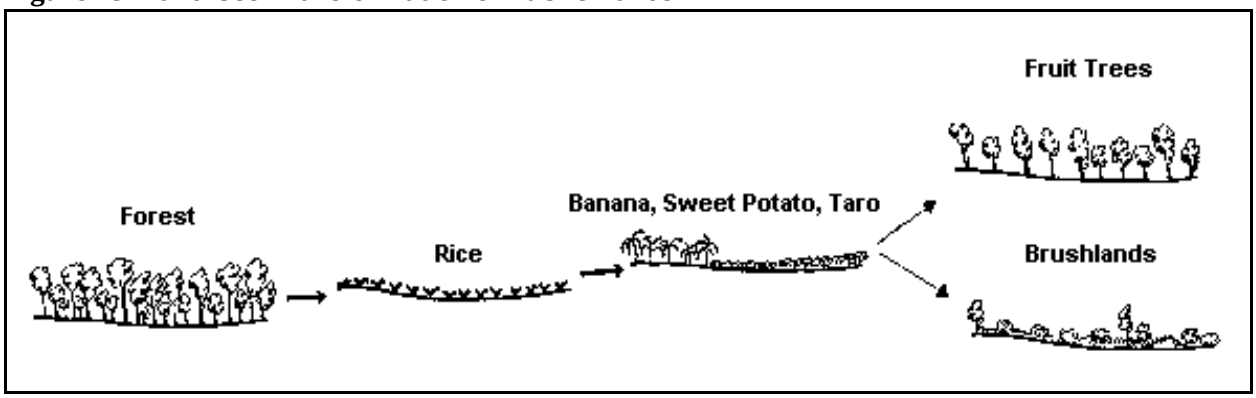
After one or two harvests, the land is planted with banana, coconut, sweet potato, and cassava. In the late 1980s citrus trees became a very important part of this system. Maintenance of these fields requires cutting underbrush, which yields additional biomass from felled pioneer trees and some undersized hardwood trees (e.g., *Syzygium garciae*, *Litsea perrottetii*, *Cleistocalyx*). These are made into charcoal. Thus, charcoal is produced as a by-product of agricultural activity.

The kaingin pattern in the area producing charcoal is shown below:

Logged-over area	---->	Open kaingin	---->	Maintain kaingin	---->	Expand
		charcoal		charcoal		charcoal

On public lands this leads to a pattern of land use transformation that differs from the one on private lands (Figure 18).

Figure 18 Land Use Transformation of Public Lands



On the other hand, some farmers make charcoal as a primary source of income. Although making charcoal is a tough job, some farmers are forced to do it for lack of any other economic opportunities. Most such farmers are landless; but others have kaingin farms with very low productivity. These farms may be unproductive for any of a variety of reasons: poor soil, lack of capital to buy farm inputs, etc. However, some people in the communities say that persistent charcoal producers are simply lazy and do not like to plant crops. Some of these kaingin producers poach wood from other kaingins and the nearby forests.

Farmers in this group also often procure wood from other farmers in many different ways. Sometimes, the land owner who provides the wood gets 1/3 of the product while 2/3 goes to the charcoal producer. In other cases, the charcoal maker serves as a hired laborer for land clearing and is paid in wood produced from the clearing activity. In this manner, the relationship between owners and charcoal makers appears to be symbiotic.

Most farmers, however, dislike making charcoal in other kaingin, and prefer to work on prospective kaingin land that they can themselves cultivate later.

Another major category of charcoal producers consists of farmers who occasionally produce charcoal for cash to meet emergency needs such as hospitalization, or for subsistence in times of crisis. In a country buffeted by an average of 20 typhoons annually, some farmers tend to rely on charcoal production whenever storms destroy agricultural crops. This is also a particularly opportune time, because wood for charcoal making is abundant from trees felled by the storms.

Charcoal production also tends to provide food and subsistence to people with practically no source of income. For example, a man who loses his job may resort to charcoal making until some other employment opportunity presents itself. Such activity becomes part of a distress economy into which the whole family is drawn.

For yet another category of people, however, charcoal making seems to be an economic activity that is restricted to a specific transition period during a long-term process of landscape modification. This means that farmers make charcoal while waiting for the land to be transformed into a more productive pattern of use. These farmers expressed a desire to abandon this kind of work once they are able to establish their own kaingin farm. They are optimistic that within about two years their farms will be able to provide economic returns sufficient to sustain them. In this regard, most people are now influenced to adopt a more agroforestry-based production system along with a citrus (*Citrus norides*) plantation as the most popular land use within the next five years. In fact, citrus is gradually replacing coconut, which used to be the most widespread agricultural crop in the uplands. This trend is not restricted to the study area, but is apparent throughout the northeastern Laguna. The current popularity of *Citrus norides* is caused by successes in other areas such as in the lower barangays of Siniloan, Sta. Maria, Mabitac and other towns in Laguna.

Some farmers, though, admit that income from farm produce simply is not enough to meet the needs of the family. In many cases, charcoal is made to augment the very meager income that people can get from their kaingin farms. It has become an integral part of their livelihood system, providing badly needed supplemental income to the family.

3.1.2 Fuelwood Producers

The majority of fuelwood producers are subsistence farmers who require secondary sources of income. Farmers in the enterprise prefer "*raheta*" production because this is less laborious than charcoal making. Although income derived from fuelwood cannot equal the profitability of charcoal, the opportunity costs of most fuelwood production are very low. Making *raheta* serves to optimize the use of available family labor. Since this is a less arduous task than charcoal making, the bulk of fuelwood production activities are done by women and children, who would probably not otherwise be gainfully employed. During summer vacation, when school is closed, children normally help their mothers gather, cut, and bundle fuelwood. The chopping of wood still involves the men in the family. This phenomenon is also evident in urban areas, where supply exceeds the demand because during this period urban households have their children gather fuelwood. In a provincial urban center like Siniloan, fuelwood can still be found.

Raheta production may also become a by-product activity of kaingin making, but only if the species preferred for fuelwood are available. This is the main reason why *raheta* production in the area is declining. *Raheta* production requires species that are "soft", easier to chop, with slender branches and trunks, and easy to dry.

3.1.3 Wood Sources

Most present-day charcoal and fuelwood makers have multiple sources of raw materials, although none are as abundant as they once were. Today sources may be broadly classified into private and forest lands.

Private lands are defined here as those which either have titles or have been released as homestead land, and upon which the occupants pay taxes. These are commonly planted with crops such as coconut, citrus, coffee, fruit trees and some annual crops. In the main study site, only 10 individuals have titles to their homesteads.

Occupants of other homestead lots have not yet requested that their land be surveyed to enable titles to be issued, although many of them have been in the area since 1960's and 1970's and have established their own croplands.

These private lots are sources of wood for charcoal and fuelwood making, especially for the owners themselves. Trees that shade or compete with crops, as well as fallen or dead branches which hamper movement, are removed. Lot owners optimize the value of the wood by making charcoal to earn additional income. In Mabitac, stumps of *Gliciridia sepium* and *Leucaena leucocephala* are dug in preparation of the land for planting citrus. These species produce high quality fuelwood. In some areas in Pangil (Zone C), mango (*Mangifera indica*) trees are being removed because they no longer bear fruit. The land owners now want to plant their fields with citrus, which is very profitable. Trunks and branches are cut and sold as fuelwood. However, one farmer in barangay Magsaysay never cuts good quality trees for charcoal because he is reserving them for other uses, such as house construction or wood carving. During the typhoon season, fallen trees in backyards and on private farm lands are also chopped up and sold as fuelwood.

Private farms, however, typically produce only about 20 to 50 sacks per kiln every one or two weeks. Children and adolescents usually get the raw materials from private farms and can obtain only enough raw material to produce 10-15 sacks of charcoal per week.

Public lands are defined as those lands that are still forested, shrublands (scrublands), kaingin farms without titles, and the sawmill. Most wood energy producers primarily obtain wood raw materials from forested or previously forested lands. The UP-Quezon Land Grant, which is adjacent to barangay Magsaysay, has been the main source of wood in the area since the start of charcoal-making in the early 1980's. Charcoal production in the area appears to have peaked in 1984 when the National Development Corporation (NDC) contracted a logging company to clear cut trees in preparation for industrial tree plantation development. The logging company left defective or damaged trees which would not yield good lumber. To meet the clear-cutting prerequisite, the NDC contracted salvaging groups to clear the site. The logged-over areas served as the major source of wood for charcoal and fuelwood makers.

Presently, the newly logged-over areas are more than 15 kms away from the main road of barangay Magsaysay where charcoal assemblers reside. This distance makes it impractical for charcoal makers to get wood from there. Persistent charcoal and fuelwood makers therefore resort to other more accessible areas: public lands or forest lands, whether secondary forest or brushlands, nearby kaingin farms, and sawmills.

Secondary forest is the major source of wood for large-scale charcoal and fuelwood production. Charcoal production in secondary forest can be as high as 200-300 sacks per kiln, although collection of the wood required might take well over a month. One interviewee said that they were able to produce 700 sacks of charcoal on a kiln as large as a regular-sized bus in the 1980s. This is understandable because these areas abound with large trees of 20 cm diameter and more. But even though large amounts of wood can be extracted, few charcoal makers exploit the area today because of its remoteness (8-15 km away) and regulations prohibiting poaching.

One fuelwood maker said that she goes to the area on a logging truck on its way to the logging site early in the morning. She then cuts trees until the logging truck returns in the afternoon and loads the logs on to it. But few people have access to logging trucks, only relatives and friends of the drivers.

Brushlands with smaller trees are also an important source of wood for charcoal, particularly for those who need immediate cash. Charcoal makers living near the main highway need not go very far to get wood, because brushlands are present less than 2 km from their houses. Those whose purpose is to make only about 1-1.5 sacks of charcoal can obtain wood from such areas.

Patches of kaingin farms located in public lands are sometimes sources of wood for charcoal-makers. The cultivated kaingin farms are commonly planted to crops like cassava, sweet potato, banana and other annual crops. But we observed many kaingin farms that were abandoned after the trees had been cut down and made into charcoal. Reasons for this neglect may be traced to the poor quality of the soil, topography, and sometimes, absentee claimants.

When the KLC sawmill was still operating, laborers were able to make charcoal from the slabs and trimmings to get some additional income. The officer-in-charge of the sawmill bought charcoal at P 10 (US$0.40) per sack from the workers and sold it at P 16 (US$0.64) per sack. However, in 1988 KLC stopped operating. Presently, charcoal made from slabs usually comes from a sawmill in barangay Llavac, which is said to be a prime source of wood for charcoal makers in that area.

3.1.4 Tree Species Preference

Up to about 5-10 years ago, while trees were still abundant, most charcoal makers chose specific types of wood for producing charcoal. These preferred species produce charcoal that is black, shiny, heavy, and does not easily break. This type of charcoal commands a higher price. *Tristania decorticata* (*Malabayabas*), for example, can be made into high quality charcoal. So can *Syzygium garciae* (*Igang*), which is commonly left by loggers because the wood is so hard that it is not suitable for lumber. Other tree species preferred by charcoal makers are *Lithocarpus buddii* (*Babaisakan*) and *Cleistocalyx operculatus* (*Malaruhat*)

As the scarcity of the preferred species became more severe, non-selective cutting down of trees for charcoal became rampant. About 25 percent of the migrants who still make fuelwood and charcoal now make charcoal from any kind of wood. Species that were seldom used and left undisturbed before have become the targets of charcoal makers. This practice has led to the spread of vast tracts of brushlands with very few standing trees in more accessible areas.

Table 4 presents the different tree species used to make wood fuels.

Table 4 Common Tree Species Used for Wood Fuels in the Main Study Site*

Local Name	Scientific Name	Uses
Malabayabas	*Tristania decorticata*	Charcoal
Igang	*Syzygium garciae*	Charcoal
Kahoy dalaga	*Macaranga dipterocarpifolia*	Fuelwood/charcoal
Babaisakan	*Lithocarpus budii*	Charcoal
Malaruhat	*Cleitocalyx operculatus*	Charcoal
Makaasim	*Syzygium nitidum*	Charcoal
Red lauan	*Shorea negrogensis*	Fuelwood/charcoal
Dalindingan	*Hopea foxworthyi*	Fuelwood/charcoal
Marang	*Litsea perrottetii*	Fuelwood/charcoal
Tibig	*Ficus nota*	Charcoal
Malasantol	*Sandoricum vidalii*	Fuelwood/charcoal
Bagtikan	*Parashorea plicata*	Charcoal
Tangile	*Shorea polysperma*	Charcoal
White lauan	*Pentacme contorta*	Charcoal
Tagpo	*Ardisia squamulosa*	Charcoal
Tangisang bayawak	*Ficus variegata*	Charcoal
Bagna	*Glochidion triandrum*	Charcoal
palosapis	*Anisoptera thurifera*	Charcoal
Piris	*Garcinia vidalii*	Charcoal
Lanete	*Wrightia laniti*	Fuelwood/charcoal
Mango	*Mangifera indica*	Fuelwood/charcoal

Note: *In the absence of recent taxonomic reference, nomenclature follows Salvosa (1963).

Even *Ficus balete*, a woody vine that clings to big trees and is believed by many superstitious residents to be the resting place of spirits is not spared. One key informant said that before, if a charcoal maker wanted to cut down a *balete*, he hit it with a single blow of his axe and left the ax there. If on the following morning the axe was still attached to the vine, it meant that the spirits were allowing him to cut it down. But if the axe fell to the ground, he could not take the vine.

Some charcoal makers, especially those who have established farms, do reserve trees which can be used for other purposes, like house construction and wood carving. But generally, almost all species of trees are cut and used for charcoal, especially if the source is forest land.

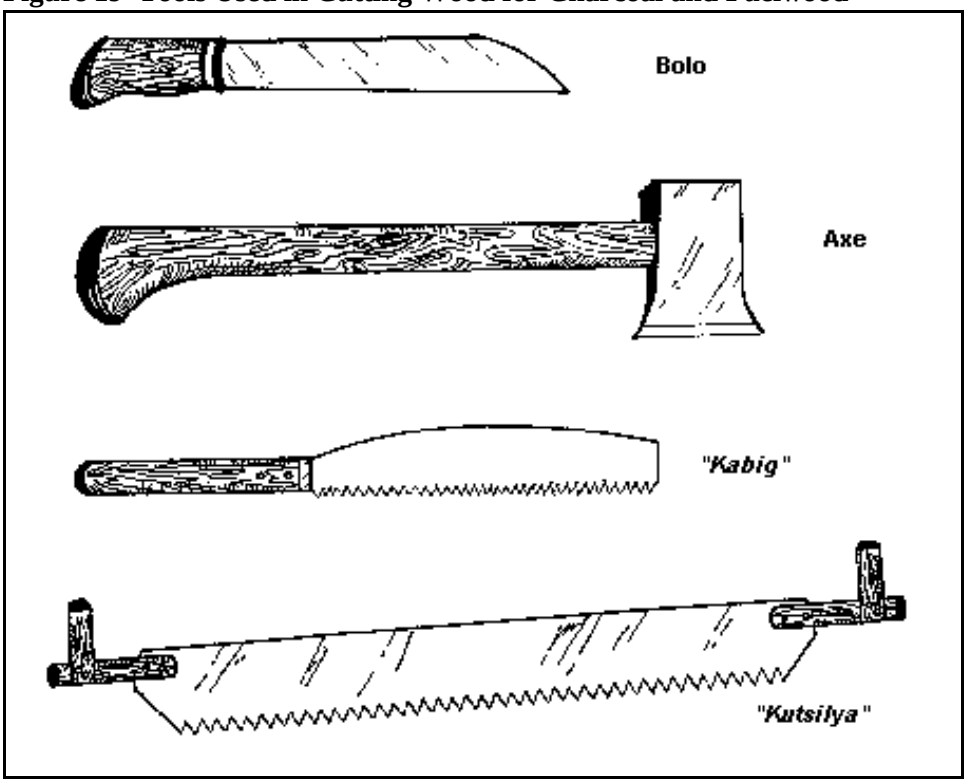
Unlike charcoal making, fuelwood making requires specific kinds of wood. Species for fuelwood should be small to medium-sized trees, slender, and easy to split. The single most commonly used species in fuelwood making in the Kapatalan-Magsaysay area is *Macaranga sp*. ("*kahoy dalaga*"). This species is commonly found in logged-over areas and sometimes in secondary forest. It is fast-growing and usually invades relatively open areas. Other preferred species are *Litsea perrottetii* (*Marang*) and *Shorea negrosensis* (*Red lauan*).

In Mabitac (Casinsin-Bagombon site), the most common species used for commercial fuelwood is the native *ipil-ipil* (*Leucaena leucocephala*), which abounds in the area. One to two years after cutting, it can again be harvested because it coppices well.

3.1.5 Wood Acquisition

Acquisition of wood in the main study site involves the use of assorted tools for cutting down trees. For large-scale production some charcoal makers use chainsaws for felling and cutting wood to desired lengths, particularly if the target output is 100 sacks of charcoal or more. It usually takes one whole day to meet the wood equivalent for 100 sacks of charcoal. A chainsaw can be rented at P 300 (US$12) a day, including the labor of the operator and one gallon of gasoline. Presently only those with financial capital use chainsaws.

Figure 19 Tools Used in Cutting Wood for Charcoal and Fuelwood



This is common in the study site because many people are involved in making square logs, some to be used for lumber, others for wood carving. According to one key informant, a total of 40 chainsaws are available in the area.

Another important tool in tree cutting is the axe. If an axe is used instead of a chainsaw, it will take about a week to collect enough wood to produce 100 sacks of charcoal. Together with this tool, the bolo is used to fell small-diameter trees and to cut twigs and branches.

Trees, especially those used in fuelwood making, like *Macaranga sp.* (*kahoy dalaga*), can also be felled by a special type of saw called "*kabig*", which can also be used to cut logs to the desired length for fuelwood and charcoal making (See Figure 19).

The size of trees to be used for making charcoal is not standard. Some charcoal makers say that even trees with a diameter of 60 cm can be transformed into charcoal efficiently. However, at present, the most common wood used in charcoal making has a diameter from 5-25 cm. Small branches of trees are also necessary to fill in the spaces when the wood is piled in the kiln. Charcoal kilns are always located near or at the source of wood. Wood is brought to the kiln by just hauling or rolling it down slopes.

In fuelwood making, trees and branches with 5-25 cm diameter are chosen. Fuelwood makers cannot cut down larger trees because of the difficulty in bringing the logs to the fuelwood making site. Acquiring wood for making charcoal and fuelwood seems to be unaffected by seasons of the year.

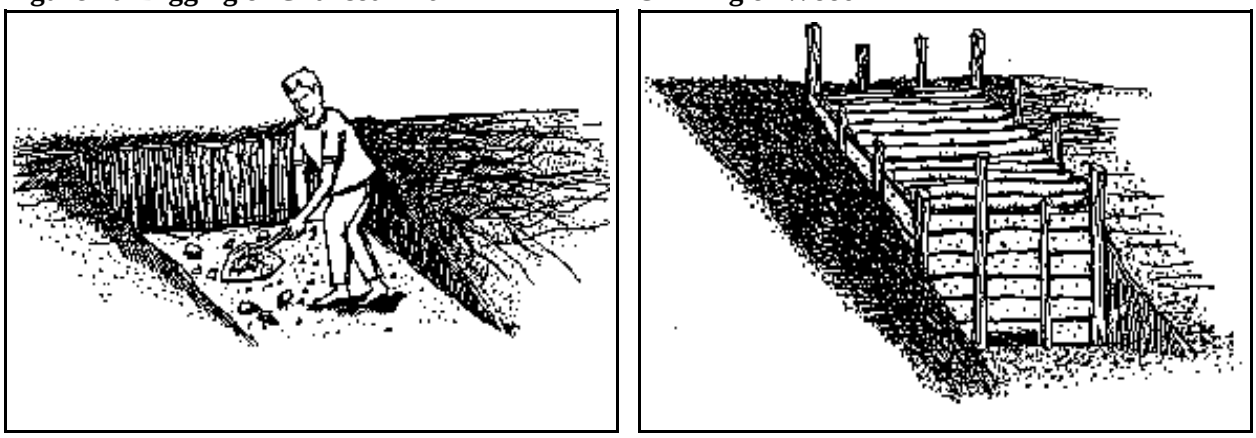
In the study site, where rainfall is common, wood fuel makers have no choice but to continue working whether it rains or not. From the source of wood, which can be as far as 3 km, fuelwood makers have to carry one or two logs on their backs, depending on the size, or load the logs on a logging truck.

In large-scale production of charcoal, some charcoal makers follow a labor arrangement in which five or six farmers form a mutual aid group for wood acquisition. If one charcoal maker intends to produce a large volume of charcoal, he seeks the help of everybody in the group in collecting and cutting wood. He is obliged then to help the others when their turn comes. This is locally called "*tornohan*," which means "taking turns." This practice was very prevalent in the 1980s when wood was still very abundant. At present, *tornohan* practice is minimal. Small-scale production, on the other hand, usually involves family labor. Charcoal processing is mainly done by household heads. The wife and the older children help in the packing.

3.1.6 Processing/Transformation

Charcoal processing is not an easy job. According to charcoal makers, it is a test of skill and endurance against fire. In the study site, all charcoal makers interviewed, except one, used shallow pits as kilns for charcoal processing. The techniques in digging the pit appeared to have also been brought by migrants. The charcoal pits are usually dug 0.5 - 0.75 m deep, 2.5 m long and 1.5 m wide on a sloping area (Figure 20). Pits of this size usually produce about 25-30 sacks of charcoal. The surface of the pit is sometimes inclined to drain water when rain comes. Newly constructed kilns are less preferred because they are expected to lose about 20-40 percent of the potential charcoal to fire.

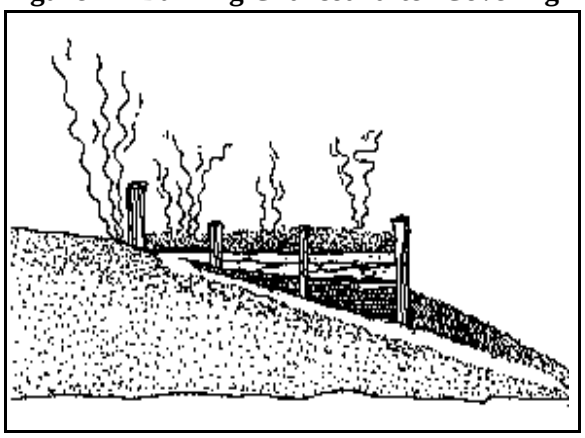
Figure 20 Digging of Charcoal Pit & Piling of Wood



After digging the pit, pieces of wood cut at the desired length are piled horizontally over 2 or 3 poles lying on the bottom of the pit. These poles, locally called "*batangan*," are needed to create air passages between the soil and the pile of wood. But not only big pieces of wood are utilized. Smaller pieces of wood fill the spaces created by the bigger ones. Space should also be left between the pile of wood and the sides of the kiln (Figure 20).

The pile, which is commonly 1-1.2 m high, should be supported by stakes at the rear end and wallings at the front end and two sides called "*barandilla*". These are made from slabs or wider pieces of wood. The pile is then covered with fresh leaves or grasses. *Imperata cylindrica* (*Cogon*) grass is preferred because it can follow the contours of the pile when it is being burned and it prevents water from penetrating when it rains.

Figure 21 Burning Charcoal after Covering



Earth dug from the charcoal pit is then placed on top of the layer of fresh leaves and grasses. If the kiln has been used more than once, the earth layer should be about 8-10 cm thick. But if the kiln is newly dug, a thicker earth cover is needed. One charcoal maker living beside the non-operating sawmill prefers sawdust because less water will be needed to put out the fire once the charcoal is ready. The spaces on the sides and the front end are also covered. The space at the rear is left unfilled for air to pass through when the pile starts to burn (Figure 21).

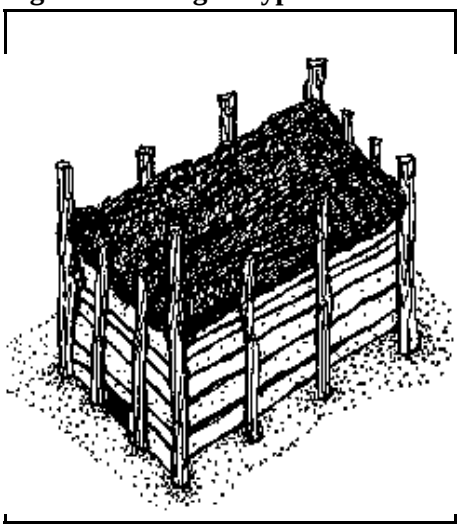
The pile is then lit at the hole in front of the pile. Scrap rubber, which can be bought in the market for P 2 (US$0.08) per bundle, or P 8 (US$0.32) per kg is used for starting the fire. This is advantageous because the rubber burns continuously. This is also popular among households who use charcoal. Kerosene is also used for starting the fire. Once the wood starts to burn the hole is covered. The kiln should be checked frequently.

If it is left untended, holes created may result in too rapid burning, turning all the wood to ashes. After two or three days, the carbonized portion of the pile is raked to separate the charcoal from the soil. It is then rapidly sprinkled with water to put out the fire. In doing this, a charcoal maker must be very careful not to start a big fire, or the whole biomass will be burned to ash. Meanwhile, the rest of the kiln is left burning slowly. When pieces of charcoal are cold, they are put in a sack. The wife and the capable children usually help the father with this.

Rubber Scrap from Slipper Factory in Manila Sold in the Market as Fire Starter

The other type of kiln is called a "hanger" (Figure 22). In this type, wood is piled on flat ground. Stakes and wallings (*barandilla*) are installed as support and the pile is also covered with grasses and earth before setting the fire. This type of kiln can only be used once.

Figure 22 Hanger Type of Kiln



Fuelwood making is less painstaking than making charcoal. Logs are brought home and placed on two crossed poles, then cut to a standard length by the wife or the children. Using an axe or a bolo, the wood is then chopped. Household heads or older male members of the family chop the wood because this is a strenuous activity. Pieces of split wood are then bundled within a prepared ring made from strips of *Flagellania indica* (*Baling-uai*) stems or wire threads from old tires.

3.1.7 Transport of Wood Fuels to Roadside Traders

After processing and packing, charcoal is transported to roadside traders. Most charcoal makers usually take their produce to their buyers using "*balaguit*" (a pole balanced on the shoulder with both ends loaded with sacks of charcoal). Four to six sacks can be carried by one person depending on the type of charcoal. Light charcoal weighs about 10-12 kg per sack. Sometimes loads must be carried for 5-7 kms. Children are also hired to carry sacks of charcoal for short distances. Two girls in barangay Magsaysay were seen carrying 2 sacks each on their heads for P 2/sack.

Charcoal Carried to the Roadside on the Shoulder

Other charcoal makers hire horses to transport their produce from the kiln to roadside traders. A horse can carry 10-11 sacks of light weight charcoal. The owner of the horse is paid P 4/sack. Carabaos or water buffalos can also be used for transporting charcoal. They can carry 6-8 sacks per trip for the same price. But only a few carabao owners are willing to lend their animals because most of the time these are being used in carabao logging.

In barangay Kapatalan, most fuelwood makers do not have the problem of transporting fuelwood, because cutting, splitting and bundling of wood is done near the roadside. In the main study site, most charcoal makers sell their products to roadside buyers, although some of them transport and sell their products directly. This practice gives them more income, perhaps an additional 9 to 11 pesos (US$ 0.36-0.34). (Details on charcoal pricing are discussed in Section 3.2).

To ensure that they will have charcoal to sell, especially if they already have orders from lowland buyers, roadside traders often give cash advances to some charcoal makers and then deduct this amount from the cash value of charcoal delivered. Sometimes, instead of cash, they provide food and basic commodities, since most of them have stores by the highway. This procedure is called "*pakunsumo*," meaning "to provide cash for consumption." In the past, this arrangement was very common because of a very high demand for charcoal and the loose regulations on the transport of charcoal. Many urban-based traders came to the area to buy charcoal from roadside traders. This practice continues, but is less common now.

There is less demand for fuelwood than for charcoal. This seems to be the main reason why there are more charcoal makers than fuelwood makers. In barangay Kapatalan, a family involved in fuelwood (*raheta*) making sells only an average of 150 to 300 bundles per week. Usually, orders are made through middlemen, who then pick up fuelwood from the producers at P 1 (US$0.04) per bundle. Unlike charcoal, the selling price of fuelwood remains constant throughout the year. The demand is not constant, however, and peak demands come only during the Siniloan town fiesta celebration (in August) and at the Christmas season, when a lot of cooking is done.

3.1.8 Constraints and Issues

3.1.8.1 Health Hazards

Charcoal makers are at risk from health hazards. They suffer sleepless nights watching the kiln and often get sick from long exposure to intense heat--three to four days and nights--and from getting soaked by the rains while transporting sacks of charcoal to the roadside. A common ailment is locally called "*pasma*," an illness characterized by severe chills and very high body temperature (40^{o}C and over). Some contract "cerebral malaria," which can be fatal. Pneumonia is not uncommon.

Other illnesses associated with charcoal making are intense coughing, reddening of the eyes, and weakening of the lungs. Some charcoal makers have abandoned the activity, primarily because of perceived health hazards. Others cite this as the main reason they want to stop making charcoal as soon as their farms become productive enough to permit them to do so. Despite the apparent risk, however, about 20 percent of the households in the locality depend on charcoal for cash. They say they just do not have any other options. When charcoal makers are attacked by *pasma* or by "cerebral malaria", they purchase medicine which is readily available in the local shops.

3.1.8.2 Tenurial Security and Government Programs

As is true elsewhere in the uplands today, the main study site is a frontier of swelling human population in search of land and livelihood. The extensive, recently logged-over area provides people with vast resources for making a living. In the 1980s, the wave of new migrants extracted resources without reservation because they wanted to optimize the opportunity to make cash from a public resource. At that time. farmers were in limbo as to the fate of their cultivated lands wrested from the forest. People say they have been hesitant to invest their small amounts of capital in the development of an area that may not be theirs in the future.

A few farmers, however, have continued to cultivate the land they occupy, and have even kept expanding their domain in the hope that someday they will obtain legal ownership of the land. Farmers reason that even if the government does take back the land, at least they will have been able to benefit from it in the short term. The drawback is that the farmers tend to plant short-term crops. Land tenure insecurity may not be the sole reason for this, however. Many farmers do not have enough money to permit a long-term investment in perennial crops. They need money now.

The recent policy of the government to implement the Comprehensive Agrarian Reform Program (CARP) in the uplands in the form of the revitalized Integrated Social Forestry Program (ISFP) seems to have affected the agricultural activity of the uplanders. A full-time charcoal maker who has been neglecting his 3.5 ha kaingin because the soil is so poor has expressed a desire to put extra efforts and capital into the cultivation of his kaingin. He said that his kaingin has red, sandy soils in which even sweet potatoes' growth is stunted. He makes a living from charcoal making instead. But with the possibility of legal ownership of the land through agrarian reform, he now plans to devote time to making his land productive, and this may eventually affect his charcoal making activity.

For others who make charcoal as a supplementary source of income, the policy may not have major impact on production, although they may be inspired to pursue agricultural activities more aggressively, perhaps even to plant more permanent crops.

This policy, however, has complicated the social arrangements in the community. An official of the barangay informed us that the forest adjacent to the barangay already has a number of claimants whose claims overlap and conflict with those of yet another group of people from a nearby, recently established area, consisting mainly of migrants who call their settlement Maunlad Veterans Barangay. Most people in this settlement are from Metro Manila, but some kaingineros in the area have joined this group.

In 1989, the Maunlad Barangay was recognized as a legal barangay by the Municipality of Real, Quezon, the town next to Siniloan, Laguna. According to a key informant and the organizer himself in Maunlad, 50 percent of the barangay residents are part-time farmers (so-called "weekend farmers," many of whom hold jobs in or around Manila), while 45 percent are full-time kaingineros. The kaingineros include charcoal making as an integral part of their subsistence activities. The remaining 5 percent are employees of the KLC sawmill. The barangay site is located at the log pond of the KLC, about 1.5 km from the roadside. The barangay claims more than 5,700 ha of forestlands, which includes the whole UP Land Grant and the National Botanic Garden. This group alleges that they are beneficiaries of the CARP-ISF.

How this is going to affect the area is unpredictable. According to farmers outside this community, charcoal making was encouraged because people needed to clear land as proof of ownership. After clearing, they are planting more permanent crops, such as citrus and coconut. According to a key informant, there are over 100 households/families who are beneficiaries of agrarian reform, and they have actually formed an Agrarian Reform Beneficiaries Association (ARBA). The weekend farmers with employment in Manila, however, are in a more advantageous position than the resident kaingineros, because they have more capital to invest in establishing plantations.

The impacts of the new land tenure policies upon wood energy production are varied. For full-time charcoal makers in the area, this is a chance to shift to more secure economic activity; but at the same time, the policy encourages fuelwood production as a prelude to more permanent agricultural activities. Whether the long term effects of this policy will favor conservation of the remaining biomass stands in the forest and discourage unsustainable fuelwood production activities is an issue that needs further and deeper inquiry.

3.1.8.3 Accessibility, Distance, Transport Problems

The most often frequent complaint of fuelwood producers is the inaccessibility and distance of the source of wood materials. All of the producers said that the major source of wood, which is the forest, is getting farther away. This is why both charcoal production and *raheta* making are on the decline. If in 1980s production reached 200-700 sacks per kiln, today the average production is down to about around 20-30 sacks per kiln every week or two. The distance for transport of charcoal from the production site is also a problem. This is sometimes overcome by using horses to haul charcoal from the kiln to the roadside.

Reactions to the increasing remoteness and depletion of wood resources has been varied. About three-fourths of the people who specialized in making charcoal have left the area, including many migrants who came for that purpose. Other people have remained in the area but have abandoned charcoal production. These people now resort to other means of livelihood, such as more aggressive kaingin farming, gathering ferns and giant fern stumps, making the special square

logs for use by wood carvers, and carabao logging.

Fern gathering dates back earlier than charcoal making, but it was overshadowed in the 1980s by the profitability of the latter. Ferns are gathered, bundled, and sold to flower shops in town and other urban centers. Ferns are collected on order from buyers and are gathered mostly on coconut farms, abandoned kaingin, and shrublands. This commodity is usually in demand at All Saint's Day and during the flower month of May and the bridal month of June. Normally, the buyer goes to a specific farmer and orders a specified quantity of ferns. The farmer then distributes the work among other interested fern gatherers. He then buys the ferns from the gatherers at P 4 (US$0.16) per bundle and sells them to the buyer, who will return to his house to pick them up, at P 4.50 (US$0.18) per bundle.

This enterprise mainly involves women, although sometimes men engage in the gathering as time permits. An informant said that fern gathering should be done only once every two weeks to allow the ferns to regenerate. Ferns prefer to grow in shaded areas. Farmers observe that ferns grow well in this type of location and can compete with the *Imperata cylindrica* (*cogon*) and *Saccharum spontaneum* (*talahib*) in the open.

Some people also extract stumps of giant ferns inside the secondary forest and sell them at pickup points for P 15 (US$0.60) per stump. Hauling costs P 2 (US$0.08) per stump via logging truck. The stumps are then sold by roadside sellers for P 25 (US$1.00) each. This commodity is used as a medium for orchid growing in the lowlands.

A number of former charcoal makers have shifted to the production of square logs (about 4 ft. x 14 in. x 16 in.) used for woodcarving. This is said to be more lucrative than charcoal making, although we were not able to get any figures on the profits made from this activity. Many farmers feel, however, that there are higher profits, which compensate for the longer distances that must now be travelled to get wood.

"Carabao logging" also has been reported to be resurging. A transporter in the lower barangay said that with the declining profitability of charcoal, illegal logging activity has increased. A logger can earn up to P 800 (US$32) per week if he goes out two times a week. The cost of hauling is P 2.5 (US$0.10) per board foot (brdft), while the rent for the chainsaw is P 1.5 (US$0.06) per brdft. This brings the cost of square logs to about P 4 (US$0.16) per brdft. If he can make 100 boardfeet every time he goes out, he can earn P 400 (US$16.00) per day. Whether there is any direct relationship between charcoal and carabao logging is not certain, although some people perceive that the increase in carabao logging is a consequence of the decreasing feasibility of charcoal production.

The roughly 20 percent of the population who are dependent on charcoal are now seeking other employment opportunities because the present rate of production is not enough to sustain the basic needs of their households. Being laborers on other farms and entering the Civilian Armed Forces Geographical Unit (CAFGU) provide alternative livelihood to some. A CAFGU member receives P 900/mo, while the daily wage for a farm laborer is P 55. A new CAFGU unit was recently formed in the controversial barangay Maunlad site. This, however, has appeared to complicate even further the brewing land ownership conflict between barangay Magsaysay village residents and the migrants from Metro Manila (Maunlad) over the lands owned by the University of the Philippines. How the university will resolve this conflict remains to be seen.

In other zones, however, the decreasing wood available for making charcoal and fuelwood has prompted the local people to tap other sources of wood and other species. In nearby portions of Mabitac municipality, which adjoins Siniloan, wood fuel usually comes from *kawakate* and *ipil-ipil*, premium species that grow naturally in the mountains. People now just cut the branches of the trees and let them grow again for the next season. However, as the recently planted citrus matures, the stumps of *kakawate* and *ipil-ipil* impede its development, so the stumps are chopped for fuel. In one area in this zone, people are now producing fuelwood and charcoal of mixed species.

One agent said that at present, buyers can hardly find pure *ipil-ipil* or *kakawate* fuelwood or charcoal. However, one producer in this site said that he is not digging stumps on very steep slopes because it may cause soil erosion, or even landslides. Other species, like mango, are also now being used instead of *ipil-ipil*; and this comes either from the backyards or upland farms.

3.1.8.4 Sustainability of the Resource

While wood energy comes from both private and public land, the bulk of wood fuel in the major production area comes from forest lands. Kaingin development in public lands is the main agricultural activity that produces wood fuel. In the 1980s a big chunk of the Land Grant (Laguna-Quezon) was awarded to another settlement namely Galalan, in the municipality of Pangil. Letter of Instruction 641 provided 500 ha of forest lands for a government resettlement program. Kaingin activities there include making charcoal and selling it along the highway of Pangil, Laguna. Producers from this area estimate that wood for charcoal making may only last for two more years.

In Mabitac and vicinity, the major source of fuelwood is private agricultural areas on hillsides. Native *ipil-ipil* and *kakawate* were naturally abundant about 10 years ago but have gradually decreased with the planting of coconut and citrus. In the peninsula, for example, for a long time before the boom of citrus, farmers cut branches to make fuelwood and charcoal and allowed trees to regenerate. But when the citrus and coconut trees mature, people start digging the stumps for fuelwood because they hamper the development of citrus. A producer of fuelwood in this area predicted that the activity may also here last only for two more years.

Production on private lands in the main study site is now very limited and short term. Although it is said that most of the downstream charcoal products are coming from private lands, the raw materials are usually the naturally growing trees under coconut. According to producers from this area, this source will not last longer than 2-3 years, because people are now planting citrus and other permanent crops, like coffee, under the coconut trees. Because of the well-known profitability of citrus in these areas, and almost everywhere in the eastern Laguna, citrus is gradually replacing coconut and even mangoes. This trend may have implications for another component of the fuelwood system--coconut-based energy.

Coconut trees have long been a source of fuel for both rural and urban households in Siniloan. The fronds, coconut husks, coconut shells and coconut charcoal have been commonly used. The fronds and husks are gathered from farmers' fields, while coconut charcoal can be bought from copra dryers and retail stores. These fuels were readily available everywhere.

This wood fuel system seems to be more sustainable than the charcoal or fuelwood (wood-based) because these are just by-products of the coconut industry. However, the wood-based fuels are preferable to coco-based charcoal because wood charcoal can be stored longer and is considerably cheaper than coco charcoal. While a sack of wood charcoal costs P 20-25 (US$0.80-1.00), the coco charcoal costs P 40-50 (US$1.60-2.00) per sack.

Coconut fronds, shells, and husks are still being used in urban households having extra labor to spare for fuelwood gathering. One old woman said that people in urban centers would rather buy fuelwood than gather it because it is easier.

The current trend in the upland agriculture, whereby coconut plantations and farms are now being replaced by citrus trees imperils this alternative fuelwood system. The contribution of coco-based fuels, especially during those periods of wood-based fuel scarcity which come during the rainy season, has not been quantified, but a number of users mentioned resorting to coco-based fuels in time of crisis.

On the national scale, however, the impact could be substantial, because 30 percent of the fuelwood requirements come from coconut. It is urgent that studies be initiated to assess the impacts of such changes in land use patterns before unanticipated effects create a national dilemma.

3.2. Distribution of Wood Energy

Distribution of wood fuel involves the movement of the product from the point of production to the point of consumption. Within the village there is a fairly well-established channel through which the product passes before reaching the urban consumers. A number of different actors participate in this flow. Wood fuel marketing channels vary according to the type of commodity handled, season, and location. There are no explicit rules that dictate to producers where and to whom they must sell their products. A producer or agent-collector who has accepted an advance payment, however, whether it be in goods or cash, does have a moral obligation to deliver all charcoal promised to a trader, even though the price may have increased. The market is seen as a free system of competition. All participants earn a portion of profit as wood energy products move from producers to end-users.

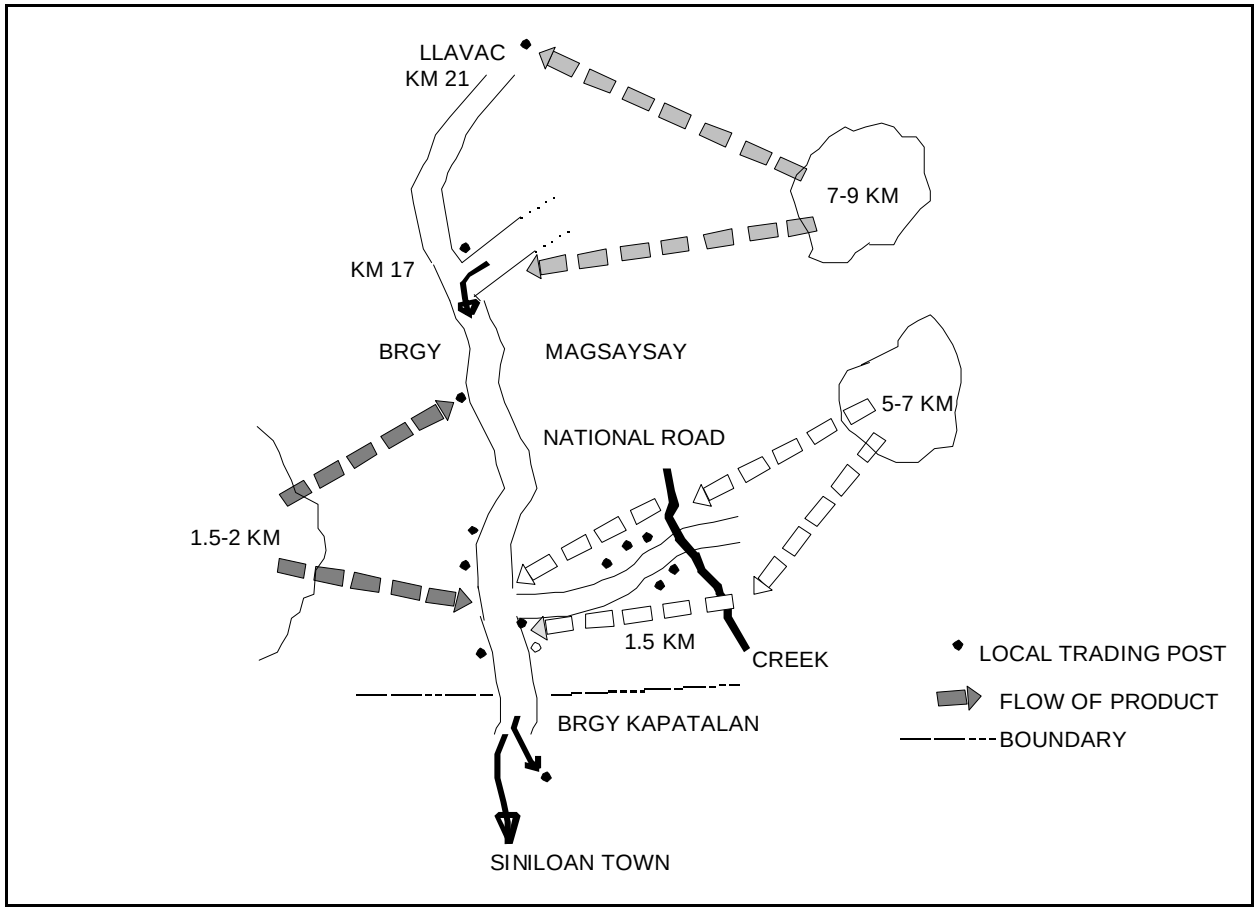
This section discusses the actors involved in the distribution of the product, methods of acquisition, terms and arrangements, seasonality in price, costs, requirements, problems and constraints, and adjustments made in response to changing conditions. It also looks at the transactions and processes that take place within the village boundary and outside of the production system.

3.2.1 Flow of Wood Fuels in the Village

Charcoal trading in the village became a big and lucrative business from 1984 to 1988 due to expanded logging operations and the establishment of a sawmill in the area. A heavy influx of migrants came to work in the sawmill and to open agricultural lands in logged-over areas, hoping that the land would become their own in the future. The sawmill workers were allowed to produce charcoal to augment their incomes.

Moreover, the increase in the price of LPG and other petroleum-based products prompted numerous urban households and industries to turn to cheaper sources of fuel. This stimulated many villagers to produce wood fuels when traders began visiting the village in search of charcoal. The demand for wood fuels became so great that settlers began an extensive exploitation of the forest lands. This also created opportunities for local traders to venture into the wood energy business because of high potential profits.

Figure 23 Wood Fuel Flow within the Village Production System



In early 1984, residents essentially served as charcoal collectors, simply providing a service to the traders who came to buy charcoal in large quantities for transport to Siniloan and Manila. For a while, local traders acted as the main conduit for the distribution of wood energy products to the town of Siniloan and other towns in the province.

Charcoal trading is still being practiced, but not as intensively as in the mid-1980s. At present, many local traders are engaged in buying and selling charcoal. Acquiring charcoal to resell is a highly competitive endeavor. Middlemen have had to learn the rudiments of the trading system, the price, and the demand and supply structure. While both production and distribution have decreased in volume, there is still a continuing and significant dependence on charcoal as a source of energy and, in the village, as a source of income (See Figure 23 for an overview of the main flows in the village).

3.2.2 Who are the charcoal traders?

The local traders are residents of the village and belong to the upper economic stratum. Most of them live near or along the main road, and either possess a transport vehicle and/or hire a public utility vehicle plying the route. Only one local trader has a delivery jeep which can load 120 sacks of charcoal for delivery to consumers. The agents/collectors usually live in the interior of the village, specifically, near the log pond area where a majority of the settlers live. One trader--who is also a producer, assembler and transporter of charcoal--owns a passenger jeepney which is occasionally hired by other traders to pick up charcoal for delivery to the town.

Women participate in the charcoal trade as agents, collectors, assemblers, and transporters. The majority of the traders also own a small variety store (*sari-sari*) where they sell household items to producers. Some women went into charcoal trading as early as 1984; others, a few years later. They usually must have two or more regular suppliers (*suki*) to ensure a continuous supply of charcoal. One trader in a nearby town maintains a network of about 65 suppliers who regularly deliver charcoal to her house at the roadside.

3.2.2.1 Categories of charcoal traders

Based upon our experience in the field, we found the following set of categories to be a useful tool for discussing the complexity we encountered in the distribution and handling of charcoal both inside and outside the village:

a. Assembler-Transporter--engaged in buying and selling charcoal, acquires charcoal from agents/collectors, hires or owns transportation vehicle; uses capital to buy in large quantities. Combines the functions of purchasing, assembling, storing, and selling charcoal to wholesalers and/or directly to end-users.

b. Assembler--primary function is to collect and gather the product from the agents/collectors and other producers. The products are assembled for another local trader. It is a form of contract buying. Capital is used to provide cash advances and subsistence to regular supplier-producers and for paying other producers who sell to him/her directly.

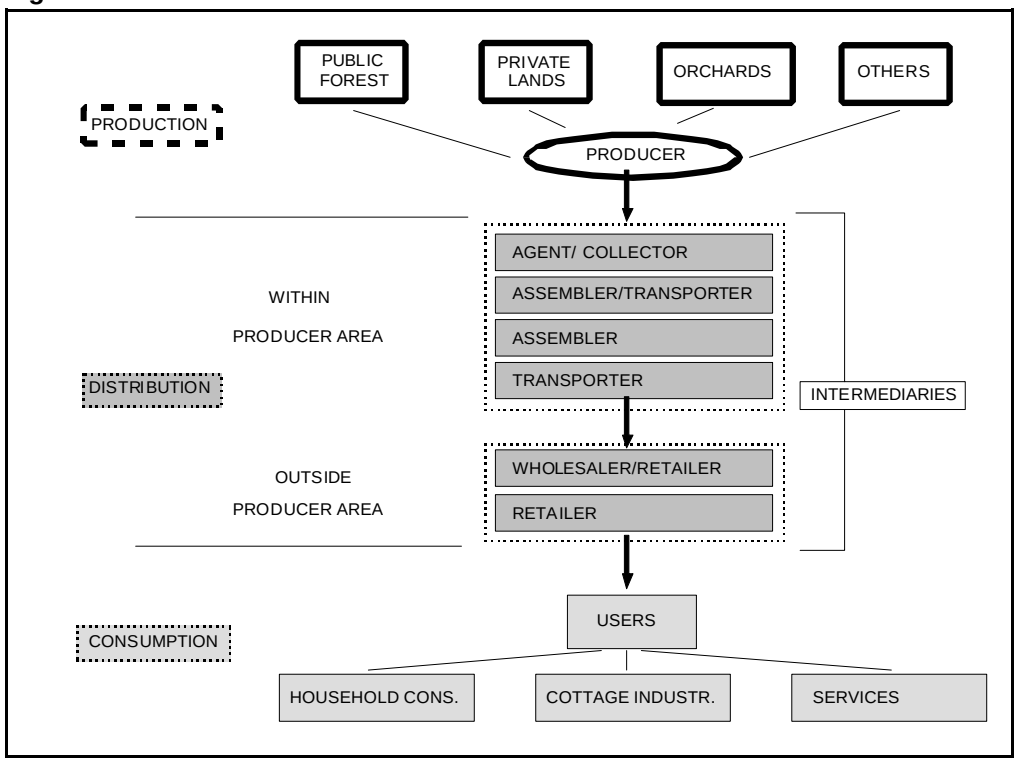
c. Transporter--buys directly from producers, assemblers and agents, and transports the product direct to urban centers. Usually owns a vehicle, either a jeep or a delivery truck, has capital, and supplies charcoal regularly to customers in the town.

d) Agent/collector--collects charcoal for a specific buyer (assembler-transporter); buys charcoal lower than the assembler/transporter and sells at a profit. Capital is limited, but he/she often receives cash advances from both big and small local traders to ensure regular supply of the product. The local agent also gets a portion from the sale of goods and a commission in selling the product to the local traders, on whom he also depends for food supply.

e. Wholesaler--urban-based, buys and sells in large quantities with storage facilities and has a permanent stall in the market. He is a merchant middleman who sells to retailers and other merchants in big quantities but not to ultimate consumers.

f). Wholesaler-retailer--urban-based; acquires products in large quantity either from wholesaler or contract buyer; sells mainly to retailers on a wholesale basis, but also sells retail. Usually, maintains a storage facility and/or permanent stall in the market.

Figure 24 Pattern of Flow of Charcoal Distribution



g. Retailer--serves as the last link in the distribution system; sells directly to consumers and also maintains a stall in the market or a small dry goods store at the roadside. Selling is on retail basis and done almost daily.

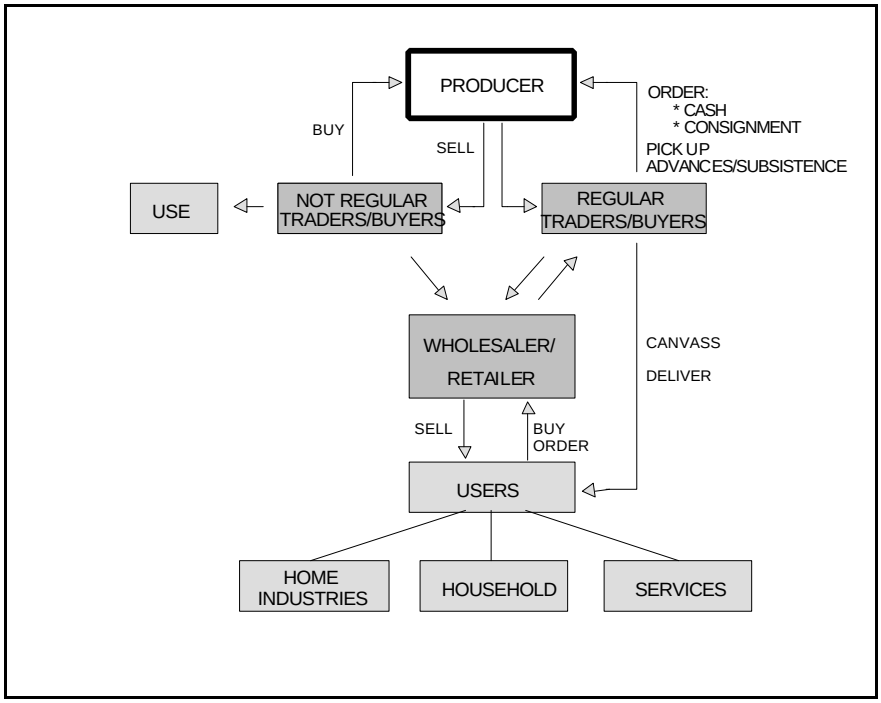
The above categories of actors compose the distribution network for charcoal. They have an established communication network that keeps them all informed of the price, supply, and demand for charcoal throughout the year. The patterns of communication are complex and shaped by certain attitudes and values that constitute a code of ethics among traders throughout the entire structure of the distribution system.

As shown in Figure 24, the general flow patterns are more or less clearly established. Each actor in the distribution process communicates with a network of other actors up and down the line. Relationships are established and maintained based on the quality of product sold, mutual trust, and mutual satisfaction with the terms agreed upon between participants in a set of transactions.

Producers and local traders sometimes find it more profitable to sell directly to the users, especially when demand is high during periods of scarcity, which often occur between July and December. They take advantage of the additional market margin that will accrue to them by by-passing some links in the normal channel.

In the case of fuelwood (*raheta*), the marketing channel is simpler and fewer actors are involved in the distribution process (Figure 25).

Figure 25 Pattern of Flow in the Distribution of Fuelwood



Only two trader-assemblers in the area are involved in distribution, one in barangay Magsaysay and another in barangay Kapatalan. Few people are involved in this activity because of low economic returns compared to charcoal. Most fuelwood producers do not market the product directly to the town market. They lack the capital needed to transport the product and do not know the outlets. Fuelwood users are mostly households and small-scale food processors.

3.2.3 Acquisition and arrangements

There are several existing practices in the procurement of fuelwood in the village. These involve both direct and indirect links between producers and local traders, and between and among local traders, middlemen and users. Agreements are based on mutual trust rather than on formal contracts or legal procedures. The practices are described below:

Credit/consignment

This arrangement is common between local traders and wholesalers/retailers in the town. A retailer will place an order with a specific village trader for a certain volume of charcoal to be delivered on a particular date. The local trader scouts about for available supplies from the agent/collectors. If there is not enough woodfuel on hand, he will contact some producers to meet the volume needed. He will provide the initial capital to the producer, but will not be paid until after delivery of the product to the urban trader. Such relationships are established only after the parties involved have long been partners in the business. The urban trader also serves as an agent for the local traders in getting regular customers. In this manner, both are assured of steady income

and of regular customers for the product. Producers are provided a subsistence allowance while waiting for final payment.

Cash advance

This practice is common among charcoal and fuelwood traders within the village. A certain percentage of the value of the product ordered by urban traders from the local traders is paid in advance, with the balance to be paid after completion of the delivery. Both traders are assured of a reliable supply of the product under this arrangement. Both producers and the local traders are "captive" participants in such arrangements in the sense that they are both virtually compelled to make such a commitment. Any break in this relationship could lead to loss of income for both and possibly affect their reputation in the village as business partners.

Provision of subsistence

Some local traders provide a subsistence allowance to certain producers who are waiting for the "harvest." During this period, some agent/collector or assembler will supply certain producers with staple household commodities, such as rice, bread, coffee, sugar, salt, canned goods, and other items. In this way, the local traders are assured of being able to meet their orders from the town traders. In some cases, producers ask local traders for credit in exchange for a certain volume of charcoal they promise to produce. After delivery of the product, credit accounts are deducted from the sale of the produce. This is an unwritten form of contract buying based on trust. Once the relationship is firmly established, it serves to bind both sides in a long-term series of economic transactions.

Direct buying (cash on delivery)

This is usually done by assembler-transporters who collect and deliver charcoal in bulk to commercial users, town traders and urban traders as far away as Metro Manila. Competition for the product is stiff during wet months because the demand is high but the supply is scarce. Local traders may stockpile charcoal in a warehouse for sale whenever the price becomes high. When charcoal becomes scarce, there is little chance for some local traders to buy enough to meet the demand, because many producers are already committed to sell their charcoal to other local traders who have provided them with subsistence goods and cash advances.

Transportation

According to an informant, some traders haul the assembled charcoal in the inner part of the village using an Elf delivery truck during the dry season when the road becomes passable. However, charcoal is often delivered directly to the roadside where it is assembled and stored for transport to Siniloan and other towns in Laguna. Those without delivery vehicles must hire a jeepney for about P 500 to P 800 (US$20-32) per trip, the rate depending on the distance and the volume of charcoal to be transported.

Transporting small quantities of charcoal (20 to 50 bags) is more convenient because one avoids the many requirements imposed by regulating agencies such as the forestry agency, the military, police and civilian/military checkpoints posted along the routes going to the town and to Manila. All kinds of vehicles carrying forest-based products are stopped and checked. It must be verified that the source of the products is legal and that clearance has been obtained from all appropriate agencies before the vehicle is allowed to pass.

Most assemblers who used passenger jeepneys enroute to the town pay P 2 (US$0.08) per sack. The jeepneys are not checked by the monitoring stations because of the small quantity of goods being transported. To get a better picture of where, when, how, and how much charcoal is transported to the town and other places, a two-week monitoring exercise was undertaken from July 21 to August 4, 1990. We hired a former employee of the University of the Philippines National Botanical Garden who is now a local resident of the study area to monitor the movement of wood fuel products out of the village, including those coming from Real, Quezon. The monitor was quite familiar with the sources of the charcoal, the capacity of the transport vehicles used, and their destinations.

Results showed that the major sources of charcoal in the study area were the areas of Llavac (39.2%); Km 18 (28.4%); and UP Land Grant (22.8%) out of the 1,899 sacks of charcoal transported for the period. Of the total volume, 72.62 percent was believed to be delivered to Siniloan and only 19.48 percent was to go to Manila. A portion of the charcoal was expected to be delivered to Mabitac (5.8%) and the rest retained within the local area.

Out of 8,977 sacks of charcoal monitored, 7,078 bags (79%) came from Real, Quezon, a municipality bordering the town of Siniloan. About 94 percent of the charcoal from Real was expected to be delivered to Metro Manila, with only 1.1 percent headed for Siniloan.

Transporting charcoal to Manila is often by ELF delivery trucks, which carry about 350 sacks, departing as early as 6:00 P.M. and late as 9:00 P.M., to travel under the cover of darkness. In the evening, the movement of the vehicles is not much hampered by the 10 or so checkpoints along the route because it is easier to "arrange" its passage, unlike during daytime hours when the trucks are very visible to the people manning the stations and may sometimes be detained for "verification" even though all documents are in order.

Table 5 Source, Volume and Destination of Charcoal from the Study Area, July 21 - August 4, 1990.

Source	Volume		Destination			
	Sacks	%	Town	Crossing	Metro Manila	Mabitac
Km. 17	130	6.8	130			
Km. 18	540	28.4	390		150	
Km. 24	27	1.4	27			
UP	433	22.8	308	15		110
Llavac	744	39.2	524		220	
LSPC	25	1.3		25		
Total	**1899**		**1379**	**40**	**370**	**110**
Percent		**99.9**	**72.62**	**2.1**	**19.48**	**5.8**

Note: Total volume was 8977 sacks of charcoal. Of this volume, 7078 (79%) sacks come from the municipality of Real, province of Quezon, and only 1,899 came from the study area. The table refers only to the latter.

An informant estimated that about 60 percent of the charcoal produced in the upland villages goes to Siniloan town. Other charcoal also comes from the towns of Pangil and Pakil to fulfill energy requirements in the town. One trader calculated that about 20 percent of the charcoal produced in Pangil is consumed in Siniloan, particularly during times of scarcity.

3.2.4 Price of Wood Fuels

The price of wood fuels for consumers in the urban center is influenced by factors such as season, quality of the product, distance from the source, degree of scarcity, and demand for the product. The price of charcoal is generally lower during the dry season and gradually increases as the wet season progresses, usually starting to rise in June and continuing until December. It then drops in January because many producers start to make charcoal. Fuelwood makers are also relatively more active during the dry season, but the price of fuelwood appears to remain fairly constant.

3.2.4.1 Season

Charcoal producers and fuelwood gatherers are more active during the dry season. Producers have easy access to the source because roads and trails become passable for easy and faster transport to the trading centers within and outside of the village. Moreover, during the dry season producers get a higher percentage of recovery from carbonization of wood into charcoal. Producers become busy because it is an opportune time to earn additional income. This is also an opportunity for producers to earn money they can use as capital for wet season farming, such as planting cash crops.

During this period, the price of charcoal may go as low as P 10.00 (US$ 0.40) per sack in the village of Magsaysay because of an abundant supply. Traders become busy, almost daily buying and selling charcoal and transporting it to various consumption centers within and outside of the town. For traders, higher volume and frequency of transactions mean bigger profits.

During the wet months, charcoal production drops because producers find it very difficult and risky to produce charcoal. The percentage of recovery is uncertain because of unfavorable weather. Considering the time and effort required to produce charcoal, the rewards are small and uncertain.

Moreover, producers are heavily exposed to health hazards in rainy weather, as explained above. During the wet season most producers make charcoal only in small amounts because of difficulties in processing and transportation.

3.2.4.2 Demand from urban areas

The high demand for charcoal and fuelwood in urban centers during the wet season exerts considerable pressure on producers and traders to increase the supply, because the price of charcoal goes up. Some producers will make charcoal only in nearby areas with wood from privately owned lands. But those producers who are highly dependent on charcoal making for subsistence must persist in their production regardless of the dangers confronting them.

3.2.4.3 Product quality

The price of charcoal and fuelwood also varies according to weight, wood species, and form. For charcoal, a premium is placed upon hard and heavy wood species.

3.2.4.4 Handling cost and income

Charcoal trading also entails costs in handling the product, from wood acquisition to production and sale to end-users. Marketing margins vary from season to season, type of users, their uses, and distance in delivering the product. As shown in Table 12 there is a wide variation in the acquisition price and the selling price of wood charcoal according to the location of the transaction and the ultimate destination of the product. The buying price of charcoal is relatively higher in areas near the national road and closer to the town. At the time of the study, in Pangil, for example, the price paid to producers ranged from P 22 to 28 (US$0.88-1.12) per sack; in Kapatalan, P 16-17 (US$0.64-0.68); and at Magsaysay, which is 17 km away from the town, it was P 17-23 (US$0.68-0.92). Price is sometimes much lower, perhaps P 13-15 (US$0.52-0.60), particularly in the inner part of the village. The market margin is bigger if charcoal is sold directly to Manila instead of in Siniloan. For fuelwood, the margin is usually lower and the rate of return on investment is relatively lower than it is for charcoal.

Charcoal retailers engaged in re-packing receive a higher price per kilogram than those who sell it by the sack. However, the rate of turnover is slow. One sack of charcoal can be re-packed into 13-14 medium-sized plastic containers that sell for P 3 (US$0.12) each. This is equivalent to P 39 to 42 (US$1.56-1.68) per sack, a price difference of P 10-14 (US$ 0.40 - 0.56) per sack. Table 6 shows the market margin of charcoal and fuelwood retailers.

Charcoal Transport on Horseback (from production site to highway)

The price paid by users also varies according to the type of users and the quality of the charcoal (Table 8). Good quality charcoal is more expensive than smaller, lighter charcoal. Price also varies according to season and according to where the charcoal was obtained.

Table 6 Price variability in wood fuel acquisition, selling, location for trading centers, and destination by types of wood fuel, and intermediaries, June to August 1990

Fuelwood Types & Intermediaries	Acquisition Price (Pesos)	Selling Price (Pesos)	Marketing Margin (Percent)	Destination
A. Charcoal				
1. Assembler/ Transporter (Pangil)	22 (June) 28 (Aug)	32-35	31-37 12-20	Manila Sta. Cruz
2. Assembler/ Transporter (UPLG)	23 15	28 25	18 40	Siniloan Manila
3. Assembler/ Transporter (Kapatalan)	16-17	20-22	15-20 23-27	Siniloan Siniloan
4. Assembler/ Transporter (Km. 17)	17 19	26 21 28-30 (H)	35 19 32-37	Siniloan Siniloan Siniloan
5. Assembler (UPLG)	17 20 (S) 23 (H)	20-22 25 30	15-23 20 23	Siniloan Siniloan Siniloan
6. Assembler (UPLG)	17-18 18-20	23-24 22	26-29 25-29 9-18	Siniloan Siniloan Siniloan
7. Producer/ Transporter	20 17 15-16	30 23-25 24-27	33 26-32 33-38 41-44	Siniloan Siniloan Siniloan
8. Agent/Collector	15	17	12	Village
9. Agent/Collector	13	15	13	Village
B. Firewood				
1. Assembler/ Transporter	1.00/bundle	1.50	33	Siniloan
2. Transporter	1.00/bundle	2.00	50	Siniloan
3. Assembler	1-1.20	2.00	40-50	Siniloan
4. Assembler (Tuod) (Mabitac)	22.00	25.00 30 w/sack	12 27	Siniloan Siniloan

Note: (S) - Low quality charcoal (H) - High quality charcoal

Table 7 Fuelwood acquisition and selling price, type of woodfuels and percentage of marketing margin among retailers

Re-tailers	Type of Fuelwood	Unit Acquisition Prices Peso	Selling Price Peso	Margin	Percent
A	Firewood (S)	1.50-1.75[a]	2.00	0.25-0.50	12.5-25
	Firewood (B)	8.00	10.00	2.00	20.0
	Charcoal	30[b]	33.35	3.00-5.00	9.0-15
B	Charcoal	27-28	39.00	11.00-12.00	28.0-31
	(repacked)				
C	Firewood	1.50	2.00	0.50	25.0
	Charcoal	30.0	35 (C)	5.00	14.0
			30 (O)	10.00	25.0
D	Charcoal	28-30	39-42	10.00-11.00	26.0-28
	(repacked)			12.00-14.00	29.0-33
		35	**39**	**4**	**10**

Notes: (S) Small - Raheta = Kapatalan; (B) Big - Raheta = Bagombon, Rizal; (C) Closed "tikom"; (O) Open "buka"; a/ per bundle; b/ per sack

Table 8 Cost of acquisition of fuelwood energy by type of users

Type of Users	Kind of Wood Energy	Unit Cost (Peso)
1. Bakery:		
a. Brick-over type	Wood slabs (sawmill)	60-75/m^3
	Coco lumber slabs	50/m^3
b. charcoal-fired oven	Charcoal	30/sack
2. Poultry (broiler)	Charcoal	24-25 (Jan. to May)
		34 (June to Dec.)
3. Blacksmith	Coconut/Charcoal	40/sack
4. Food vendors (Barbecue)	Charcoal	30/sack
5. Slaughter house	Firewood	2/bundle
6. Households	Charcoal	28-30/sack (S)
		33 (H)
7. Eateries	Charcoal	35-38/sack
8. Food processors	Charcoal	35/sack (H)
		26-32 (S)
9. Restaurant	Rice hull	Free
10. Fish smoking	Firewood	2/bundle

(S) Lower quality charcoal (weighing 10-12 kg); (H) Good quality charcoal (weight about 18-20 kg)

The variation in prices in various market channels is shown in Figure 26. Based on observations made in Magsaysay village, it appears that the revenue of a bag of charcoal is about evenly split between the producers + agent/collectors on the one hand and the assembler/transporter + wholesaler/retailer on the other hand. The mark-up in transport may be readily explained by the transport cost. As Table 9 shows, the profits involved are not very high and show much seasonal variation. However, if the volume and frequency with which the capital revolves are sufficiently high the enterprise may be quite profitable. We were told that in Kapatalan, one charcoal trader who started in the business on a modest scale now has three passenger jeepneys and a new house (we were obviously not in a position to check whether his bussiness dealt only with charcoal).

Though possibilities for channeling a greater share of the wood fuel revenue to the wood fuel producers (and resources) should not be ruled out, our research indicates that expectations should not be too high.

Figure 26 Price Difference and Percentage of Marketing Margin in Charcoal Production in Various Marketing Channels, July-August, 1990

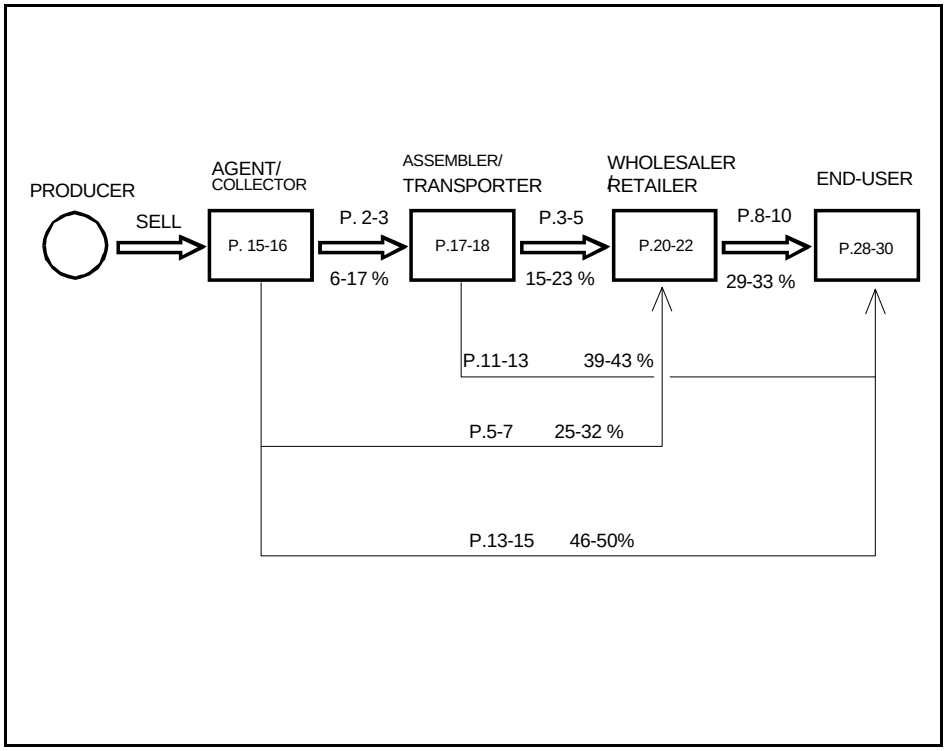


Table 9 Cost and returns in charcoal trading

CASE 1: Assembler/Transporter (Magsaysay)	
Sales from charcoal (150 sacks at Peso 25/sack)	**3,750.00**
Expenses:	
Capital investment (150 sacks at Peso 15/sack)	2,250.00
Transportation (hires)	600.00
Permit/invoice (Peso 2/sack)	300.00
Cost of sacks (Peso 1.50/sack)	225.00
Passage/inspection fees	125.00
Total	**3,500.00**
Net Profit	**250.00**
Percent margin	**7.14**
CASE 2: Assembler/Transporter (Pangil)	
Sales: 120 bags at Peso 33/bag	**3,960.00**
Expenses:	
Capital investment (120 at Peso 22.00)	2,640.00
Transportation (hired)	600.00
Handling fee (0.50/sack)	60.00
Mayor's permit	20.00
Total	**3,320.00**
Net Profit	**640.00**
Percent margin	**19.27**
CASE 3: Fuelwood Assembler/Transporter (Kapatalan)	
Sales: 400 bundles at Peso 1.50 each	**600.00**
Expenses:	
Capital investment (400 at Peso 1.00 each)	400.00
Transportation cost (0.35/bundle)	140.00
Total	**560.00**
Margin of profit	**40.00**
Percent	**7.14**

3.2.4.5 Constraints and Adjustments

Several constraints were expressed by traders, retailers and users in the procurement and distribution of charcoal and fuelwood in the area. These are a) inconsistency in the enforcement of regulations and changing policies of regulating agencies; b) dishonesty/non-commitment by producers and other merchants; and c) adulteration of the product by some traders to obtain a bigger profit.

Enforcement of regulations and policies

Informants claim they are at a loss to understand the policies of the forestry agencies and other regulatory agencies in the transport of the product particularly the forest charges/fees. They are required to pay P 2 (US$0.08) per sack for certification from the agency declaring that the product is sawmill wastes. The certification/permit is only good for 2-3 trips. Furthermore, a BIR invoice is also required at P 30 (US$1.20) per cubic meter, as is a mayor's permit of P 10 to 20 (US$0.40-0.80), depending on the town.

In spite of their compliance with all requirements, the traders are still detained at various checkpoints or stations set up along the routes going to Manila. There are about 10 to 15 different checkpoints en route. One informant reported that her cargo was seized and held at one such checkpoint. She claimed that her charcoal was confiscated and disposed of by the personnel manning the station. In spite of the restrictions, the question that traders have always been asked was "why do big traders keep on transporting charcoal to Manila?"

Sometimes small traders with 20 to 50 sacks are allowed to pass through checkpoints, but other times they are held in various stations. The trader often "negotiates" with the people monitoring the station for free passage. The cost of negotiations ranges from P 10-30 per station.

Non-payment and non-delivery

Several middlemen revealed in interviews that they had encountered losses when producers failed to deliver charcoal after they had been provided with subsistence goods and cash advances. The products were delivered or sold to another trader. One trader has floated P 10,000 (US$400) capital which has not yet been recovered. She incurred losses of P 3,000 (US$120) for two producers, and only P 600 (US$24) was recovered out of P 2,000 (US$800) cost of investment to another family. Most traders now rarely make cash advances to producers and prefer to provide subsistence instead.

Cheating practices

These problems were identified by users who noticed that traders sometimes put heavy objects and mixed poor quality charcoal with good charcoal to obtain a higher price. Traders and retailers have adjusted to these problems in a variety of ways. Some have abandoned business operations due to heavy losses. Others are becoming more selective in picking producers and assemblers to work with, and they are becoming more reluctant to advance money before receiving any charcoal. Some are trying to sell directly to users to avail themselves of higher profit margins.

Some traders engage in direct negotiations with the monitoring stations; some ask landowners and/or tenants to get a certificate from the mayor to help get wood energy products through the checkpoints.

At present, urban traders seldom pick up the product from the source, because the charcoal has already been sold or consigned to local assemblers and transporters engaged in the buying and selling of charcoal. The urban traders become middlemen between the local rural traders and the end-users.

3.3 Consumption System

Dependence on fuelwood and charcoal by urban households, commercial establishments, home industries and other services is influenced by their demand for cheap and readily available fuel. As viewed by the informants, the events and the pattern of changes related to the use of fuel in the town are brought about by population growth and socio-cultural as well as econonomic factors such as status, level of income, occupation, and accessibility of the resource. These have impinged on the capacity of the resource to sustain the needs of the urban users.

This section presents the main uses of wood energy; the users, and their activities; the kinds of wood fuels used and their sources; consumer preferences; cost of acquisition; purposes; and the constraints/adjustments in time of scarcity.

Food Products Processed in Siniloan, Using Various Types of Fuelwood

3.3.1 Food Processing

A flourishing home industry which started sometime in 1980, food processing is a family activity involving about 200 households in the urban centers. The wide array of foods produced include native delicacies such as yam (*ube*), rice cake (*puto*), custard (*leche flan*), "*bagets*" (a mixture of candied *macapuno* and beans), and "*espasol*" (candied dough rolled in bread flour).

According to one informant, only two food processors are duly registered business establishments. Another informant estimated that 80 to 100 individuals, mostly women, are engaged in the daily sale of processed foods to Manila and its suburbs. Two to five jeepney loads of vendors go to Manila every morning (usually at 3:00 A.M.), spending P 40 (US$1.60) for a one-way trip. The vendors are usually back in town by afternoon.

Food vendors get their products from food processors. Either paying in installments or working on consignment, a food vendor typically has somewhere between P 100 to P 500 (US$4-20) worth of processed food products. An ordinary vendor can easily earn P 100 to P 250 (US$4-10) a day with little or no capital. The margin of profit ranges from 33 percent to more than 100 percent, depending on the kind of products sold. The home industry is an income-generating activity for families in the town. One processor told us that considerable investment is needed to buy the ingredients used in preparing food products. In view of this, the daily turn-over of P 1,000 to P 3,000 (US$40-120) must be seen in its proper perspective. It may well be that the food vendors get as much profit as the producers.

Different kinds of wood energy are used by food processors, depending on the kind of food products processed. For example, charcoal is usually preferred over fuelwood in preparing "bagets" because it produces less smoke and ashes. Fuelwood is commonly used to prepare rice cakes (*puto*) and "*espasol*". Rice hull may also be used for cooking rice cakes. However, only few are using rice hull because of the big investment needed in the construction of the oven. A lot of fuelwood is consumed in preparing rice cakes and desserts because of the lengthy cooking time, usually not less than one hour in order to harden the mixture of coconut milk and sugar, and the yam and taro or sweet potato added as blenders. Sometimes, cocoshells and coco lumber are combined with fuelwood to speed up the cooking.

Most processors use "*raheta*". Wood charcoal from hard forest species is preferred, even though it is more expensive, because it lasts longer and is cheaper in the long run. Fuelwood from stumps of *ipil-ipil* and *kakawate* are good fuels but they are not often used because the supply is limited.

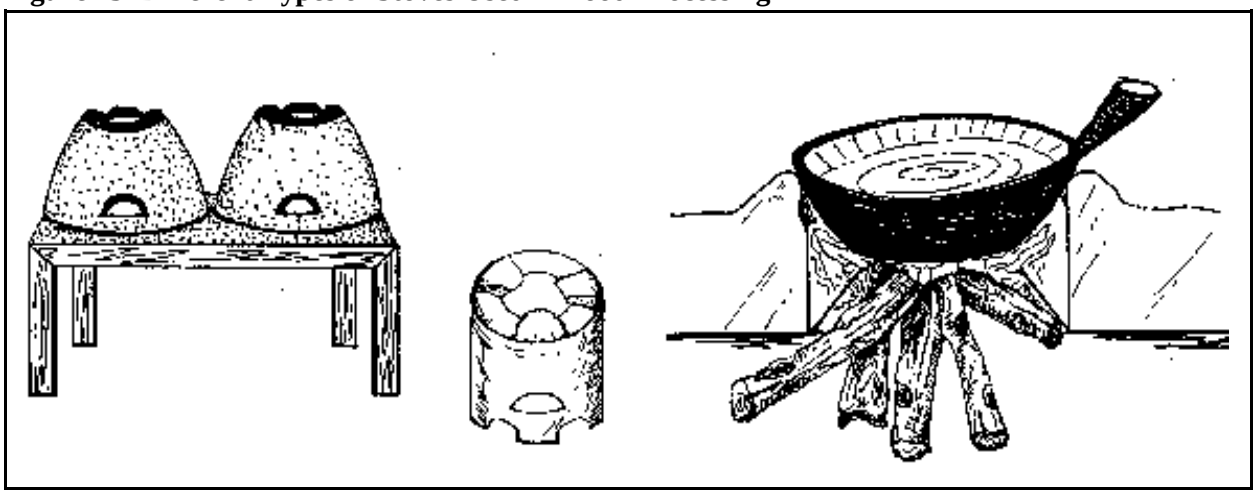
Charcoal is regularly delivered by suppliers at a price ranging from P 32 to P 35 (US$1.28-1.40) per sack of heavy charcoal and P 26 (US$1.04) for low quality charcoal. The price of fuelwood increases from P 32 to P 40 (US$1.28-1.60) per sack at the start of the rainy season (July to December). Fuelwood is bought at P 1.70 to P 2.40 (US$0.07-0.08) per bundle, depending on the wood species and delivered weekly by suppliers from the upland villages.

LPG, on the other hand, is used for delicate products like *leche flan* (custard), a dessert that must be cooked slowly over low heat to produce a product of high quality.

Different sizes of charcoal stoves are used in cooking the food products, depending on the quantity to be processed. Figure 27 shows the different types of stoves used by food processors.

Stoves are usually available at the market and cost about P 35 (US$1.40) for a small stove, and about P 75 (US$3) for a bigger one. Commercial stoves are made of concrete and last for only 3 months. Most processors repair old stoves rather than buy new ones. There are artisans in the town who make larger-size charcoal stove which costs about P 100 (US$4).

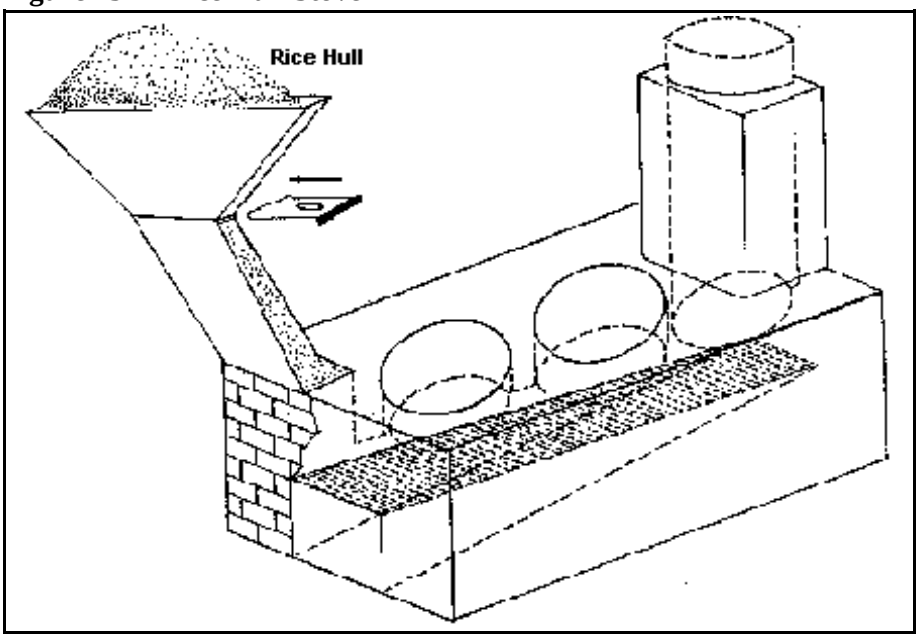
Figure 23 Different Types of Stoves Used in Food Processing



While the home industry provides families with an additional source of income, some of the food vendors who take their products on installment or consignment do not pay their accounts regularly. One food processor claims that she has a food vendor with an accumulated amount of P 5,000 (US$200) still unpaid. To minimize this kind of problem, most processors limit the number of food vendors they deal with and retain only those with a good track record.

The increasing cost of fuelwood energy and the uncertainty of supply, particularly during wet season, has prompted some processors to invest in rice hull ovens for making rice cakes. They are currently investigating the feasibility of using the same technology for other food products to make the industry less dependent on traditional wood energy (Figure 28). Liquified petroleum gas is still considered by most processors to be expensive, although there is one processor who uses an LPG-operated stove to make rice cakes.

Figure 25 A Rice Hull Stove

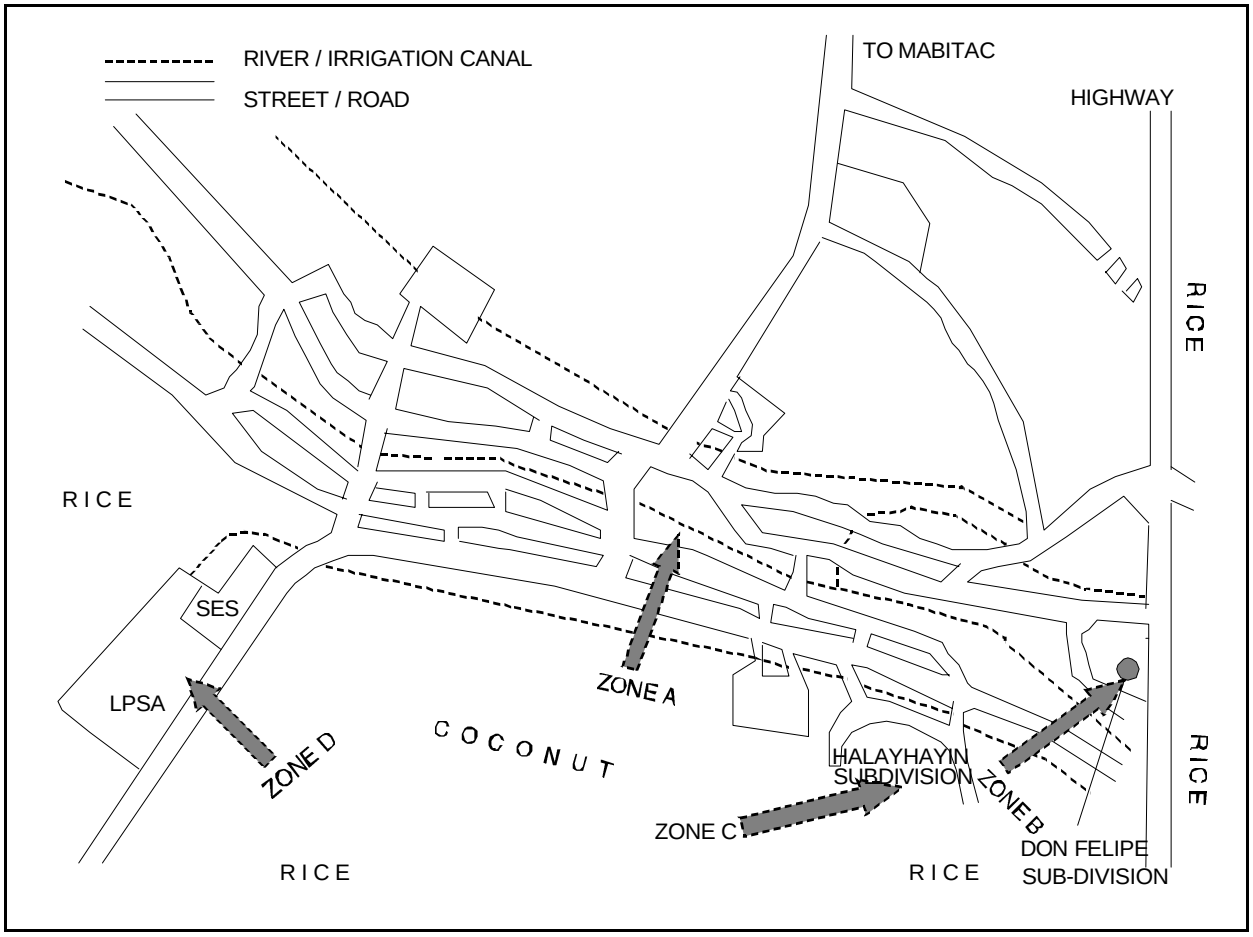


3.3.2 Household Cooking

Wood fuel is a poor man's source of energy. We found various income groups to be located in specific areas within the town. The high income group is concentrated in the center of the town by the municipal town hall complex. Most residents in this zone are professionals, and many others have established businesses, such as restaurants and shops (Zone A).

The middle-low income groups, on the other hand, can be located in the peripheral areas in the town (Zone B, C and D). The residents usually work as fish and meat vendors, operators of beauty saloons and other small stalls in the market. In area C, most residents are farmers in the nearby coconut and rice fields, while area D is a community of small fishermen (Figure 29).

Figure 29 Location of Sample Income Groups in the Town of Siniloan



In a rice growing village in town (Zone C), 66 percent of the families earn a monthly income of less than P 2,000 (US$80). Of the 358 households, a little more than half (50.56%) had a monthly income from P 1,200 to P 2,000 (US$48-80) and about 16 percent received less than P 1,200 (US$48). In this village, 85 percent of the households used wood or charcoal for household cooking, 10 percent LPG and 5 percent electricity.

In a nearby fishing village, the barangay captain reported that wood and charcoal are widely used as household fuels. Kerosene stoves are popular among middle-income families because the acquisition cost is lower than an LPG stove. A unit costs only P 150 to P 200 (US$6-8), which many households can afford.

Professionals and families with business establishments living within the town center commonly use an LPG stove for household cooking. Wood and charcoal are only used as emergency fuels, or if a large amount of food is being prepared for some special occasions, such as for birthdays, weddings, fiesta and holiday seasons.

Household informants mentioned cleanliness; difficulty in starting a charcoal fire; and smoke which stains the paint on walls and ceilings of the house as reasons for using LPG as fuel energy. In spite of the presence of an electric cooperative, electricity is seldom used for cooking because of its high cost. It is mainly used for lighting and appliances (TV, refrigerators, electric fans, irons, etc.).

One informant of upper class status recalled that 26 years ago, coconut fronds were commonly used as fuelwood and that clay stoves and pots were used by most households in the town. People began to use fuelwood as it became available in the market. However, when fuelwood became scarce, charcoal was used as a substitute fuel. In 1967, using LPG became a status symbol. Middle income families use LPG only for emergency purposes. Some consumers combine LPG use with charcoal to reduce expenses.

For a low-income family, a plastic bag of charcoal costing P 3-5 (US$0.12-0.20) is enough for a whole day of cooking. But three bundles of "*raheta*" fuelwood are needed to cook one meal. An average family of six may use about four or five sacks of charcoal a month. Even if the price of LPG increases, richer informants say they will continue to use it. In one of the low-middle income villages, most of the households prefer charcoal to fuelwood because it is cheaper.

3.3.3 Eateries/Restaurants

Most eateries and restaurant owners are still using charcoal as their main fuel in selling ready-to-serve meals. From observations made at six eateries inside the market, most of them use charcoal-fired stoves to heat food. Some eateries, however, also maintain an LPG stove for emergency cooking and boiling of water for coffee and eggs. The soup for noodles is continuously heated by charcoal. Each eatery/restaurant maintains at least one or two charcoal stoves and operates these daily throughout the week.

An eatery owner had been using charcoal for almost four years and uses three sacks per week. Charcoal is delivered to her place of business from the market and from a supplier in a nearby street. She pays P 38 (US$1.52) per sack for good quality wood charcoal, less than P 35 (US$1.40) for inferior quality, and an additional P 1 (US$0.04) per sack for delivery.

In one village visited, an official reported that six eateries in their area used both charcoal and fuelwood for cooking food. One sack of charcoal at P 30 (US$1.20) and two bundles of fuelwood at P 2 (US$0.08) per bundle are used daily in each of these eateries.

Charcoal is preferred to fuelwood, which produces smoke that bothers the customers. Besides, the dishes and utensils are easier to clean than if fuelwood is used.

Some informants think that LPG is cheaper than other fuels because it can be better controlled. One restaurant owner, however, does not want to use LPG for fear of loss due to theft She will use LPG only if somebody will sleep in the eatery to guard the stove.

Some restaurants are apparently turning to the use of rice hull stoves for cooking. One restaurant owner reported that he is still testing the stove and hopes to improve its design for more efficient heat. He spent about P 5,000 (US$200) for the construction of the stove. He believes that rice hull stoves may well be cheaper in the long run, because rice hull can be obtained free in many rice mills in the town. The only expense is for hauling.

3.3.4 Bakeries

Nine bakeries are within the town center. There are three categories of bakeries, distinguished by the type of oven used. The biggest and the oldest bakery uses a fuelwood-fired brick-oven. Some bakeries use an LPG-operated oven, and others, a charcoal-fired oven. The biggest bakery was established in 1963 with 45 baking trays and a capacity of 12 trays per cooking. The bakery has five employees who prepare baked goods and deliver them to consumers at the market center. Wood fuels and sawmill slabs, coco lumber trimmings, stumps and branches from orchards and forest lands are all used as fuel.

Fuel from hardwoods (from orchard and forest) are acquired at a price of P 60-75 (US$2.40-3.00) per cubic meter. Coco lumber slabs cost P 50 (US$2.00) per cubic meter. Sawmill slabs cost about P 100-150 (US$4-6) per jeepney load. A jeepney load, which contains about three cubic meters of wood, is estimated to last about a week, while the daily consumption is about 0.5 cubic meters of wood.

One charcoal-fired mini-bakery opened eight years ago, but the owner actually started the business as early as 1961 in her hometown, Sta. Maria. That original bakery is still managed by her mother. The informant decided to convert the LPG-operated oven to a charcoal burning type because of the rising cost of LPG sometime in 1980 when the price of LPG rose to P 63 to P 90 (US$2.52-3.60) per tank load. One tank load of LPG only lasts for three days, while it takes four days to use four sacks of charcoal at P 8 (US$3.20) per sack, costing only P 32 (US$1.28). At its present capacity of twelve trays, the bakery uses five to nine sacks of charcoal per day at P 30 (US$1.20) per sack, at a cost of about P 150 to P 270 (US$6.00-10.80) per week.

The charcoal comes from the upland areas of Llavac and Real, Quezon. Charcoal is regularly delivered, but the owner also buys charcoal at the market when there is no delivery, although it costs her P 5 (US$0.20) more per sack. The bakery consumes about 15 sacks of charcoal per week. This owner complains that charcoal is getting so expensive that she is planning to shift back to LPG use. But new oil price increases may change her mind again.

3.3.5. Slaughterhouse

Two informants, a market administrator and a market meat vendor, reported that the town's public slaughterhouse used fuelwood in boiling water for scalding and cleaning slaughtered hogs and cattle and for dressing chicken daily. Five bundles of fuelwood are consumed daily. Every month about 110 large cattle and 600 hogs are slaughtered and perhaps 3,000-5,000 chickens are dressed every day. About 16 butchers are involved in the activity. It is estimated that between

7,300 to 9,125 bundles of fuelwood are used every year, at P 2 (US$0.08) per bundle, with a total cost of about P 14,600-18,250 (US$584-730) per year. The demand for meat products in the future is likely to increase as some meat traders go to Siniloan to buy livestock and poultry for resale in Manila. The price of meat is cheaper in Siniloan. This means wood consumption will increase in the future.

3.3.6 Fish Smoking

This is one small industry that depends solely on fuelwood for energy. One informant said that 10 bundles of fuelwood are used to smoke fish everyday by a fish vendor who has a stall in the town market.

3.3.7 Paper Mache Making

Paper mache is a common cottage industry in one of the villages in town, involving about 20 households. A paper mache entrepreneur, who has been in the business for three years, once used charcoal as a source of heat for drying the paper mache molds, but he later shifted to fuelwood because of the high cost of using charcoal. Paper mache products are placed inside a temporary kiln for drying. Drying paper mache with fuelwood is laborious during both wet and dry months.

The informant only spends P 20 (US$0.80) every one or two days for fuelwood bought from sawmills. Extra fuelwood is used for household cooking.

Paper mache making is an activity in which all members of the family participate in pasting, cleaning, and drying. A contractor picks up the products from the residence at P 90 (US$3.60) per piece. However, pieces with designs are sold directly to exporters in Manila, where they command P 200 (US$8) per piece.

3.3.8 Blacksmith Industry

One man who has been a blacksmith since 1937 long used charcoal as a source of heat in making iron and metal crafts. Later, he shifted to coconut charcoal. According to him, the wood charcoal available now is of poor quality and there is a lack of supply of hardwood species. The high heat intensity of coco charcoal makes it an ideal substitute for wood charcoal, as it softens the iron and makes it more malleable for easy molding into various tools and products (bolos, scythes, cutting tools, etc.).

The informant makes 10 bolos in one day and obtains coco charcoal from the village of Kapatalan at P 40 (US$1.60) per sack. In 1952, the price of coco charcoal was only P 1.50 (US$0.06) per kerosene can or P 4.50 (US$0.18) per sack. He makes agricultural tools on order. It would require three sacks of coco charcoal to make 100 bolos. The products are made mostly for stall owners who sell agricultural tools in the town market.

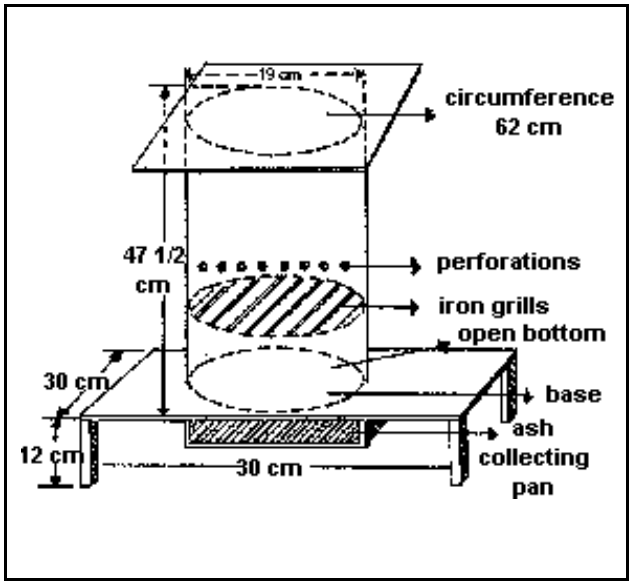
3.3.9 Other Uses of Wood Energy

3.3.9.1 Poultry farms

One trader supplies wood charcoal to a poultry farm in the capital town of Sta. Cruz. According to this informant, a large quantity of wood charcoal is used by poultry raisers in other towns such as Pila, Victoria, and San Pablo City. A visit to one of the poultry farms in Sta. Cruz revealed that use of charcoal as a substitute for heating broiler chicks has been going on for the past four years. The caretakers reported that the poultry farm previously used an electric Hoover type of brooder, equipped with a 300-watt bulb for providing heat to the chicks. For every pen of 1,200 chicks, one heater with a 300-watt bulb was installed. The poultry house is made up of 2 pens, with a total capacity of 42,000 birds.

The owner has been in the poultry business for almost 10 years, under a contract arrangement with a private company. It was also reported that all poultry farms in the town of Sta. Cruz are now using charcoal-based heaters.

Figure 30 Diagram of Heater Used in Brooding Broiler Chicks



These heaters are filled to the brim with charcoal and covered with galvanized iron. The charcoal is fired at the base, where it is held by iron grills. The ashes are collected on a pan that can be removed and emptied when full. Overnight, 5 caretakers replace the charcoal five times (Figure 30). If the charcoal is dry and light, it lasts for two or three hours, but good quality charcoal lasts longer. Consumption is higher during cool and rainy days.

The brooding period lasts for 12 days. There are three or four full production cycles per year, each lasting 45 days. A one-month rest period between cycles is used to clean and disinfect the pens before a new batch is raised.

A vegetable dealer and a charcoal supplier who happened to be present during the visit estimated that about 80 sacks of charcoal are delivered twice during each production cycle, for a total of 160 sacks per cycle.

The owner usually arranges in advance for charcoal deliveries to ensure that there will be enough for the duration of the brooding period. The price varies from P 34 (US$1.32) (June to December) to P 25 (US$1) per sack (January to May). The main sources of this charcoal are towns of Cavinti and Llavac/Kapatalan in Siniloan. Their source before was Kapatalan and the charcoal was of good quality. The charcoal from Cavinti is not good as the charcoal from Kapatalan.

Concern was expressed about the poor quality of charcoal now available, which does not last long, and also about the limited supply of charcoal, felt to be due mainly to restrictions by authorities.

3.3.9.2 Meat barbecuing

Although a minor user of wood charcoal, selling snacks like barbecued meat or bananas is a common income-generating activity of some poor households. Vendors of these snacks are located in market areas and around recreation centers like movie houses, billiard halls, and waiting stations. Meat barbecuing goes on near the movie house from 2 P.M. until midnight. Most vendors use about a half a sack of wood charcoal per day. Charcoal is also used to prepare hotdogs, bloodcakes, chicken entrails, head and shank, commonly called "*adidas*".

3.3.9.3 Socio-cultural festivals/celebrations

It is a custom in every village and town to celebrate an annual religious festival in honor of their patron saint. This is part of the cultural heritage inherited from the Spaniards. The town "fiesta," or festival, held the last Friday of the month of August, is observed by the town people regularly. Moreover, seven other religious festivals are regularly observed, three of which are observed by the whole town.

During such celebrations, large quantities of many kinds of wood energy (fuelwood, charcoal, coconut fronds, sawmill waste, coco shells, etc.) are used in food preparation. Fuelwood is heavily used during the yuletide season. The quantity of extra fuelwood consumed during these socio- cultural activities, however, has never been measured. A summary of uses and types of fuelwood used is shown in Table 10.

A 40,000 Bird Poultry House in Sta. Cruz,
Consuming 640 Sacks of Charcoal per Year

Table 10 Type of woodfuel and quantity consumed by various users

Uses	Type of Wood Fuel Used	Quantity Consumed
1. Food Processing		
- Leche flan, beans, macapuno, bagets	Charcoal	3 sacks/week (small scale) 1 sack/day (large scale)
- Ube, espasol	Firewood "raheta" "tuod"	 50 bundles/week (large scale) 1/2 sack/day (subts. for "raheta")
2. Household cooking	Charcoal Firewood	10 sacks/month (household size = 6) 3 bundles/day
3. Eateries/restaurant	Charcoal	3 sacks/week
4. Bakeries	Charcoal Firewood (slabs, trimmings, stumps & branches)	15 sacks/week 1 jeepney load (3 cu m)/week
5. Slaughterhouse	Firewood ("babat")	5 bundles/day
6. Fish smoking	Firewood ("raheta")	10 bundles/day
7. Paper mache making	Firewood (sawmill wastes)	-
8. Blacksmith	Coconut shell charcoal	2 sacks/week[1]
9. Poultry farms	Charcoal	160 sacks/cycle (40,000 birds/cycle)
10. Barbecue vending	Charcoal	1/2 sack/day
11. Socio-cultural festivals	Charcoal Firewood (all kinds)	- -

[1] Irregular consumption, depending on orders

4. SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

4.1 Producer System

Wood energy is produced from private and public forest lands. Most producers are motivated by the income generated as supplementary source to meet the basic needs of the family. For the landless, it is a means of survival. And for others, it enables them to maintain and support existing production activities; to expand or open new lands for crop cultivation; and to have the means of responding to emergency situations. Broadly, the motives are rooted in insecurity of land tenure, limited resources, and the lack of better economic alternatives.

How, where and when fuelwood and charcoal are acquired is influenced by season, accessibility and distance, and more importantly, the risks and hazards it poses to one's health and life.

Replacing coconut trees with citrus farms and other upland perennial crops indirectly poses a danger to the sustainability of the forest ecosystem. Coconut trees are an alternative source of fuel energy and their removal might exert more pressure on producers to continue exploiting the forest lands in the absence of alternatives during the transition period.

Producers make adjustments by not producing fuel, by shifting to other sources of livelihood, by returning to their home provinces, by migrating to other logging areas, and by seeking employment as workers in commercial or industrial establishments. Others, who do not have any such alternatives, must continue exploiting the forest lands and find substitutes for scarce tree species, such as using wood stumps to produce wood charcoal and fuelwood. A few others engage in traditional carabao logging activities.

The wood fuel producers today are mostly subsistence farmers in the uplands, exploiting their own lands or forest lands. For most of them, charcoal and fuelwood are an integral part of the management and expansion of their kaingin farms. Yet their present cropping system--rice, sweet potato, banana, and sometimes coconut-- simply does not produce enough income to sustain the family in the long run. This cropping pattern, coupled with the poor biophysical conditions existing in the area, spells low productivity and generates further kaingin expansion into the remaining forest resources. Increasing areas of abandoned kaingin are part of the chain reaction. Unless the present kaingin farms are made productive enough to sustain the families and provide their children better opportunities in the future, we can expect a swelling population entirely dependent on the uplands for a living.

At a superficial level of analysis, one may readily be led into concluding that fuelwood and charcoal production must be discouraged and eventually eliminated through some combination of providing alternative livelihood activities and implementing strict punitive measures. While in the uplands, wood energy production is an activity that generates just enough to fill empty stomachs, in the lowlands wood energy has become a flourishing industry. Our study has led us to believe that there are many opportunities to turn wood energy production into an (additional) income generating activity in the uplands as well, and we recommend to further develop sustainable wood energy resource management systems, for both private and public lands.

4.2 Distribution System

After production, part of the wood fuel products is transported to and marketed in urban areas. Distribution of wood fuel to urban centers follows a system of marketing channels, starting in production sites and ending at the urban areas (Consumption System). Several intermediaries are involved in moving and handling the product. They are entrepreneurs who perform varied functions as producer-assembler-transporter; producer-transporter; assembler-transporter; assembler; and agent or collectors.

Most of the local traders who assemble and transport the product reside in the area, are financially above average, sometimes have warehouses, and/or own a transport vehicle, and are by virtue of their trade highly mobile.

Producers have some options that enable them to get a higher return for their labour. One option is to better exploit the higher prices paid for higher quality charcoal; another negotiate for better terms in the sale of their products to various intermediaries. Some transporters provide initial capital to agents/collectors to ensure a supply of charcoal when high demand for the product generates competition. For others, while selling the product directly to consumers in the town offers higher income, limited resources and restrictions in transporting the product constrain them. Selling to the local traders is the easiest way.

The price of charcoal in the production area is 46 to 50 percent lower than the selling price in the urban centers. The price varies according to weight, kind of wood species, season, form and quality. Retailers are part of the market channel and serve as the direct link to urban users. They get more returns by repacking the product into smaller plastic containers which users prefer to buy for their daily consumption needs.

Although some informants characterized charcoal trading as a lucrative business, local traders also encounter difficulties in transporting the product to its destination. Traders are required to pay charges in getting permits and invoices from regulatory agencies for clearance and passage through various checkpoints along the routes. They find it cumbersome and experience delays in transporting the product. The cost of delays in the transport processes results in higher prices paid by consumers.

One of the topics requiring further study is the effect of the various regulatory constraints on the type of traders involved; some of our findings seem to suggest that more influential persons with better contacts ("larger traders") thus become more important. Other findings indicate that the decreasing attractiveness of the trade because of the "informal taxes", leave a niche for smaller traders to become involved.

Fuelwood marketing is a simpler process than charcoal marketing. Only few entrepreneurs are engaged in this activity, which requires little capital. The frequency of buying and selling is low compared to charcoal, which is in greater demand than fuelwood.

4.3 Consumption System

The kind and use of fuel vary according to the type of activity. For household use, wood and charcoal are fuel for the poor. In the low-income farming village in town where the majority (71%) of the households earn a monthly income of less than P 2,000 ($80.00), most households use either fuelwood or charcoal for cooking. Availability and cost of acquisition are important determinants of dependence. Middle-income households on the other hand, are using kerosene-operated stoves, although wood and charcoal are still widely used. The initial cost of investment for a kerosene stove is within reach of middle-income families.

For most professionals and families engaged in business at the commercial center of the town, LPG is a major source of fuel for household cooking. Convenience, speed of use, cleanliness, and status are some of the identified reasons for the use of LPG among high-income households. Charcoal is used occasionally such as in times of emergency. Fuelwood is occasionally used for food preparations during fiestas, birthday parties, and for Christmas and New Year celebrations.

Fuel preferences depend on the activity or occupation engaged in by the family. Food processors, for example, use a variety of fuels (charcoal, fuelwood, rice hull, LPG, coconut shells), singly or in combination, depending on the kind of food products being processed. A few food processors and restaurant owners have started to use rice hull as an alternative source of energy that, for them, is cheaper and accessible.

Fast food services such as eateries and stalls are also heavy users of charcoal for continuous heating of ready-to-serve hot food. Fuelwood is not commonly used because of the smoke, which could drive away customers and irritate people eating in other food stalls. Some eateries and food stalls also maintain an LPG stove as an emergency energy for easy and fast preparation of food such as frying and rice cooking. Charcoal is readily available in small stores in the market by sack and repacked in plastic bags.

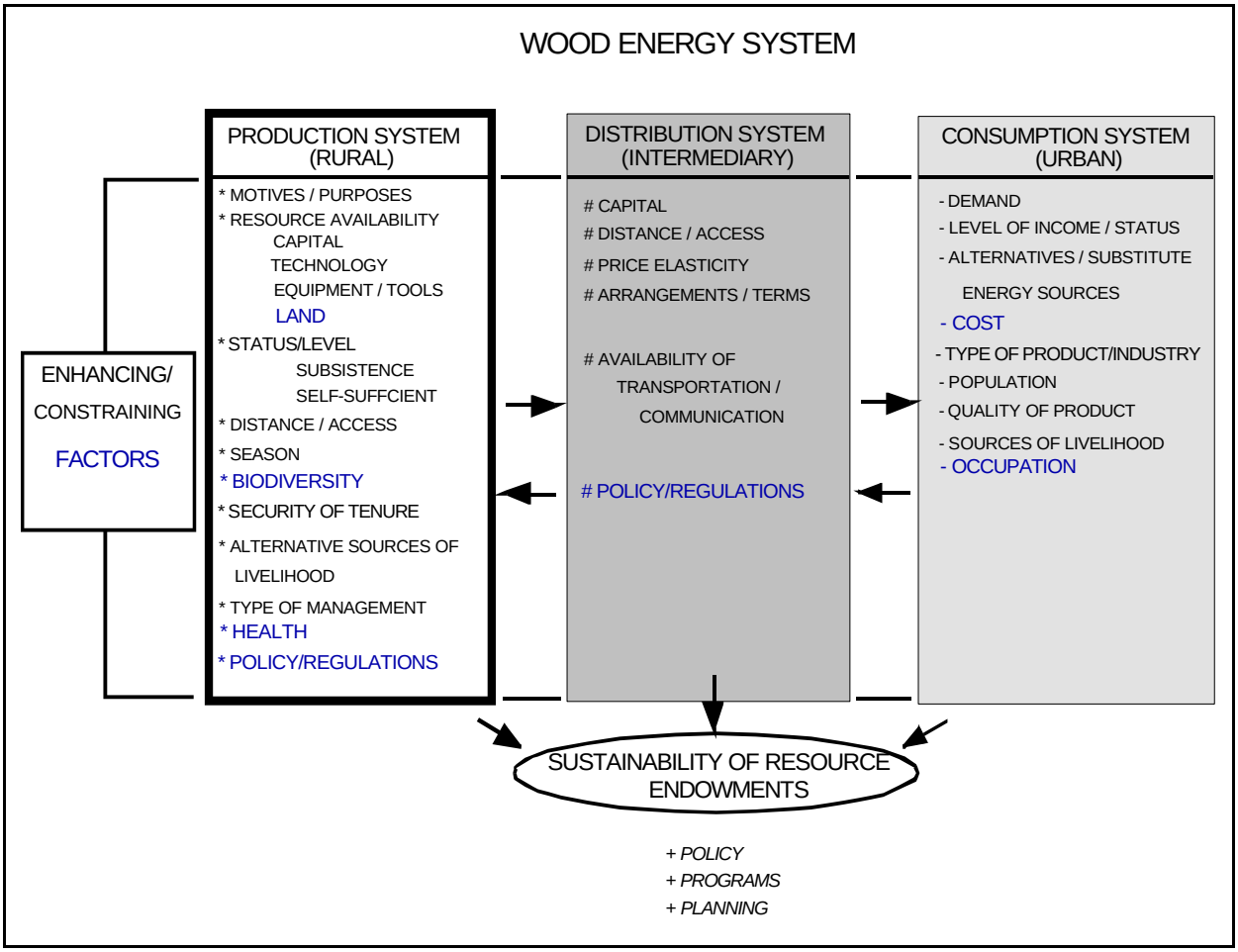
For brick-oven type bakeries, fuelwood is generally used in making different kinds of bread and cookies. A big volume of fuelwood is used to fire the ovens. This wood comes from orchards, sawmill slabs, and split stumps and boles of *ipil-ipil* and *kakawate* from private lands and it is usually purchased by the cubic meter. Some small bakeries, on the other hand, use LPG or charcoal in making bakery products. The shift from LPG to charcoal has been brought about by an increase in the price of LPG, which owners feel is no longer economical when compared to charcoal. Most charcoal-using bakeries prefer the heavy type of charcoal, because it lasts longer and provides more intense heat, although it is more expensive than the "light" charcoal.

Slaughterhouses also use fuelwood daily in boiling water to be used for scalding and cleaning slaughtered hogs and cattle and for dressing chickens. Poultry raising is also a heavy user of wood charcoal to provide heat for the chicks during the brooding stage. The popularity of charcoal for heating is due to uncertainty of supply of electric power to sustain the heat requirement of the chicks which is vital to their continued growth and more efficient distribution of heat within the poultry house. Other major uses of wood energy are for barbequing meat (pork and chicken) and cooking bananas, hotdogs, and other food stuffs sold by vendors around the commercial center and market places. Paper mache making uses a small quantity of wood fuel, only for heating the molded product during the wet months.

Coconut charcoal is used for iron and metal craft by a few blacksmiths who make agricultural tools and kitchen utensils. Other coconut by-products such as coco shells, fronds and sheaths, husks, and coconut lumber slabs are beginning to be an alternative source of energy for household and commercial use, especially for poor, resource-limited families.

Figure 31 shows the conceptual model of the wood energy system. For most producers, it is a means of survival. Intermediaries who facilitate the transfer of wood fuel to urban users sometimes make a tidy profit. Urban users' dependence on wood energy is seen to be induced by population growth, the availability of cheap energy; the rising cost of conventional energy; the demand for cheaper food affordable to low-income groups of society; the high cost of investment for acquiring household technologies; and the increasing price of electricity. The system is also influenced by policies and programs of the government.

Figure 31 A Model of the Determinants of Rural-Urban Dependency on Wood Energy



The growing demand for wood fuel as a substitute for conventional energy sources due to price increases in LPG in the study area, added to the wood fuel required by traditional consumers such as middle and low income households and small-scale industries, exerts pressure on the producer side to exploit available resources and increase the production of wood fuel.

The continuing urban and industrial needs for wood fuels is expected to sustain the economics of wood fuel production and trade. Within this complicated network of relationships and dynamic interactions, an outright prohibition of wood fuel production and provision of alternative livelihood simply will not work to conserve the remaining forest stands. Moreover it seems that there are prospects to better use the economic incentives to improve the ecological sustainability of wood fuel resources.

Some issues have emerged from this study that appear to have significant policy implications.

1. Tenurial issues in the uplands may well have a significant impact on the promotion of more productive and more sustainable farming systems. Secure land tenure may be an essential prerequisite (if not a sufficient cause) of increased production and sustainability in many upland areas.

2. Wood fuel production in the area studied seems to be emerging into an industry unto itself, one which is a valuable component of the subsistence economy. In some areas it seems that wood fuel is produced in a sustainable manner (e.g., through the pollarding of *Gliricidia sp* and *Leucaena sp* for fuel). In other areas tenurial arrangements and the growing demand to convert land to agricultural purposes, coupled with the income that people can expect to receive from wood fuel production, has gradually replaced more sustainable patterns with a more extractive system of wood fuel production.

Research programs should be undertaken to further explore and clarify the above issues. There are a number of related issues that might usefully be examined through topical RRA.

Some of them are enumerated below:

1. Potential indigenous tree species for wood fuel production.

2. Impacts of CARP-ISFP on land use transformation in the uplands.

3. Wood fuel as an alternative source of energy in poultry production.

4. Impacts of declining coconut industry and the promotion of coconut lumber industry on wood fuel supply and demand.

5. Migration patterns in the uplands, perceptions and issues, managing migration.

6. The role of women and children and their potential roles in wood fuel economy.

7. Possibilities,and modalities of community or joint management of (degraded) forest areas, by carabao loggers, and wood fuel producers.

8. The economics of charcoal/fuelwood trading.

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