

# Haiti

South Department  
Forest Energy  
Supply Chains

UNEP Haiti, September 2016



NORWEGIAN MINISTRY  
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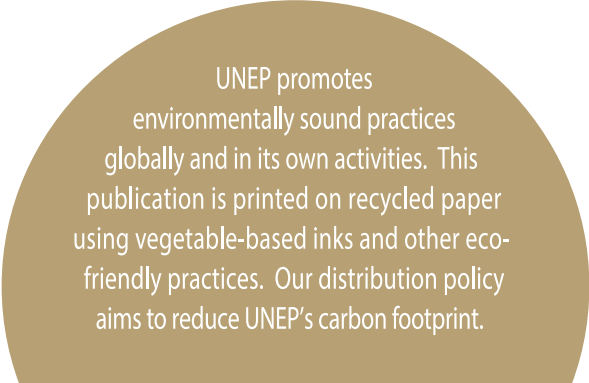
First published in October 2016 by the United Nations Environment Programme  
© 2016, United Nations Environment Programme  
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Cover Photo: A truck is loaded with bags of charcoal in the commune of Tiburon, South Department, for transport to Les Cayes and Port-au-Prince. 2014 © UNEP/Marc Lee Steed.

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Design and layout: Claudia Zimmerman



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## **Acknowledgements**

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This report was developed by the UNEP Haiti team, led by Adrienne Stork and Jean Elie Thys. Antonio Perera and Andrew Morton provided project supervision.

The surveys on the charcoal and firewood supply chains were developed by UNEP Haiti and executed through a partnership with the Université Américaine des Caraïbes in Les Cayes, led by Paul Touloute, Director of the Agronomy Department. A team of students from the University executed the surveys on the ground: Avridor Assert, Beauzile Sancha, Blanc Sylvain, Exumé Rodine, Fenelon Hyvertha, Georges Marie Claudette, Jean Louis Ruben Bersonly, Lalane Dachna, Louis Jean Junette, Simelus Dieubon, Telisca Angelitho et Telisca Thierry. A second team of students from the University of Notre Dame in Les Cayes also assisted the survey work: Destine Wadline, Theogene Markenzy, Yvenie Jean Charles, Policar Jean Olrich Rico, Calvin Job and Dely Herve.

Market surveys in Port-au-Prince were carried out by UNEP Haiti and by Macorel Coquillon. In Les Cayes, market surveys were completed by Danio Gerard. The visits to Maniche with OREB and OPSALMADJ were coordinated by Jean Elie Thys with Victor Moise.

## **Definition of Terms**

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<b>Carreau</b>	A traditional unit of land measurement in Haiti equal to 1.29 hectares.
<b>Communes/ Sections</b>	The commune is the third-level administrative division of Haiti. The country's 10 departments have 42 arrondissements, which are divided into 145 communes and then into 571 communal sections.
<b>Département/ Department</b>	Administrative unit of Haiti; there are 10 departments in the country.
<b>En détail</b>	"En détail" can mean anything from a marmite (5-6 pound coffee can) to even smaller bags of charcoal that are sufficient to cook one pot of food or one meal for a household. Typically, a household requires 2-3 marmites of charcoal per day to cook food and boil water.
<b>Farine</b>	Flour
<b>Gourdes</b>	National currency of Haiti. As of April 2016, the exchange rate was approximately 60 gourdes per US dollar.
<b>Jouisseur</b>	A housing arrangement whereby the owner of a house allows a person to occupy it without paying any formal rent or claiming ownership. It is an informal arrangement widely recognized in Haiti.
<b>Marchands</b>	"Marchand" is a general term for merchant in Haiti. Marchands can be those who sell goods in the markets that they have produced (such as agricultural products) or those who buy wholesale and re-sell (such as imported commercial goods, charcoal, etc.).
<b>Marmite</b>	A marmite is a 5-6 pound coffee can that is used as a standard unit of measurement in Haitian markets for everything from charcoal to dry goods like beans or flour.
<b>Sac</b>	Charcoal bags are classified in three sizes in Haiti: "gwo sak" which are 2 sacs sewn together and sell for around 10,000 Htg; "saks nomals" which sell for 4500 – 7500 Htg; and "ti saks farin", or small flour bags, which sell for 4,000-4,500 Htg. A "gwo sak" holds approximately 70 marmites of charcoal, a "sak normal" holds around 50, and a "ti sak farin" holds between 20-22 marmites.



**Photo 1.** The process of making charcoal typically takes around 4-5 days, whereby all water and volatile elements of freshly cut wood becomes converted to carbon through a slow pyrolysis method. The traditional charcoal production method includes a pile of wood covered with dirt and leaves that will be lit from below and left to burn. This method of charcoal production is highly inefficient from an energetic perspective, as only around 25% of the energy in the wood remains in the finished charcoal.

**Photo 2.** Once the charcoal is ready, producers go through the laborious task of filling sacs to transport it to market. In doing so, they are exposed to high amounts of charcoal dust, which is especially damaging to the lungs, especially for the elderly and young children, who are often implicated in these tasks.





## **Executive Summary**

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Production and sale of wood fuels are one of the main means of earning much needed cash income in Haiti's rural South Department. In contrast to agriculture, which is dependent on precipitation and follows set harvest cycles, charcoal is an effective means of generating revenue to respond to pressing economic needs, such as school fees, ceremonies such as weddings and funerals, or health care costs. While dead wood, old trees and branches are regularly used to produce charcoal, the surveys conducted for this report and UNEP's observations in the South Department in recent months and years, indicate that mangrove forests, as well as mature and young trees (including fruit trees) are also frequently targeted for charcoal production. This trend represents a direct threat to key ecosystems that support coastal livelihoods, such as mangroves, as well as an increased risk of erosion from deforested hillsides.

There is both significant need and opportunity for UNEP to intervene in the fuel wood sector in the South Department. By concentrating on specific areas of high-risk, a well-designed programme can improve livelihoods and promote alternatives to wood-based fuels, as well as allow for the preservation of key coastal ecosystems and preservation of existing tree cover. Support for a rotating tree production system based on sustainably harvested trees grown specifically for the charcoal and construction industries can stimulate the local economy and provide a model that can be expanded to additional departments in the larger Grand Sud.

UNEP support for the sustainable development of wood energy value chains can so have a significant impact on pressure on existing tree cover and forests in and around the buffer zones of the Macaya National Natural Park, as defined in the Park's management plan approved in 2015. While pressures inside the park are largely due to high demand for land for agriculture and for pine planks used for furniture and coffins throughout the south and in the capital, Port-au-Prince, the buffer zone of the park covers key watersheds throughout the South and Grand'Anse Departments that are key to ensuring sustained water supply and avoiding risk for landslides and erosion. A successful programme promoting fuel-wood forests would allow for greater soil protection and limit additional cutting of existing tree cover in these key watersheds.

This report assesses the socioeconomics of charcoal production in the South Department as well as potential solutions to prevent the harvesting of valuable tree species and to reduce pressure for wood from key coastal ecosystems. It provides the results of extensive surveying of the charcoal and firewood supply chains from their origin in the South Department to the main markets of Les Cayes and Port-au-Prince. It then assesses and identifies several significant opportunities for UNEP to intervene and add value in the forest energy sector in the South Department.



## Section A: Introduction and Purpose of Report

This section provides an introduction to the information contained in this report and states the purpose of this evaluation on wood energy in the South Department of Haiti by UNEP. It also provides a brief overview of UNEP's work in Haiti.

### **Introduction**

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Charcoal will continue to be a mainstay to meet the household energy needs of Haitians for years to come, both for practical and cultural reasons. Consequently, an approach is needed to ensure that charcoal is produced sustainably, meeting people's economic needs but without threatening remaining natural forest. While this report highlights examples of ways to advance such an approach, wood energy supplies remains a largely under-addressed area in development cooperation in Haiti.

To date, attempts to cope with the chaotic and unregulated wood energy supply chains, especially charcoal, have included strict legal directives from the government aimed at banning charcoal production and trade without supporting alternatives. These are often unenforced, or too under-resourced to fully enforce, and result in little impact on the volume of charcoal produced and the subsequent pressure on Haiti's ecosystems. Intervening effectively in this area requires an understanding of both the supply and demand side of charcoal and the identification of strategies to effectively address both.

The demand side of the charcoal sector is largely a result of cooking habits, tradition and economic realities. Charcoal, bought in small quantities ("en detail"), is the most affordable cooking fuel for households on a daily basis, even if it is not necessarily cheaper than the alternatives such as LPG in the long-term. Large amounts of time are needed to cook rice, beans and other dietary staples, for which charcoal provides a steady cooking temperature. Wood-based fuels are also often the only source of energy for cooking outside of larger urban centres in Haiti.

On the supply side, charcoal production is an economic necessity in rural areas. It is one of the only ways for people to generate cash income, as the lack of regular-wage jobs, coupled with poor development in agricultural supply chains (lack of storage facilities, agricultural extension services, difficulties transforming products to add value, challenges to transport products to markets, lack of access to credit and market information and low technical capacities to meet phyto-sanitary standards) leaves rural populations with few options to generate cash needed to pay medical bills, funeral services or school fees. Charcoal meets this need, as it is relatively easy and cheap to produce, and is a largely unregulated supply chain.

Most supply networks originating in rural areas tend to be connected to intermediaries in either regional urban centres or at the main markets of Port-au-Prince. These may be intermediaries seeking to redistribute to sellers who will then market it in smaller quantities, or who may be seeking to buy large quantities from the rural areas and then sell them to other intermediaries and depots in the capital, from where it can be further sold and distributed (*see Annex B for more details*).

While the existing supply networks for charcoal can seem disorganized, in fact they require substantial creativity, ingenuity and persistence to ensure their success. Like many types of businesses, they are reliant first and foremost on social relationships and on reliable logistical networks. They are also extremely complex and difficult to penetrate for an outsider. To date, the majority of efforts to promote more efficient charcoal cooking stoves have failed, either because of high prices or the inability to penetrate the market and create demand.

## **Purpose of report**

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The evaluation of the wood energy sector was undertaken in order to provide the most precise and current information available on the wood energy sector in the South Department. It provides a common baseline of information that the Government of Haiti and all stakeholders can refer to. The report examines the current socioeconomic dynamics of the wood energy sector in the South Department of Haiti, as well as resulting environmental pressures and vulnerabilities that ensue from the high demand for wood-based charcoal in regional and national urban centres. It then provides recommendations for future programming by UNEP and partners based on existing successful initiatives.

This evaluation was designed and implemented by UNEP and is a public document. Dr. Paul Touloute and a team of agronomy students from the American University of the Caribbean in Les Cayes, who provided valuable assistance in undertaking surveys of charcoal and firewood producers and consumers throughout the South Department from June through August 2014, assisted UNEP in the surveying work.

A full methodology for the evaluation is available in Annex A.

## **UNEP in Haiti**

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In 2008, following a request from the Government of Haiti, UNEP established a country office and commenced work on a range of topics related to sustainable development, including sustainable energy. After one year of recovery work following the 2010 earthquake, UNEP moved its main office to Port Salut, South Department and maintains a support office in Port-au-Prince.

UNEP's strategy in the South Department includes 5 main pillars: i) Biodiversity and Protected Areas; ii) Green Economy and Value Chains; iii) Natural barriers and Disaster Risk Reduction; iv) Sustainable Energy; and v) Regional Sustainable Development. This particular evaluation of the socioeconomic and environmental factors around wood energy supply chains is relevant for all pillars and aims to inform future efforts tackling the related issues of economic development around protected areas, reforestation and sustainable energy demand.

Further information is available from <http://www.unep.org/haiti>



**Photo 3.** A truck is loaded with bags charcoal in the commune of Tiburon, South Department, for transport to Les Cayes and Port-au-Prince.



## Section B: A background to forest energy in Haiti

Haiti is the only least developed country (LDC) in the Western Hemisphere.<sup>1</sup> It suffers from high incidence of natural disasters and 77% of its population lives below the poverty line (World Bank, 2014). Malnutrition and lack of access to safe drinking water<sup>2</sup> and medical facilities is common, especially in rural areas. In spite of the large amounts of development aid funnelled into the country in recent decades, Haiti is heavily dependent on imported food products and the agricultural sector, which is the mainstay of livelihoods for rural areas, remains largely underdeveloped. Estimates from various studies contend that between 70-85% of the Haitian population relies on biomass to meet their primary energy needs (ESMAP, 2007).

### **National energy consumption and demand**

Related to its development challenges, energy consumption per capita in Haiti is amongst the lowest in the world (at 320 kg of annual oil equivalent per capita,<sup>3</sup> Haiti is on par with Cameroon and the Democratic Republic of Congo). Electricity is available to only 12.5% of the population (though another 12.5% are estimated to access the electric grid illegally) at a very high cost (approximately 0.35 USD per kWh). Many rural areas have no access to the electric grid at all, including several coastal and mountain towns in the South Department. Energy poverty precludes economic development at both the local and national level, limiting the operational capacity of health centres, schools and other basic social services, and prevents improvements in the supply chains of essential economic sectors, such as agriculture.

To meet its limited energy generation capacity, Haiti has a high reliance on imported fossil fuels. Over 63% of Haiti's electricity supply comes from imported petroleum products, which consume 35-50% of Haiti's foreign revenues but provide only 20-25% of the country's energy needs (ESMAP, 2007). Only 25% of Haiti's installed electric capacity is in use due to lack of effective operation of production facilities, maintenance requirements and an absence of proper tracking and charging for usage. As a result, the Haitian state heavily subsidizes the operations of EDH, the national electric company, at around \$20 million USD per year.

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<sup>1</sup> Haiti's status is reported according to UN classifications. LDC criteria are based on three main factors: poverty, limited human resources and an undiversified economy.

<sup>2</sup> Only 47% of Haitians have access to an improved drinking water source (World Bank, 2014).

<sup>3</sup> World Bank DataBank 2004-2008. Accessed on May 16, 2014 from: <http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE/countries>

As a result, the vast majority of the Haitian population relies on locally available fuel resources to meet daily needs for heating and cooking. Small and medium enterprises (SMEs), such as bakeries and laundries, rely heavily on firewood, which comes mainly from cutting live trees. In urban areas, an estimated 90% of households cook with charcoal (Lawrence Berkley National Laboratory, 2015). In Port-au-Prince alone, there is an estimated 600,000+ households,<sup>4</sup> each of which uses one marmite's<sup>5</sup> worth of charcoal per day to cook. At this rate, an estimated 2.5 -7.3 million normal sized bags of charcoal are consumed in the city each year.

In rural areas, where approximately 80% of households use fuel wood for their cooking needs (typically gathered from the ground), charcoal production is an essential means of generating cash income to pay school fees and health costs. The charcoal production supply chain includes producers, transporters, "marchands" or intermediaries at multiple levels, and market women who sell "en détail", or in small quantities.

The increasing scarcity of natural forests in Haiti presents challenges to future development.<sup>6</sup> Over the past century, natural forest cover has been reduced from 60% of the land surface to between 1.5-4% (depending on estimates; FAO, 2010). Deforestation has damaged the integrity of ecosystems and increased the risk of natural disasters and threatened biodiversity that is key to healthy production of various agricultural and forest species, yet none of these effects are reflected in the current dynamics of the charcoal market. For instance, the increasing scarcity of Haiti's forests is not reflected in the price of charcoal and firewood, the prices of which have remained largely consistent over the past two decades. With natural forest regeneration rates estimated to be only around 26% of consumption, without concerted efforts at replanting Haiti will continue to run a deficit ratio of new to cut forest each year (ESMAP, 2007).

Positive trends in alternative fuel consumption are also slowly becoming evident, including the increased use of bagasse, agricultural wastes and LPG. Bagasse is frequently used to power the distillation of sugar cane by guildives, especially in and around the Port-au-Prince - Léogâne and the Plaine-du-Nord (Cap Haitian) area. Bagasse is also carbonized and pressed into charcoal briquettes by Carbon Roots Haiti, based in Cap Haitian.

LPG consumption for households and SMEs in the capital has also doubled in the past 18 months, though efficient distribution and affordability remain major challenges to increasing the use of this fuel.<sup>7</sup> Much of the LPG available in Haiti is imported from the Dominican Republic, where per capita usage is nearly five times that of Haiti, or from other regional sources. In terms of the equivalent of LPG to charcoal, one gallon of LPG is equivalent to five 10.6 kg sacs of charcoal in terms of cooking capacity.

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<sup>4</sup> The population of Port-au-Prince is estimated to be anywhere from 3-4 million people, though a formal census has not been conducted in many years. The aftermath of the 2010 earthquake and the response by the international community attracted many people to migrate to the capital from rural areas in search of jobs in reconstruction. The household estimate used here is 5 members per household with a population of 3 million.

<sup>5</sup> See "Definition of Terms"

<sup>6</sup> Natural forests are defined as: "Forests with natural species and ecological processes and for which there has been continuity of ecological processes over a very long period of time. The time period of continuity is sometimes quoted as being of more than 200 years but this may not be relevant for all types of forests." From the Organization for Economic Cooperation and Development, Division of Environmental Statistics, 2005.

<sup>7</sup> USAID RechoPa'w interview on April 17, 2014. Consumption was reported to have increased from 4 to 8 million gallons of LPG.

## **Governance of the wood energy sector**

At the national level, governance aspects of the wood energy sector fall under the mandates of the Bureau of Mines and Energy (as well as LPG), the Ministry of Agriculture (MARNDR) and the Ministry of Environment (MDE).

The responsibilities of MARNDR and MDE are both related to forest management and charcoal supply chains. MARNDR is responsible for management of rural resources and support to any agricultural activities, while MDE is occupied with forests and protected areas (through its jurisdiction over the National Protected Areas Agency – ANAP), protection of environmental resources and support for forest rehabilitation activities.

Governance in the charcoal sector exists through laws that forbid the production and sale of charcoal (from the Code Rurale passed during the Duvalier era) and in decrees that seek to ban all activity in the charcoal sector (for example, the May 2014 ban against charcoal production, sale and transport in Grand'Anse). However, this heavy-handed approach to regulation in the sector does little to mask the vacuum of governance and formal organization of the sector and neglects the need to provide alternatives and incentives for different sources of energy for households and SMEs. Moreover, the local authorities lack the human resources to effectively uphold and implement such a ban.





*Photos 4-5. Charcoal along the road from Camp-Perrin going north towards Jérémie, Grand'Anse. Photo credit: 2014 © UNEP/Marc Lee Steed.*





## Section C: Impacts and drivers in the wood energy sector in the south of Haiti

This section provides an overview of the main ecological impacts and economic drivers of the wood energy sector in southern Haiti.

### **Pressure on forest resources in the southwest peninsula**

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Haiti's constant demand for wood energy resources at the household and small and medium enterprise (SME) level, coupled with rising population and a shortage of means to generate cash income in rural areas, has kept consistent pressure on the remaining forest resources in the country. In coastal areas, mangroves and other coastal tree and shrub species are targeted. In the centre of the peninsula and in the buffer zone of the Macaya National Natural Park, pine and other species are targeted for wood planks for furniture and coffins. Together, the pressure from these demands means that the remaining stands of natural forest in Haiti – the majority of which are found on the southwest peninsula in the departments of Grand'Anse, Nippes and South – are at risk of permanent loss if alternative sources of wood are not developed and demand reduced.

Studies conducted in the late 1980's estimated that around 35% of charcoal sold in Port-au-Prince markets was estimated to be coming from the southwest peninsula, by both road and sea, while the majority came from the northwest. Since then, however, the southwest peninsula has become the principal source of charcoal for the capital. An April 2014 survey by the Ministry of Environment in Grand'Anse estimates that approximately 6,000 bags of charcoal leave the Department daily for Port-au-Prince. This signifies 60,000 kg of charcoal, made from 372,000 kg of wood using estimated conversion rates.<sup>8</sup>

The ever-increasing consumption of charcoal leads to both direct and secondary impacts on both ecosystems and livelihoods. The deforestation of steep, erosion-prone hillsides and mangrove habitats directly increases the risk of landslides during heavy rains, leads to erosion and reduces soil productivity for agriculture. Secondary impacts include siltation of mangroves, coral reefs and fish spawning grounds, which further threatens marine biodiversity and productivity in fisheries, one of the mainstays for livelihoods in the South Department. Along the coast, important mangroves are also directly targeted as a fuel wood source, particularly in la Cahouane, Île-à-Vâche, Saint Louis du Sud and Aquin, thereby reducing available natural habitat for fish spawning and reducing coastal protection against extreme weather events.

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<sup>8</sup> From the "Haiti Propane Reform Vision and Strategy" conference, 25 April, 2014, Port-au-Prince, Haiti.



**Photos 6-7.** Tours through the mangroves around Pointe Abacou and La Cahouane show visible evidence of consistent charcoal production, which reduced important habitat for fisheries and bird life. Both Pointe Abacou and La Cahouane, in addition to the vast mangrove areas in Aquin and Ile à Vache, were declared marine protected areas by the Haitian government in 2013.



## **The wood energy economy in the South Department**

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Charcoal and firewood production provide much-needed cash income for a significant number of people in the South Department. The results of a 2012 socioeconomic study in the Aquin and Saint Louis du Sud areas by the Ministry of Environment noted that people spend less time in harvesting of firewood or producing charcoal than they do in agriculture. In fact, firewood and charcoal contribute much more to the household economy (up to 25% according to the study) than agriculture (around 4%).<sup>9</sup> Dependence on natural resource exploitation is understood to be especially high in the Aquin - Saint Louis du Sud area, where dry forests and mangroves are used for charcoal production.

The suppression of agricultural markets in Haiti, due to unfavourable trade policies and tariff structures, coupled with insufficient means of transport, inputs, credit and insurance systems for farmers, leads to an under-productive agricultural economy in rural areas, which subsequently pushes people towards charcoal production and other types of natural resource exploitation (such as wood plank production). Addressing the root causes of deforestation and successfully protecting remaining forest ecosystems in the South Department is therefore inextricably linked to increasing the viability of agricultural supply chains.

Seeking to address one issue without the other will only obscure the underlying causes of rural poverty in the South Department that led to unfettered natural resource exploitation in the first place. The results of this UNEP evaluation show that approximately half of the rural population relies on charcoal and firewood production as either a primary or secondary source of income in the South Department. The larger charcoal supply chain employs thousands of people, including transporters, wholesalers and retailers from the South to the main markets in Port-au-Prince.

In terms of human impacts, charcoal production and consumption is linked to several well documented environmental and health threats. Carbon dust from charcoal production and smoke from consumption often lead to respiratory illnesses, especially in women and children, who are regularly exposed to smoke during cooking and in the home area. Acute respiratory illness is among the leading cause of illness amongst children under the age of 5 in Haiti (WHO, 2014).

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<sup>9</sup> Direction Départementale du Sud du Ministère de l'Environnement, 2012





## Section D: Survey results for charcoal and firewood supply chains and markets in the South Department

The surveys conducted for this study were designed by UNEP and carried out by a team of students from the American University in Les Cayes under the supervision of Dr. Paul Touloute and the UNEP team. The surveyors worked throughout the period of late June – August 2014 and surveyed over 750 charcoal producers, 200 firewood producers and 45 bakeries and laundries throughout the South Department. In addition, 90 charcoal traders and marchands from local markets in Les Cayes were interviewed. Charcoal markets in Port-au-Prince that regularly receive deliveries from the South were also surveyed, as well as transporters and depot storage owners. Additional data displays are available in Annex C.

It should be noted that it was very difficult to get figures on the exact cost and quantity of charcoal produced and sold due to the informal nature of the sector and the lack of any written records by producers or transporters. However, this data does provide valuable insight to the socioeconomic dynamics of charcoal production in the South Department and is relevant to inform the development of targeted interventions by UNEP and partners.

### 1. Charcoal and firewood

This section provides an analysis of the results of over 950 charcoal and firewood producers surveyed throughout the South Department. A full methodology is available in Annex A and copies of the survey results are in Annex C.

#### Profile of charcoal and firewood producers surveyed in the South Department

The producers surveyed were chosen at random by surveying teams. The breakdown of age and sex disaggregation of the data is shown in Table 1.

**Table 1.** Age and sex

	Range	Median
<b>Age</b>	15-86	43
	Female	Male
<b>Sex</b>	23%	77%

The UNEP team has observed women making charcoal both alone and in groups in the South Department, yet this data suggests that more men are responsible for charcoal and/or firewood production. This fits with other evidence from the charcoal markets, which shows that women are more often in a position of selling charcoal rather than producing it.

### Residential status

The data shows that the households of most charcoal and firewood producers include a significant number of dependents. While some adults in the household may also be working and contributing financially, others may be elderly, unable to work or occupied with non-cash remunerating activities. In terms of occupancy, around one-third of producers surveyed are required to earn cash to pay for rent for their housing. This trend shows up later in the data when producers were asked what their motivation for charcoal production is, though paying rent came much lower on the list of expenses than would be expected.

**Table 2.** Residential status

	Average	Minimum	Maximum
Number of families living in house	1.3	1	6
Number of persons living in house	6.5	1	18
Number of adults living in house (>15 years of age)	4	1	16
	Own	Rent	Jouisseur <sup>10</sup>
Occupancy status	78%	11%	12%

<sup>10</sup> A housing arrangement whereby the owner of a house allows a person to occupy it without paying any formal rent or claiming ownership. It is an informal arrangement widely recognized in Haiti.

## Household energy use

The World Bank estimates that 77% of Haitians live on less than US\$2 per day. While the economics of each household was not possible to determine through this evaluation, the median expenditure from the surveys is 65 gourdes, indicating that many households spend between US\$ 1-2 per day on energy.

The results also show that in rural areas, firewood is a more frequently used cooking fuel than charcoal. This supports other findings that charcoal is primarily used to generate income in rural areas, while it is actually consumed in towns and other urban centres.

**Table 3.** Location of kitchen and type of energy used in residence

	<b>Inside</b>	<b>Outside</b>	<b>No kitchen</b>
<b>Kitchen location</b>	2%	88%	10%
	<b>Charcoal</b>	<b>Wood</b>	<b>Charcoal &amp; wood</b>
<b>Energy source</b>	3%	54%	43%
	<b>Solar</b>	<b>EDH</b>	<b>Gas lamp</b>
<b>Source of lighting</b>	20%	4%	50%
	<b>Yes</b>	<b>No</b>	
<b>Electrified house</b>	12%	88%	
	<b>Average</b>	<b>Median</b>	
<b>Energy expenditures</b>	137	65	(per week, in Haitian gourdes)

## Exposure to natural disasters

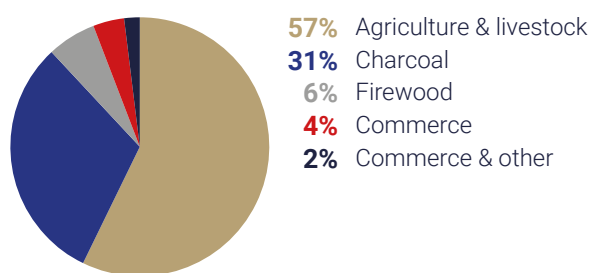
The survey also asked for data on exposure to natural disasters, where 29% of respondents reported experiencing drought, while 69% reported experiencing cyclones or heavy rainstorms. In terms of damages sustained, 52% reported losing one or more of livestock and crops. A loss of housing was reported by 5% and 11% reported losing their house as well as family members. An additional 5% reported losing documents.



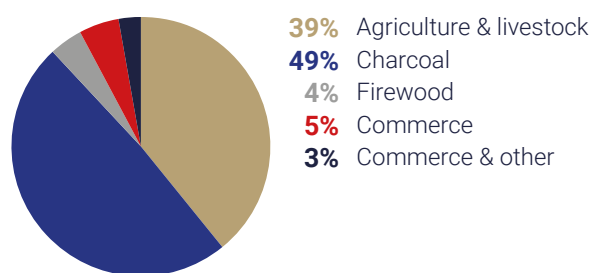
## Primary and secondary economic activities

Charcoal production is one of the main economic activities in the South Department. As this data suggests, up to half of those surveyed count on it as one of their primary means of earning income. Firewood, on the other hand, does not measure significantly in people's income earning activities, as the household largely consumes it as a cooking fuel. Agriculture and livestock, or some combination of the two, is the primary means of supporting one's household.

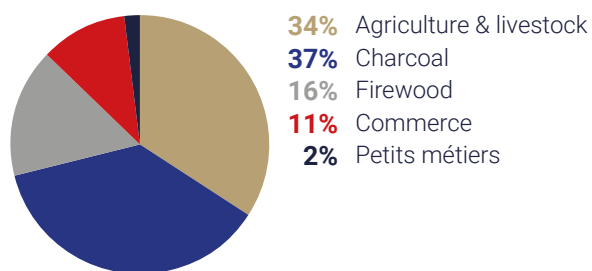
**Figure 1.** Primary economic activity



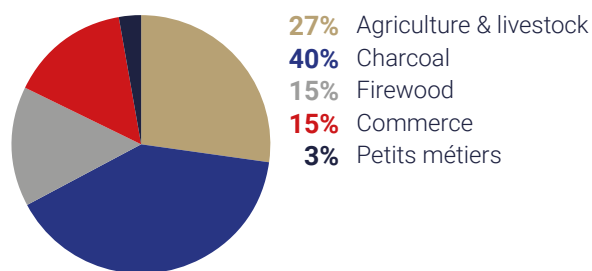
**Figure 2.** Secondary economic activity



**Figure 3.** Women's primary economic activity



**Figure 4.** Women's secondary economic activity



This data confirms that charcoal production and trade is one of the main economic activities of the South Department, as it is second in importance as a primary activity and first as a secondary activity.

The data was further disaggregated by sex and analysed to determine if women's primary and secondary economic activities followed the same trends. As shown in the Figures 1 and 2 below, women were engaged in charcoal trading as a main primary and secondary economic activity. For the purposes of the survey, "petits métiers" included tailors, shoe repairers, mechanics, etc. Respondents also noted that they often engage in a combination of charcoal, firewood and trade in other items at markets as part of their main economic activities.

Quantity of charcoal and firewood produced per week

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All producers surveyed were asked how much charcoal or firewood they produced per week. Given a total of 776 respondents to the charcoal producers survey, at a rate of 11 bags per week production would average a total of approximately 8,536 bags per week for only those surveyed. However, as shown in Table 4, there are certain times of year when charcoal production is higher and therefore it is only possible to estimate the total production of charcoal in the South Department at any given time within a certain range.

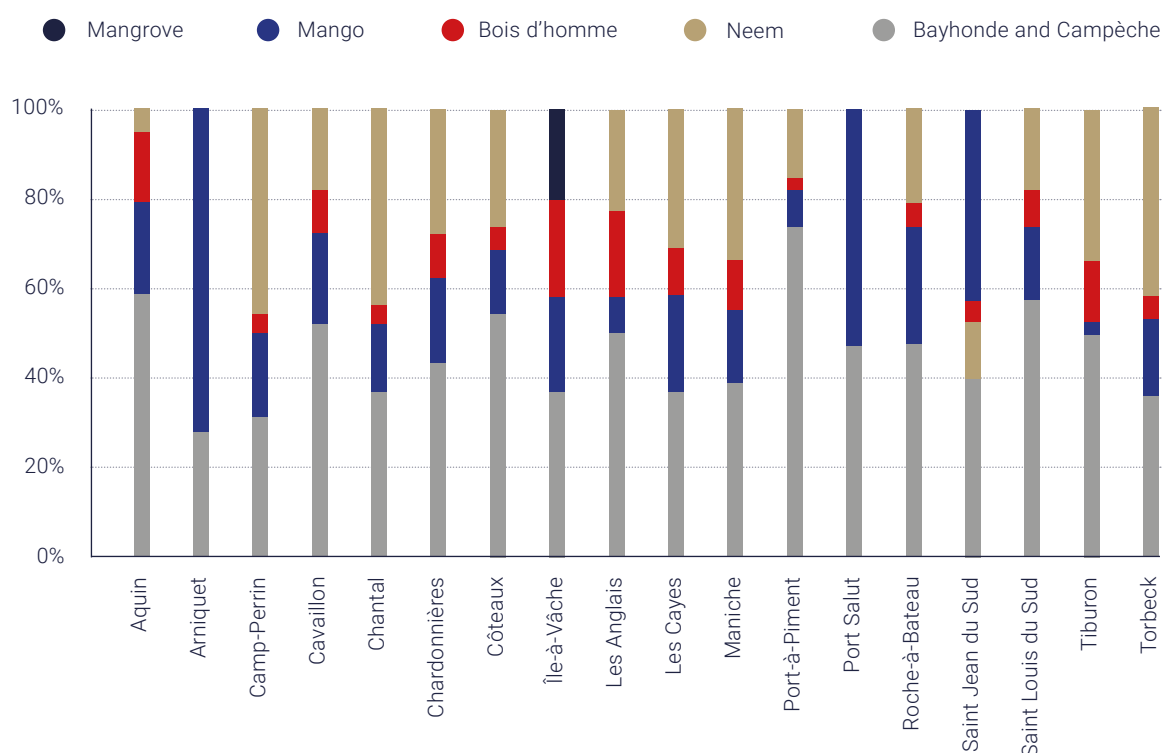
**Table 4.** Production quantity of charcoal and firewood per person, per week

	Average	Maximum	Minimum
<b>Charcoal</b> (sacs)	11	60	2
<b>Firewood</b> (douzaines)	11	25	3

## Types of wood used to produce charcoal

Producers reported 28 different types of wood used to make charcoal in the South Department.<sup>11</sup> Figure 5 shows the distribution of the most commonly cited species per commune. Several notable trends stand out, including high use of mango wood in Arniquet, Chantal and Torbeck, as well as high rates of bayhonde and campèche used in Aquin, Port-à-Piment and Saint Louis du Sud. Another notable trend from the data is mangrove, which represents 20% of wood used for charcoal production in Île-à-Vâche. However, 87% of all reports of using mangrove wood for charcoal came from Île-à-Vâche, showing that it was far more frequently reported in Île-à-Vâche than in any other communes.

**Figure 5.** Type of wood most commonly used for charcoal production



In terms of tree species targeted for firewood, mangrove was frequently cited in Aquin, with bayhonde, campèche and mango most commonly listed in other areas.

<sup>11</sup> A full list of tree species cited is available in Annex A.

## Source of wood

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Survey results indicated that charcoal and firewood producers source their wood from a combination of places, though most use wood from land belonging to them. Many also buy wood or pay to harvest trees from others' land. It is more common for charcoal producers to buy wood than firewood, but a significant proportion of both use trees belonging to them, which has implications for any programmes seeking to address the management of wood stocks by landowners.

**Table 5.** *Origin of wood for charcoal and firewood production*

	Charcoal	Firewood
<b>From own land</b>	47%	66%
<b>Buys wood</b>	22%	20%
<b>Uses wood from own land and supplements by buying</b>	23%	6%
<b>Pays to harvest wood from others' land</b>	8%	8%

When asked how far they had to travel to get wood, 52% of respondents said near and 48% reported far. Over half of respondents (52%) reported traveling between 1-3 kilometers to get wood, while 27% said they travelled 4-6 kilometers and 21% said they travel more than 6 kilometers to access wood.

## Production characteristics and labour structure

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Approximately half of all respondents reported working in groups to gather wood for charcoal production and for sale as firewood. Out of the charcoal producers, 62% reported working in groups, with 20% of these hiring other people to assist in the production process. The average size of a group of employees was 4.5 and they were paid an average of 134 gourdes per day.

All respondents surveyed reported using an earthen mound to produce charcoal. There were no reports of using improved charcoal kilns, in spite of the opportunity to produce charcoal with much greater efficiency.

Respondents cited three main reasons for making charcoal:

- › **To buy food (38%)**
- › **To pay school fees (28%)**
- › **Cash for household needs (27%)**

**Photo 8.** A woman makes charcoal at La Cahouane, near Tiburon. She noted that she only makes charcoal to pay for her children's school fees and would prefer different means for making income if they were available.



Production levels were higher towards the latter part of the year, from September to December, although over half of charcoal producers reported working throughout the year.

**Figure 6.** Production levels for charcoal per period



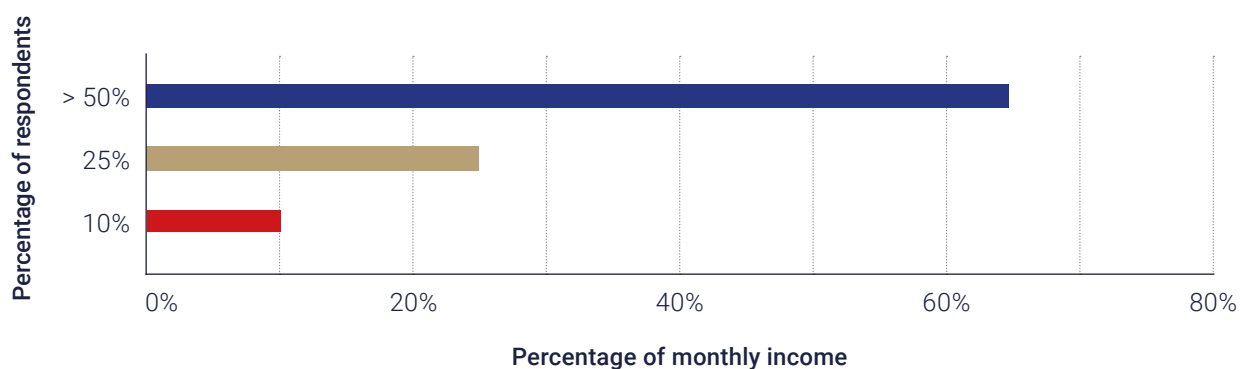
Price difference based on wood type

Overall, 82% of individuals surveyed indicated that there was no difference in the price or demand for charcoal depending on the type of wood used. Of those who did report a difference in price, however, 90% came from Île-à-Vâche. Bayhonde, campèche, mango and mangrove were listed as the most expensive and sought-after species in the markets.

## Income from charcoal production and sale

Respondents were asked to estimate what percentage of their monthly income was from charcoal production and/or sale. Results shown in Figure 5 confirm that over half of all surveyed depend on charcoal for more than half of their monthly income.

**Figure 7.** Percentage of monthly income from charcoal production and sale



## Sale and trade in charcoal

In terms of the sale of charcoal, survey results showed that on average producers sold around half of their production at local markets and half to intermediary traders. Overall, 96% of respondents sold their charcoal locally or to intermediaries, with only 4% taking it themselves to Port-au-Prince for sale. Prices were shown to be higher for traders by about 75 gourdes, though transport costs on average are around 75 gourdes as well. Who pays the transport cost depends on the individual arrangements.

**Table 6.** Average quantity and price of charcoal sold per week

	Sacs per week	Price per sac (in gourdes)
Local market	12	254
Intermediary/trader	11.6	326

Reforestation programmes

All respondents surveyed were also asked if they had ever participated in reforestation programmes before. Nearly 27% responded positively, while 73% reported that they had not. Of those who had participated, most reported that the main challenges to success were lack of follow up and care for seedlings.

Photo 9. Pétionville charcoal market, Port-au-Prince.



Photo 10. Charcoal ready for transport, South Department.



## 2. Charcoal market trends for the South Department

UNEP conducted surveys in 6 charcoal markets in Les Cayes and in 17 markets in Port-au-Prince that primarily receive charcoal from the South. The purpose of the surveys was to attempt an estimate of the amount of charcoal received by each of these markets on a weekly basis and to better understand the socioeconomic aspects of the supply chains. It should be noted that individual sellers or traders in each market were interviewed, meaning that the surveying technique was limited in its ability to give a precise figure for the total amount of charcoal received. However, the information provided by the surveys gives a much clearer idea of the overall supply chain.

### Les Cayes

Market surveys were conducted in 6 markets in Les Cayes to determine the origin of the charcoal and to estimate of the volume received on a weekly basis. Additional surveys with individual “marchands”, or charcoal sellers, were also conducted to better understand the socioeconomic aspects of the charcoal supply chain.

#### Overall market trends

The market surveys sought to determine the source of charcoal in each market, the quantity delivered per week and the buying and selling prices of the sacs.

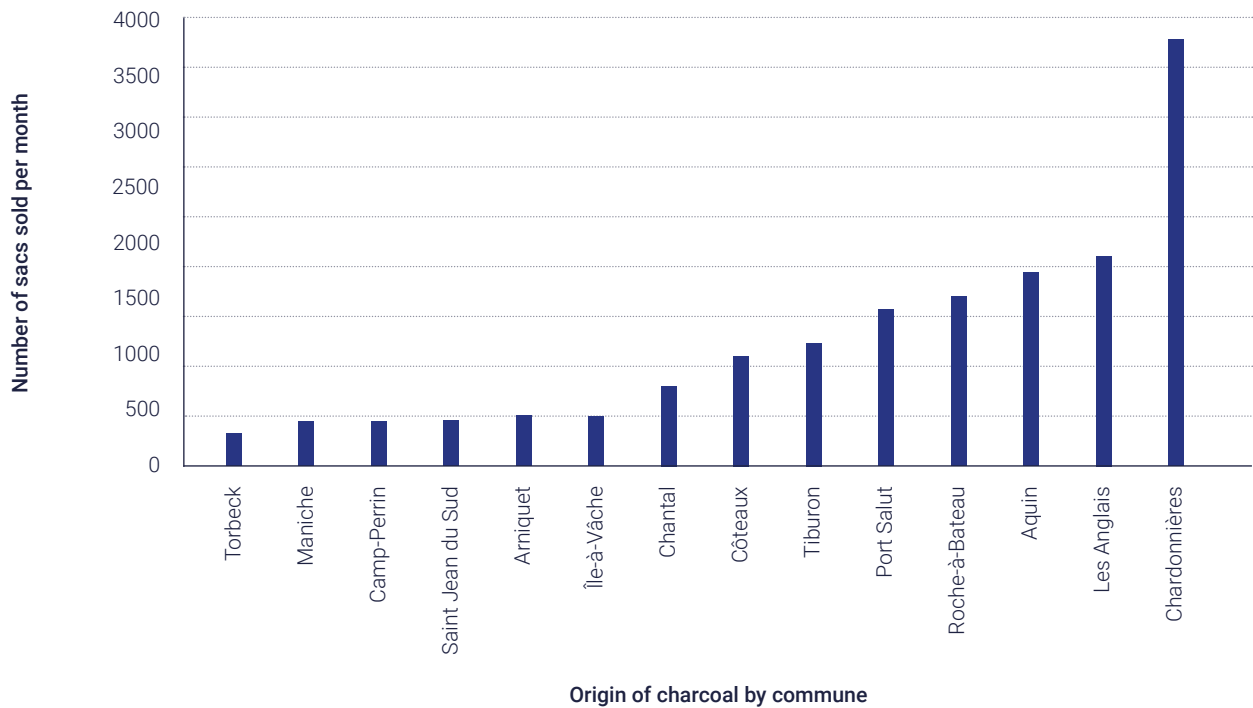
**Table 7.** *Origin of wood for charcoal and firewood production*

	Charcoal	Firewood
<b>From own land</b>	47%	66%
<b>Buys wood</b>	22%	20%
<b>Uses wood from own land and supplements by buying</b>	23%	6%
<b>Pays to harvest wood from others’ land</b>	8%	8%



Buying prices in these markets were consistently cited at 400 gourdes per sac, with a selling price of 500 gourdes per sac. Charcoal sold for transport to Port-au-Prince was sold for a higher price of between 600-650 gourdes per sac. It was noted in half of the markets that these prices were subject to change depending on current market price trends.

**Figure 8.** Volume of charcoal sold in markets in Les Cayes

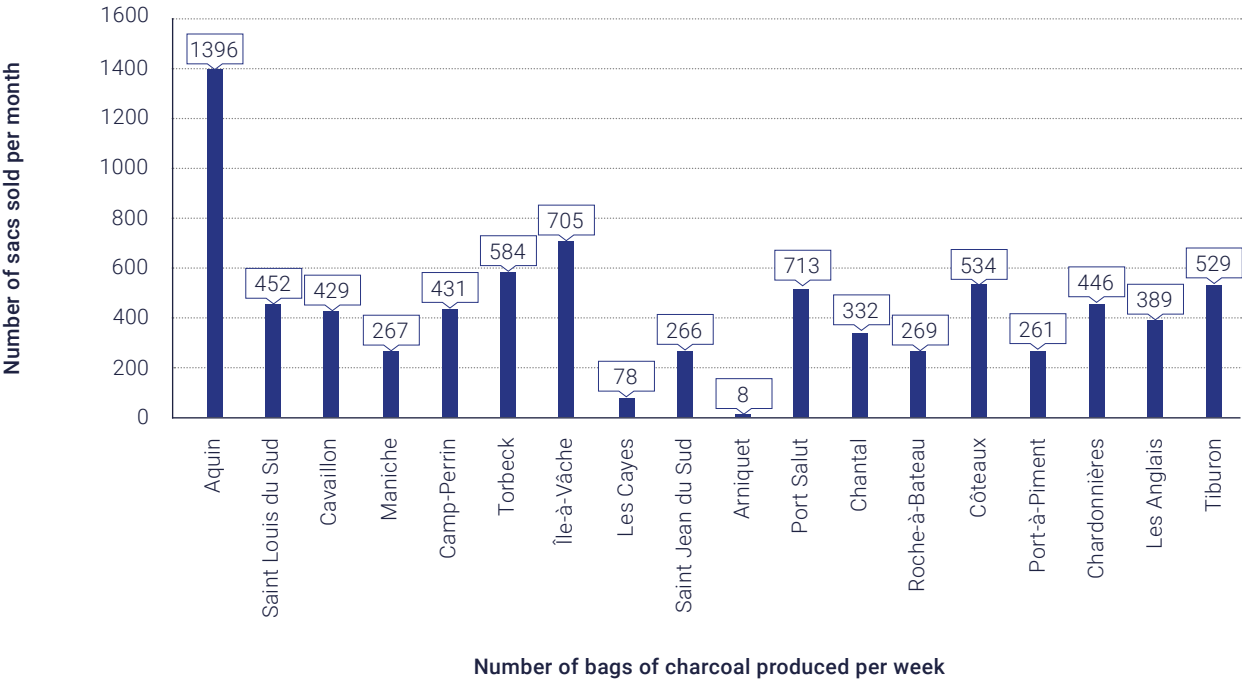


The survey results from the Les Cayes markets suggest that most of the charcoal produced in the South Department comes from the western portion extending from Tiburon to Port Salut. Of the large volume of charcoal coming from Chardonnières, 63% comes from the 1<sup>ère</sup> section of Randel.

These numbers correspond roughly with the results of the charcoal surveys as well, where over 40% of the charcoal volumes produced also originated from the western portion of the South Department (from Port Salut to Tiburon).

UNEP also conducted surveys with charcoal sellers, or marchands, in multiple markets around Les Cayes. Both male and female marchands in the Les Cayes markets reported having to pay a fee of 25 gourdes per day for keeping the market area clean. They reported no government assistance or intervention in the workings of the market. If there are problems, they report them to the police. On average, they make around 100 gourdes per sac of charcoal that they sell, or more if the sacs are broken down and sold in smaller quantities (marmites). The most difficult aspects of the job were reported to be the health and hygiene impacts from the charcoal dust.

**Figure 9.** Production volume of charcoal per commune in the South Department



**Port-au-Prince**

Market surveys were conducted in 14 markets in areas of Port-au-Prince that primarily receive charcoal from the southern peninsula. These surveys included interviews with charcoal traders who purchase larger volumes of charcoal and then resell to other traders and depot owners. The charcoal is then further sold to specific markets in neighbourhoods of Port-au-Prince, where the prices can vary depending on the demand and affluence of the area. This supply chain is described in greater detail through the informational graphics in Annex B.

Overall market trends

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The market surveys sought to determine the source of charcoal in each market, the quantity delivered per week and the buying and selling prices of the sacs. Overall, the revenues realized from the charcoal value chain rise significantly once the sacs reach the urban areas of Port-au-Prince. For example, most sacs surveyed are bought in rural areas of the South for an average price of 250 gourdes and sold for a profit of 190 gourdes on average. The buyer of the charcoal in Port-au-Prince, often the owner or manager of a depot, will also pay the transport costs. The full results of the Port-au-Prince market surveys are available in Annex C.

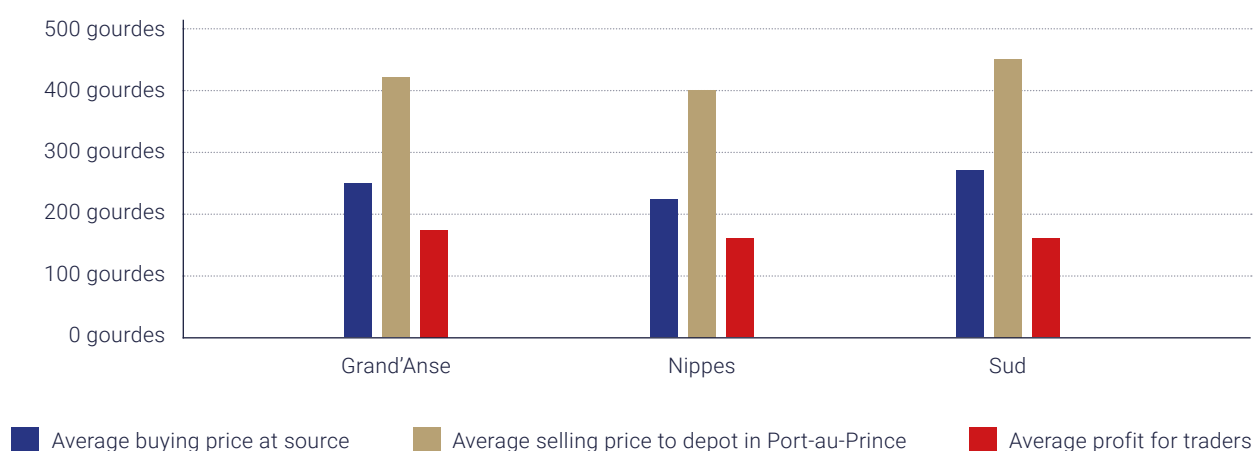
**Table 8.** Excerpt of survey results of the economics of buying and selling of charcoal from the southern departments in Port-au-Prince (gourdes per sac)

Source of charcoal	Buying price by trader	Selling price by trader	Transport cost (paid by buyer)	Profit earned by trader
Petit-Trou-de-Nippes, Nippes	200	450	75	250
Cavaillon, Sud	300	470	50	170
Beaumont, Grand'Anse	250	400	150	150

According to the UNEP surveys, each buyer is receiving between 2-3 truckloads of charcoal per week. Each truck contains 150-200 bags of charcoal. While the trader is earning on average 170 gourdes per sac traded, at a rate of 3 truckloads per week the trader can potentially earn a maximum of 75,000 – 105,000 gourdes per week, or between US\$1,250 and US\$1,750 per week. Pricing can vary somewhat depending on the bags' size. Charcoal bags are typically made in 1 of 3 sizes:

- › **Gwo sak** – a doubled bag of charcoal made by sewing two long bags together vertically, higher transport cost and typically sold in markets in wealthier urban areas; sells for 2,000 gourdes in Port-au-Prince
- › **Sak nomal** – a single long bag of charcoal, often transported for the same price as the smaller “sak farin”, therefore is preferred for road transport; sells for between 1,000-1,500 gourdes in Port-au-Prince
- › **Ti sak farin** – a flour bag filled with charcoal, typically marketed in poorer areas and also preferred for sea transport; sells for 800-1,000 gourdes in Port-au-Prince

**Figure 10.** Average buying, selling and earnings of charcoal traders operating between the southern departments of Haiti and Port-au-Prince markets per sac



### **3. Cleaners and bakeries**

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The UNEP survey covered 50 of the 85 bakeries located in the South Department. The total number of cleaners is unknown and only 4 could be sampled in the zones where the survey teams travelled.

#### Cleaners

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The cleaners surveyed reported using exclusively firewood as an energy source. They did not report any preference for the type of wood used. On average, they treated 140 articles of clothing per week and operated 3-4 days per week.

All cleaners surveyed received wood by the truckload (1 load per week) and paid 800 gourdes per load. All reported to be interested in changing their energy source but cited cost, lack of information and need for different equipment as barriers. They also noted that procuring wood was sometimes difficult, especially during the rainy season and that it was dirty to burn and difficult to work with.

#### Bakeries

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Of the 50 bakeries surveyed in the South Department, 1 reported using electricity and 3 used LPG as an energy source, all located in Aquin. The bakery using electricity reported using 6 sacs of flour per week and paying 2250 gourdes for electricity consumption. The bakeries using LPG reported using 34 kilos of LPG every 3 days. They used 3-5 sacs of flour per week for production. These 3 bakeries were all located in Fond-des-Blancs, Aquin.

#### Profile

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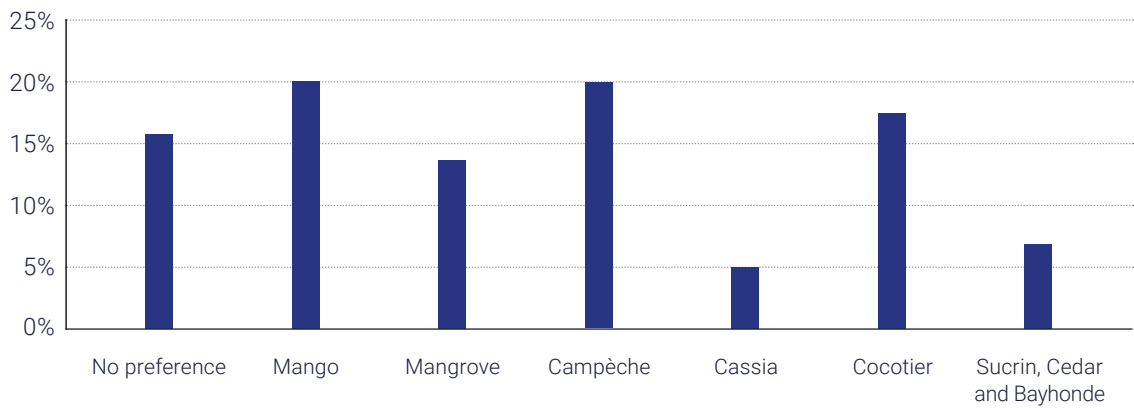
Of the bakeries surveyed, men ran 76%, and women ran 24%. On average, they used 8.4 sacs of flour per week. Bakeries in Haiti often lease their service to others, who will pay the owner to use the facility and may also supply their own firewood and will pay a lower fee to the bakery owner if this is the case. Approximately 74% of the bakeries operate with this service system, providing services to an average of 6 people. Payments to use the service of a bakery were 77 gourdes per sac of flour consumed, on average.

#### Energy source

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Firewood was reported as the main energy source for 92% of all bakeries surveyed. The wood was obtained from the local market (18%) or from direct purveyors (45%) or a combination of both (8%). Approximately 18% of bakery owners cut their own wood and 11% used a combination of their own wood and that of purveyors.

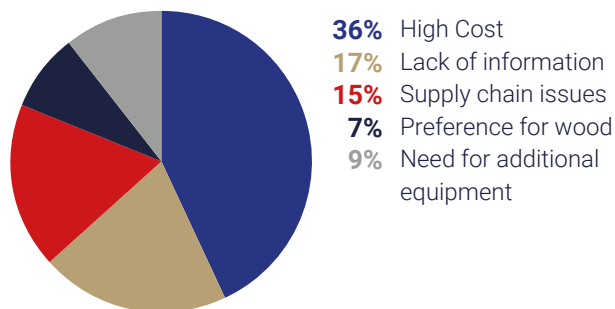
**Figure 11.** Wood preferences by bakery owners



Results show that cocotier wood is largely preferred in Arniquet, whereas mango and mangrove wood are preferred Île-à-Vâche and Tiburon.

### Energy supply and sourcing

**Figure 12.** Challenges to changing energy source for bakeries



Firewood is sold in bundles called “douzaines”. On average, bakeries used 8.6 douzaines of wood per week and paid 66 gourdes per douzaine, meaning that roughly 1 douzaine is required to bake 1 sac of flour’s worth of bread.

Survey results show that 35% of bakery owners using firewood experience supply issues and that 74% are interested in changing to another energy source. High cost was cited as the major barrier to making such a change.

### Motivations to change energy source

Of the bakeries surveyed, 87% reported that they would be interested in participating in a programme to change their energy source. Respondents noted that it was tiring and difficult to procure wood and that it became especially difficult during the rainy season. They also cited health concerns, noting that wood was dirty to work with due to the dust and smoke fumes. Several people also cited the need for a more economical energy source if they were to keep running their businesses successfully. One respondent in Chardonnières reported a desire to link to the Côteaux (CEAC – Cooperative Électrique de l’Arrondissement de Côteaux) electric grid once it was functional.



## Section E: Analysis of alternative interventions

UNEP assessed several alternative interventions that could be employed to address the main challenges identified related to forest energy in the South Department. These interventions were assessed based upon previous experiences in the South Department and elsewhere, economic viability and potential to reduce pressure on intact forest resources in the South Department. Each of these interventions is assessed in its value as a system to be implemented in and of itself, as well as its potential to complement existing and future efforts.

### **Energy plantations/fuel-wood forests**

Fuel-wood forests are based on the principle of a rotating system for harvesting wood from trees with the purpose of making charcoal, construction poles or other wood-based products. Typically, fast-growing tree species are planted and allowed to mature for approximately 3 years, depending on the species, after which point parts of the trees can be harvested on a yearly or bi-yearly basis. By planting trees for this purpose, individuals and families are able to accumulate an important form of capital (for example, wood for construction and/or charcoal) that they can rely on for regular income or as a reserve for large or unexpected events (such as illnesses, hospitalizations, funerals, etc.).

There are several strong examples of fuel-wood forests in Haiti that have been operating for over 20 years. One of these is in the Maniche area of the South Department, and another in Desarmes. Only the Maniche project was visited for this evaluation, however a “lessons-learned” visit to Desarmes is recommended in the case that this intervention option moves forward. These projects both provide substantial lessons learned that could be expanded upon as a solid intervention option for the South Department.

## Project site: Maniche-Cavaillon, South Department

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### **Lead organisation: OREB/ORE and OPSALMADJ**

The UNEP team visited fuel-wood forest projects in July 2014 in Maniche and Cavaillon, South Department. These projects were started by two local NGOs, Organisation Plante Sainte-Hélène Lamore-MadikSouch-Zantizat (OPSALMADJ) and Organisation pour la Rehabilitation de Bouffard (OREB) in the mid-1990's through funding support from the Pan American Development Fund. The project consisted of the establishment of nurseries for seedlings, the distribution of seedlings and training for farmers, as well as technical support. They reached several hundred participants, though funding ended after several years. Since then, many of the trees planted have remained in use as part of fuel-wood systems and the success of the project has motivated the original participants and members of their communities to continue using the approach. Currently, OREB and OPSALMADJ continue to work with farmers, though they are unable to produce new seedlings without further funding resources.

In some cases, the fuel-wood forests were also implemented in conjunction with agricultural systems. At one site visited in Maniche (2<sup>ème</sup> section), fuel-wood trees were intercropped with pineapple and rows were hedged with rows of manioc to diversify production. In the surrounding area, representatives of the NGO pointed to steep slopes where fuel-wood forests were ideal to cope with soil erosion as an alternative to tilling and agriculture.

Both projects have resulted in several hundred fuel-wood forest producers, though the exact number is not known. Some own as much as one carreau (1.3 hectares) of forest, others less. The species typically planted are acacia and cassia trees, which are fast growing and good for both construction and charcoal production. Most plots have already been harvested multiple times. Charcoal production observed during UNEP's visit was done using typical earthen-mound kilns. Those interviewed reported only making charcoal from their "gardens" or fuel-wood forests, thus suggesting that the project is successful in reducing pressure on additional or existing forest resources in the area.

Opportunities for improvement in kiln technologies, better organization amongst charcoal producers for regular production at improved prices (all charcoal is sold to middle-men who then transport it to Les Cayes or other large markets to re-sell) and improved intercropping techniques with shade-friendly crops, such as cacao, could increase the success of this project and build upon its sturdy base of long-term results. UNEP's interest in supporting the next phase of this project can provide a positive demonstration for the implementation of fuel-wood forests in other areas of the South Department, as well as an opportunity to take the project to the next level in terms of efficiency and diversification of production.

The estimated cost of the project in Maniche per participant is not known, but estimates can be made based upon UNEP's reforestation experience in the South Department. Building on the experience of OREB in Maniche, similar strategies to establish fuel wood forests could be applied throughout the South Department, with a focus on steep slopes and watersheds where soil erosion and disaster risk are particularly high. This can be accomplished through a programme including training in tree maintenance and branch harvesting, establishment of tree nurseries for seedlings of fast growing species and regular follow up through community committees established as part of decentralized governance within the communes of the South Department.



**Photo 11.** Victor Moïse, president of the Organisation pour la Rehabilitation de Bouffard, leads the 70+ members of his organization in regular meetings to organize and augment the production of fuel-wood forests in their communities. He notes that the wood production techniques employed bring direct benefits to the members of the association, thereby motivating them to continue the regular sustainable harvesting techniques.





*Photo 12-13. A member of OREB prepares wood from his lot after harvesting to make charcoal. Improved kilns could help these efforts to produce charcoal more efficiently and increase the energetic benefits from equal volumes of wood.*





## Section F: Conclusions and recommendations

The analysis from this report shows that while the wood energy sector is a source of intense pressure on fragile and important ecosystems in the South Department, it also plays a key role in addressing the economic needs of rural populations. To ensure success, interventions need to work within this existing economic structure, while at the same time targeting sensitive ecosystems in order to reduce pressure on them.

Analysis of past experiences and decades of reforestation attempts in Haiti shows that interventions will only be successful where there is a strong incentive for local populations to ensure the survival of seedlings and continuous tree-cover in the intervention area. The increasing demand for charcoal, spurred by growing urban populations, constitutes both a threat and an opportunity for reforestation in this regard.

The production of charcoal via sustainably managed fuel-wood plots can both reduce pressure on natural forests (both coastal and along upper watersheds) and ensure regular economic benefits for local populations. Such initiatives have demonstrated success in the South Department before and show strong potential for scale up and application in other areas.

Based on the findings of this report, UNEP recommends the following:

### **1. Support and scale-up existing sustainable charcoal initiatives in the Macaya National Park buffer zone with improved kiln technologies and capacity building.**

In cooperation with the Macaya Park Management Bureau, UNEP should seek to improve existing initiatives for the sustainable management of wood lots to include improved kiln technologies. This can ensure greater energy efficiency for the charcoal production process and further develop the sustainable charcoal supply chain in existing areas. In addition, support for improved management capacities of the wood lot associations should be completed to integrate a geo-referencing system for their members with the goal of developing a traceable charcoal value chain that can be marketed to target sustainably-minded consumers in Haiti's urban areas.

Specifically, the existing wood energy initiative of OREB/ORE can be improved through the following:

- › Training in usage of improved charcoal kilns for greater energy efficiency in the charcoal production process (technical assessment for kiln design based on local materials needed)
- › Support expertise to increase intercropping of agroforestry and horticultural crops to boost agricultural production (with ORE)
- › Improve organization amongst charcoal producers to increase market power and revenues
- › Track all planted areas with GPS monitoring systems and provide training to establish record logs of production levels for monitoring purposes. Use this to model and predict production levels and to experiment with techniques to maximize productivity and output

## **2. Support the reforestation of fast growing tree species as part of a sustainable charcoal production system.**

Based on the experiences of UNEP's partners, short and medium-term support for the establishment of wood-energy lots for charcoal production should be provided to partners with proven track records in this field of work (ORE/OREB). Such support should include i) demonstration plots and training for participants on growing, planting and ensuring the survival of seedlings; ii) trainings for participants on how to maintain sustainable rotating harvest systems for new wood lots; and iii) improved kiln technology for charcoal production. These activities should be realized and supported in the short-term (1-2 years) with a joint monitoring system established through the Ministries of Agriculture and Environment to ensure continuity and the development of a traceability system for the value chain in the medium-term (3-5 years).

## **3. Target critical ecosystems with wood lots to reduce pressure on protected areas and fragile environments.**

New wood lots should be established around sensitive ecosystems currently threatened by wood harvesting for charcoal production. Sensitive ecosystems include mangroves such as La Cahouane, Pointe Abacou and Aquin, as well as critical watersheds suffering from high deforestation rates and soil erosion in the Macaya Park buffer zone, such as Port-à-Piment and Randel.

Since most of the critical ecosystems are part of the protected areas network in the South Department, sensitization and engagement of local communities and authorities for the establishment and development of wood lots should be done in conjunction with the development of management plans for these areas. This will ensure the engagement of key government institutions and other actors and integrate the wood lots into the management of the protected areas buffer zones.

## **4. Integrate wood energy value chains into the Regional Sustainable Development Plan for the Grand Sud.**

UNEP's support to the Inter-ministerial Committee on Land Management (CIAT) for the development of a Regional Sustainable Development Plan for the Grand Sud should include the elaboration of a strategy for wood energy value chains as part of regional economic development for the area in and around the Macaya Park buffer zone and other sensitive coastal ecosystems. In conjunction with the CIAT, this strategy should be developed through the Macaya Park Management Bureau's focal point on agricultural value chain development for any interventions in the Park's buffer zones, as well as MDE, MARNDR and partners for interventions in and around the coastal and marine protected areas.



## Annex A. Methodology

### **Surveys of charcoal producers, bakeries and cleaners**

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The survey was conducted using a random sampling of charcoal producers and market vendors throughout the South Department. The group of 12 students from the American University of the Caribbean in Les Cayes were divided up into groups of 2 and each assigned several communes to cover. The communes were assigned based on their size and logistical feasibility of travel in between.

The individuals in the teams were paired to ensure that one member was from one of the communes being covered to provide local knowledge and another who had previous experience with surveying techniques. Two trainings on surveying techniques were given and 5 practice sessions on conducting the surveys held. The groups accessed field sites using local transport and spent a total of 8 days surveying charcoal producers, bakeries and cleaners in their assigned communes. All survey sites were recorded with GPS positioning points.

The exception to this is Île-à-Vâche, where a local person with survey experience was hired to spend 3 days traveling across the island to key areas to survey charcoal producers, due to accessibility restraints.

The bakeries and cleaners surveyed were selected at random based on the area covered by each group of students. Out of a total of 85 bakeries in the South Department, 40 were surveyed. Follow up visits and phone calls were made to the owners to glean the maximum amount of detail and to confirm responses. The UNEP team additionally visited several bakeries to confirm results and to gather additional data on various technologies being employed (including propane boilers).

### **Surveys of Les Cayes and Port-au-Prince charcoal and firewood markets**

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Two different market surveys were conducted. The first was aimed at understanding the volume of charcoal and firewood being sold and the overall supply and demand dynamics of the markets. Individual surveyors conducted these surveys in 10 markets in Les Cayes and 18 markets in Port-au-Prince. The Port-au-Prince markets selected were those that receive deliveries of charcoal largely from the southern region of Haiti. The surveyor for Port-au-Prince is a former charcoal transporter from the South with strong local knowledge of distribution networks and markets, as well as the overall charcoal trade between the South and the capital.

For the market vendor surveys, female students were paired in groups of two and spent 3 days surveying markets in Les Cayes. Female students were chosen for this task since the majority of charcoal vendors are women and are thus more likely to speak with other women.

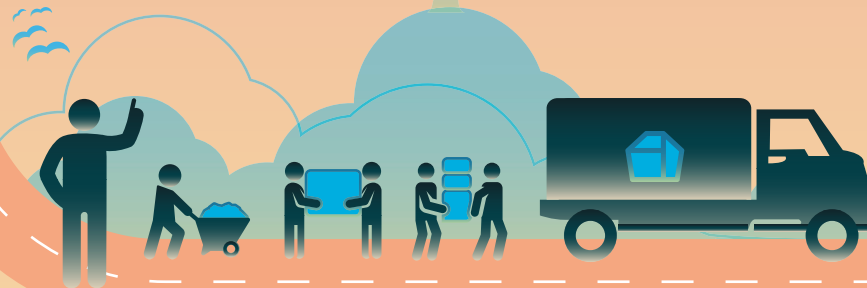
## Annex B. Charcoal supply chains

Scenario 1.  
Charcoal supply chain is controlled  
from beginning to end by 1 person

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*This group of people has been paid by the owner of a charcoal depot in Port-au-Prince to make charcoal. Since they do not own their land and the land owner lives abroad, the land manager is paid to organize them and ensure that the work is completed.*

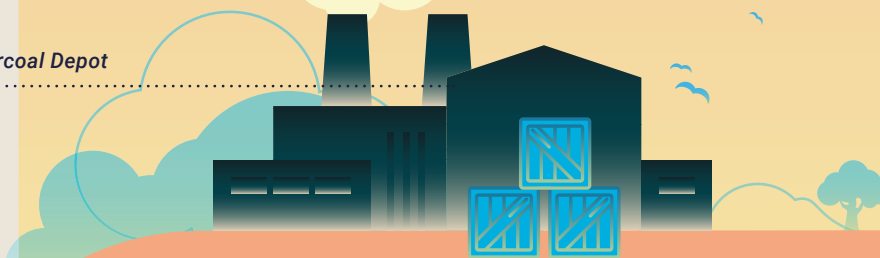
*The depot owner buys the bags of charcoal and covers the cost of transport to the depot in Port-au-Prince.*



*The charcoal is delivered to the depot and the owner re-sells the charcoal to marchands (typically women) who then sell in smaller quantities in local market.*

**Pétionville Charcoal Depot**

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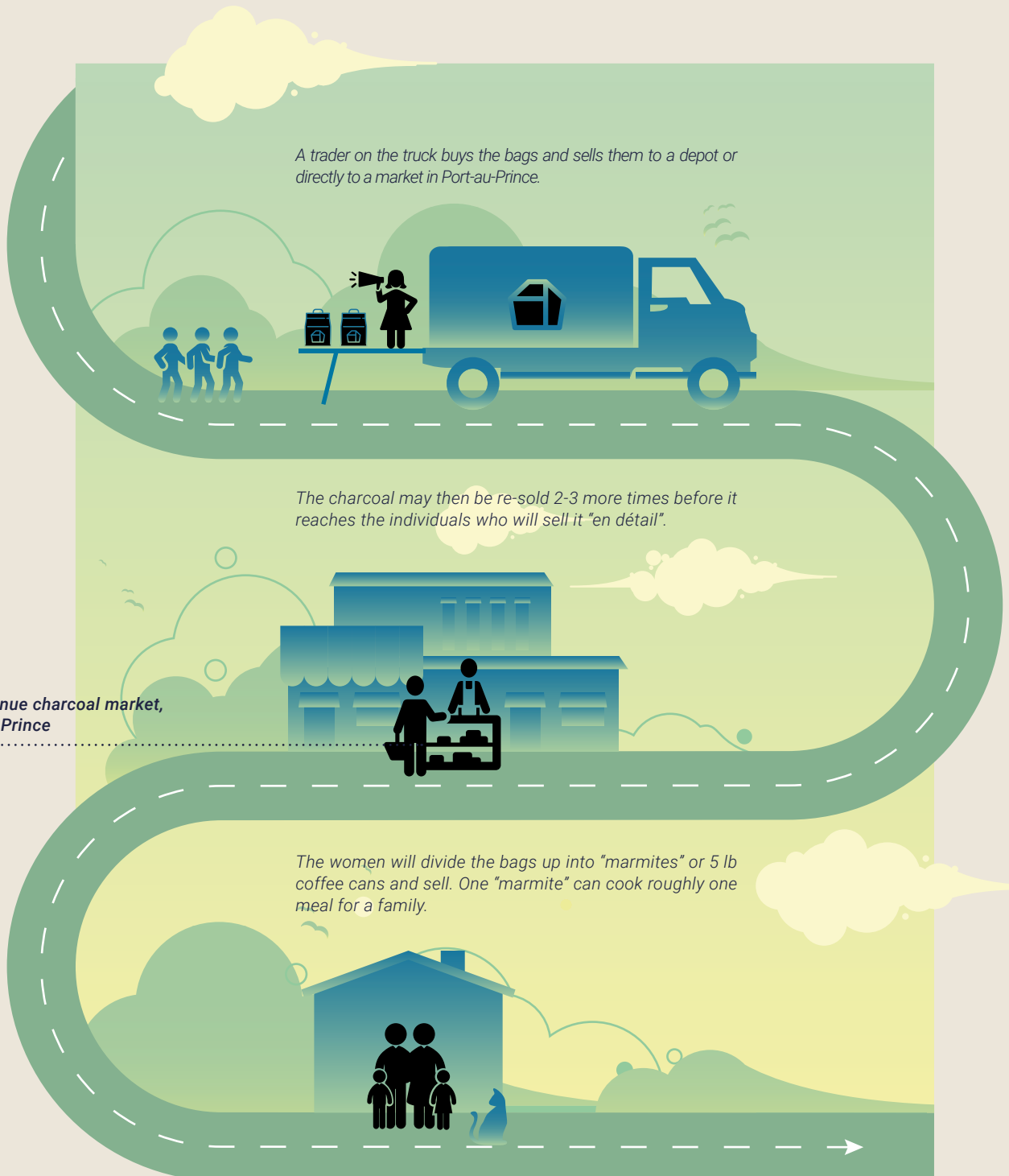


*The women will divide the bags up into "marmites" or 5 lb coffee cans and sell. One "marmite" can cook roughly one meal for a family.*



Scenario 2.  
Trader-centred charcoal supply chain

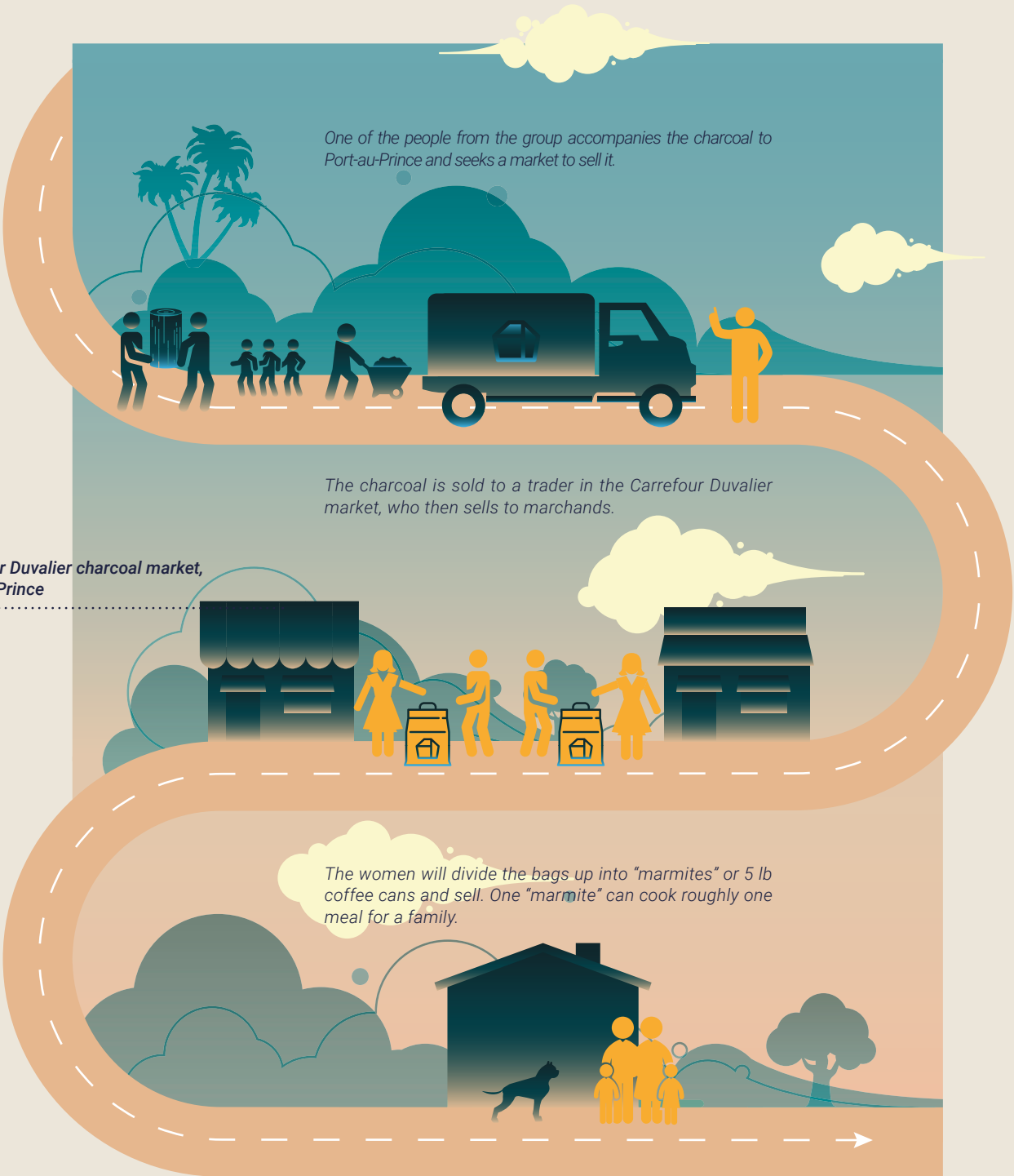
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Scenario 3.  
Self-transport and land payment  
charcoal supply chain

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*A group of people make charcoal using wood from someone else's land. They pay 4 of the 10 bags of charcoal that they make to the land owner.*



# Annexe C.

## Data analysis results

**Table 9.** Types of wood cited for charcoal production

			
Bayhonde	Sucrin	Bois cèdre	Goyavier
			
Campèche	Acacia	Chadèque	Mombin bata
			
Neem	Cassia	Cocotier	Bois blanc
			
Bois d'homme	Comma	Bois de Chaîne	Freine
			
Mango	Bois cabrit	Abricotier	Bois-de-fer
			
Mangrove	Eucalyptus	Vertiable	Dame Marie
			
Gommier	Acajou	Petit feuille	Avocatier



**Table 10.** Price structure and quantity traded per week for Les Cayes charcoal traders

Market	Source of charcoal	Quantity	
Name/ Location of market	Department	Commune	Sacs per week
Rue Antoine Simon	South Department	Ferme-LeBlanc	1700
		Randel	1300
		Les Anglais	1200
		Port Salut	1400
Croix Beausale	Grand'Anse	Beaumont	1700
		Pestel	1600
		Corail	1400
Rue Général Marion	South Department	Camp-Perrin	400
		Maniche	380
		Chantal	700
		Arniquet	450
Cabrief/Zone Brefaite	Grand'Anse/ South Department	Dame Marie	1300
		Tiburon	1100
		Anse d'Hainault	1400
		Les Irois	1000
La Côte, Rue Toussaint Louverture	South Department	Les Anglais	700
		Chardonnières	1400
		Roche-à-Bateau	1500
		Côteaux	1000
Simon Boulevard	South Department	Île-à-Vache	450
		Saint Jean du Sud	400
		Torbeck	300
Carrefour Boiser, Rue Toussaint Louverture	Grand'Anse/ South Department	Chambellan	1300
		Randel	1100
		Moron	1200

**Table 11.** Price structure and quantity traded per week for Port-au-Prince charcoal traders sourcing from the south

Market	Source of charcoal		Quantity	Transport	Price	Revenue
Name of market	Department	Commune	Truckloads per week (150-200 sacs per load)	Transport cost per sac, paid by buyer at depot (gourdes)	Buying price per sac at source Selling price per sac at depot (gourdes)	Profit earned by trader per sac (gourdes)
Carrefour - Duvalier	Nippes	Baradères	3	100	Buy: 250 Sell: 370	120
Brochette 99 (des Portes)	Nippes	Baradères	3	100	Buy: 250 Sell: 370	120
Descartes Carrefour	Nippes	Baradères	3	100	Buy: 250 Sell: 370	130
Bisontion 4	Grand'Anse	Beaumont	3	150	Buy: 250 Sell: 400	150
	Nippes	Lazile	2	100	Buy: 250 Sell: 375	125
	Nippes	Baradères	3	75	Buy: 250 Sell: 380	130
Wanely 93 Touloug (depot)	Grand'Anse	Jérémie	2	125	Buy: 250 Sell: 425	175
Carrefour Feuille	Grand'Anse	Jérémie	2	125	Buy: 250 Sell: 425	175
Nan Tinelle	Sud	Tiburou	3	75	Buy: 250 Sell: 425	175
Desdalle	Sud	Cavaillon	3	50	Buy: 300 Sell: 470	170
Soudalle	Sud	Tiburou	3	100	Buy: 225 Sell: 450	175
Ports Marchau	Grand'Anse	Les Irois	3	100	Buy: 250 Sell: 450	200
	Sud	Fond-des-Nègres	3	100	Buy: 300 Sell: 550	250
		Gros-marin	3	75		

Market	Source of charcoal		Quantity	Transport	Price	Revenue
Name of market	Department	Commune	Truckloads per week (150-200 sacs per load)	Transport cost per sac, paid by buyer at depot (gourdes)	Buying price per sac at source Selling price per sac at depot (gourdes)	Profit earned by trader per sac (gourdes)
Croix-des-Bosales	Grand'Anse	Les Irois	2	100	Buy: 250 Sell: 450	200
		Pesteles	3	100	Buy: 250 Sell: 370	120
	Sud	Les Anglais	3	100	Buy: 250 Sell: 450	200
		Côteaux	3	100	Buy: 250 Sell: 370	120
Radio Progrès	Grand'Anse	Jérémie	2	100	Buy: 250 Sell: 470	220
5 <sup>eme</sup> Avenue	Grand'Anse	Jérémie	2	100	Buy: 250 Sell: 475	225
		Beaumont	2	100	Buy: 250 Sell: 480	230
	Nippes	Baradères	3	100	Buy: 250 Sell: 450	200
4 <sup>eme</sup> Avenue	Nippes	Petit Trou	3	75	Buy: 200 Sell: 450	250
		Petite Rivière	3	75	Buy: 250 Sell: 450	200
	Nippes	L'azile	3	100	Buy: 250 Sell: 480	230
Diquini Bison 63	Nippes	Baradères	2	100	Buy: 250 Sell: 380	130



## Annex D. Bibliography

- Direction départementale du Sud du Ministère de l'Environnement, 2012.  
'Caractéristique et Diagnostique Socioéconomique. Unité hydrographique Aquin - Saint Louis du Sud'.  
Ministère de l'Environnement: Les Cayes, Haïti.
- Energy Sector Management Assistance Programme (ESMAP), 2007.  
'Strategy to Alleviate the Pressure of Fuel Demand on National Fuelwood Resources'. Technical Paper  
112/07. World Bank, Washington, D.C.
- Food and Agriculture Organization of the United Nations (FAO), 2010.  
'Global Forest Resources Assessment'. FAO, Rome.
- Lawrence Berkley National Laboratory, 2016. 'Cookstove Projects, Haiti', viewed May 2014  
(<http://cookstoves.lbl.gov/haiti.php>)
- Government of Haiti, 2014, Haiti Propane Reform Vision and Strategy conference,  
Port-au-Prince, Haiti, 25 April.
- Organization for Economic Cooperation and Development (OECD), 2005.  
'OECD Annual Report 2005, 45th Anniversary'. OECD Division of Environmental Statistics, Paris
- World Bank, 2016. 'Haiti overview', viewed July 3, 2014.  
(<http://www.worldbank.org/en/country/haiti/overview>)
- World Bank, 2016a. 'Energy use (kg of oil equivalent per capita)', Databank 2004-2008, viewed May 16, 2014.  
(<http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE/countries>)
- World Health Organization (WHO), 2014. 'Haiti: Mortality Country Fact Sheet'.  
WHO and UN Partners, Geneva
- Anon., 2014, RechoPa'w: Improved Cooking Technology Program.  
Interview with A. Stork on 17 April, Haiti.



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# Haiti

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South Department  
Forest Energy  
Supply Chains

UNEP Haiti, September 2016



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