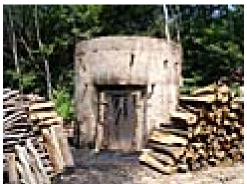
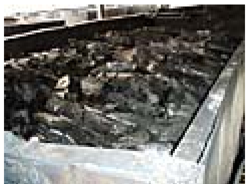
TCP/CRO/3101 (A) Development of a sustainable charcoal industry

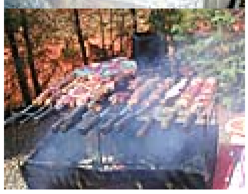
MARKET STUDY
CHARCOAL IN CROATIA

June 2008
Zagreb, Croatia







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TCP/CRO/3101 (A) Development of a sustainable charcoal industry

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Production:
North-West Croatia Regional Energy Agency

This project was launched in July 2006 within FAO Technical Cooperation Programme withthe objective to assess the current status of the charcoal production in Croatia, in order to develop a programme for the revitalisation of this industry.
Apart from recommendations and best solutions for the technological modernisation, the programme will provide guidelines for the production improvement and amplification with a holistic approach.
Ministry of Agriculture, Forestry and Water management is responsible for the project execution on behalf of the Government of the Republic of Croatia.

MARKET STUDY
CHARCOAL IN CROATIA

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EXECUTIVE SUMMARY

Charcoal is by far the most important processed biomass fuel in Croatia and it is used mainly as a luxury fuel for barbeque, both as simple charcoal and in a densified form of charcoal briquettes. It is also an important subject of export/import activities of Croatian companies. However, according to the market surveys conducted in July 2002, the total annual charcoal production of Croatia has been reducing progressively over the last decade. The reason for this reduction has been explained as loss of market competitiveness.

The single industrial charcoal producer in Croatia is located in Belišće, eastern Croatia. There are also several small to medium charcoal producers in Croatia that practice less modern production techniques. All producers apart from Belišće have old facilities and equipments which are not efficient enough and are lowering their competitiveness in both input (wood) and output (charcoal) markets on national and international scale due to rapidly increasing demand for biomass.

The main objective of this study is to identify the most promising opportunities for sustainable development of charcoal industry in Croatia. Specific aims are :

- To review and evaluate existing studies that address economic, financial and market aspects of charcoal industry in Croatia;
- To study, analyze, examine and evaluate the costs of raw materials, production costs and prices for charcoal on national markets;
- To determine market opportunities for increased charcoal consumption at national level;
- To identify areas of project with potential investment opportunities.

In regard to potential feedstock for charcoal production, a rough estimation of the total available quantities of wood waste and wood residues in Croatia gives the amount of 1 000 000 tonnes per year, of which approximately 50 to 60 percent is hardwood suitable for charcoal production. However, over the past years, and especially in 2006, there is a rather fast raise of interest in this type of biomass provoking harsh competition for the available quantities, both domestic and abroad. Hence at present, the biggest challenge for a sustainable charcoal production in Croatia is the raw material price competition with biomass heating plants in Hungary, other EU countires like Austria and Italy as well as Croatia.

Looking at investment opportunities for new and existing charcoal producers, the following options were identified:

- grill (charcoal) briquettes production;
- new industrial charcoal production facility

The first option could be an interesting addition for existing small charcoal producers, which is confirmed by the experience of Šumooprema Ltd., while the second could be interesting to existing large charcoal producers both in Croatia, i.e. Belišće, and abroad.

A particular problem for the charcoal industry lies in the fact that currently charcoal quality standards in Croatia are not established through legislative acts and standards. This results in poor quality control and consequently, relatively large variation in the quality of charcoal placed on the national market. Consequently, an important recommendation which should be drawn from this study is to introduce and enforce quality EU standards regarding barbecue charcoal and related products which could be a short-term follow up activity of this TCP project.

Other recommendations should address problems of placing charcoal on domestic and international market and include:

- Introduction of *Croatian quality charcoal* brand;
- Forming a cluster of small and medium producers who can not ensure sufficient quantities to make a market impact alone.

1 INTRODUCTION

Forests cover 36 percent of Croatian territory on which resources dominantly depends a well established national wood and wood processing industry. Both forest and wood processing industry represent a solid base for the development of woody biomass utilization as a complimentary business activity with added value of being environmentaly friendly and and locally available source of renewable energy. Althought there is potential to develop utilization of other types of biomass in Croatia, this study focuses on possibility of wooden charcoal production as a luxurious type of biomass in stead of dealing with primary energy concern.

According to the market surveys, conducted in July 2002, the total annual charcoal production of Croatia has been reducing progressively over the last decade. The reason for this reduction has been explained as loss of market competitiveness.This study has been commissioned by the FAO Project *Development of a sustainable charcoal industry*, under its TCP programme, with an aim to identify the most promising opportunities for future charcoal production in Croatia.

The study has been carried out by a team of experts from Energy Institute Hrvoje Pozar with the help of Dr Roland Siemons, international consultant provided by FAO project. Inputs of data and information from other Croatian institutions and charcoal producers and traders are gratefully acknowledged and referenced.

1.1 OBJECTIVES

The main objective of this study is to identify the most promising opportunities for sustainable development of charcoal industry in Croatia. Specific aims are :

- To review and evaluate existing studies that address economic, financial and market aspects of charcoal industry in Croatia;
- To study, analyze, examine and evaluate the costs of raw materials, production costs and prices for charcoal on national markets;
- To determine market opportunities for increased charcoal consumption at national level;
- To identify areas of project with potential investment opportunities.

1.2 SCOPE

The single industrial charcoal producer in Croatia is located in Belišće, eastern Croatia. There are also several small to medium charcoal producers in Croatia that practice less modern production techniques. Namely, all producers apart from

Belišće have old facilities and equipments which are not efficient enough and, thus, require renovation and modernization in order become competitive with other international vendors.

Croatia also has around 10 small and medium scal and 400 very small-scale charcoal producers scattered in forest areas. Those producers are responsible for around half of the national charcoal production (approximately 3.000 tonnes per year). Small-scale charcoal production generates directly approximately 800 jobs for people living in and around forests. The production techniques involve low productivity carbonisation in traditional charcoal pits, mounds and kilns and represents health hazard for the workers involved.

Outdated technology of charcoal production and low conversion efficiency of wood to charcoal is forcing both small and large-scale charcoal producers out from the market. They are losing competitiveness in both input (wood) and output (charcoal) markets on national and international scale due to rapidly increasing demand for biomass. The consequences are reduced incomes for people involved in this industry and increased number of unemployment in rural areas.

Charcoal is an internationally traded good in Croaita. The main export markets for charcoal are Switzerland and other European Union countries such as Italy and Slovenia while the import countries are dominantly Bosnia and Herzegovina and Serbia.

1.3 METHODOLOGY

The Croatian Central Bureau of Statistics provided overall data on the charcoal production. However, the data gave little comprehensive information about the extent of the charcoal consumption in Croaita or export and import. Even more, the production data on charcoal were inconsistent since there are many non-registered producers. Gathering of information continued with site visits to all major producers, retail survey, through telephone enquiries with charcoal producers and traders and exchange of information with Ministry of Agriculture and Forestry, Croatian Customs Office, Croatian Chamber of Economy and other relevant institutions in order to get as closes outlook of charcoal production in Croatia as possible.

Information covering all aspects regarding charcoal production, consumption and trade was collected from from July 2006 to January 2007.

1.4 STRUCTURE OF THE REPORT

The report delivers the collected information on charcoal market in Croatia in a systematic manner so that the Chapter 2 is focusing on charcoal production with detailed overview of all existing producers, produced quantities and type of technology used. Chapter 3 gives resource availiability analysis including raw materials costs and charcoal prices while the Chapter 4 continues with market and investment opportunities which include quality standards and indication of legal and investment frameworks. Chapter 5 describes international trade of charcoal with detailed overview of 2005 and 2006 data. Conclusions and recommendations are presented in chapter 6.

2 CHARCOAL PRODUCTION IN CROATIA

Charcoal is by far the most important processed biomass fuel in Croatia. To the difference in the developing countries, in Croatia, charcoal is used as a luxury energy input (barbeque) both as simple charcoal and in a densified form of charcoal briquettes. It is also an important subject of export/import activities of Croatian companies. The official records recognize only one major charcoal producer located in Belišće, eastern Croatia, which uses retort technology for production. Other sources of information show that there are several more medium and small charcoal producers in Croatia (Table 1). They use traditional earth kilns and improved clay kilns production methods, which result in lower conversion efficiency as well as pollution due to the emission of unburnt gasses. A large number of very small private and non-registered producers (approximately 400), located in the area of Zagorje, Kalnik and Našice, produce charcoal in traditional charcoal pits utilising mud for insulation (Map 1) They achieve very low efficiences and sometimes represent a serious problem for the environment.

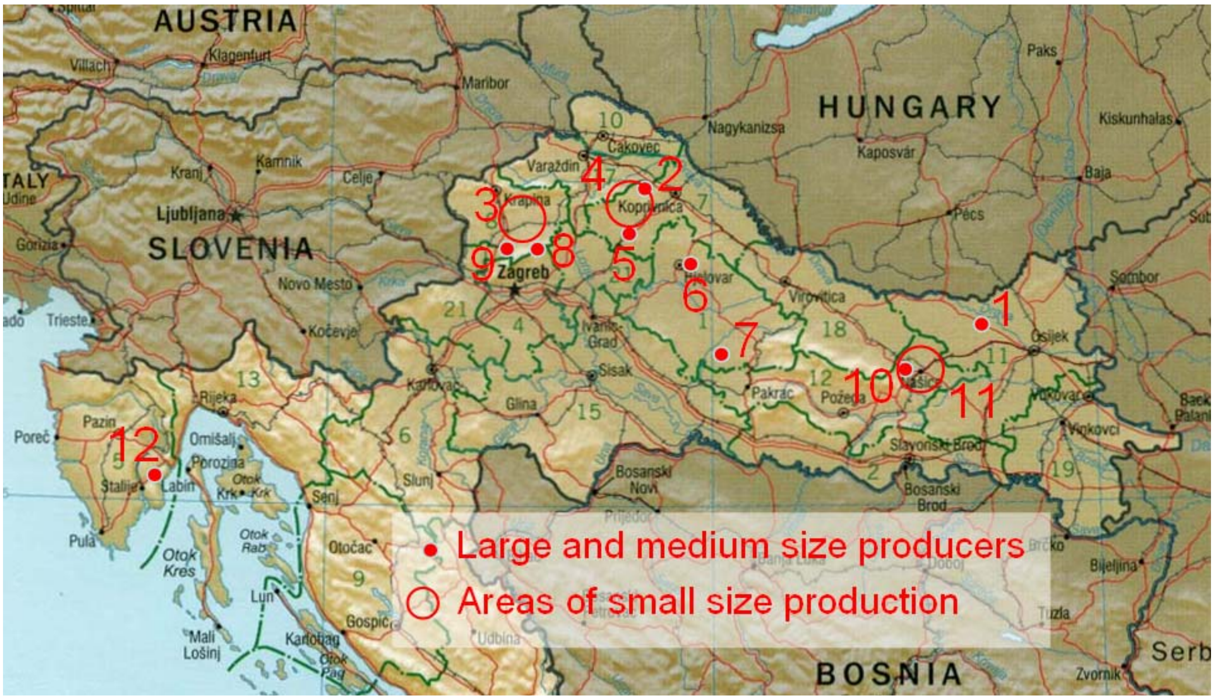
***Table 1** Active producers, location and annual production of charcoal and grill briquettes in 2006*

No	Producer	Location/Area	Charcoal (t)	Grill briquettes (t)
1	Belišće d.d.	Belišće	3 000	1 120
2	Sumooprema d.o.o.	Duga Rijeka	200	150
3	Small producers	Zagorje	25	0
4	Small producers	Kalnik (Apatovec)	800	0
5	Krizevci-produkt d.o.o. and local small producers	Krizevci	515	0
6	Ekoprom d.o.o.	Sv. Ivan Žabno	300	0
7	Žega d.o.o.	Bjelovar	15	0
8	Hormar d.o.o.	Garesnica	400	0
9	Trgostil d.o.o.	Donja Stubica	50	0
10	Obrt Franc	Kraljev vrh, Jakovlje	30	0
11	Poljosum d.o.o.	Nasice	100	0
12	Small producers	Nasice area	300-400	0
13	Obrt Startuk	Cerovlje	150-300	0
14	Small producers	Majar (Đakovo)	100	
	TOTAL		**5 985 - 6 235**	**1 270**

Source: Croatian Chamber of Economy
EIHP own field research
Ministry of Agriculture, Forestry and Water Management
Economy departments in various Croatian counties and municipalities

The only industrial charcoal producer, **Belišće - Wood Processing Factory**, produces charcoal of homogeneous quality and in continuous quantity that enables better positioning in the domestic and foreign markets which is reflected in coverage of more than 50 percent of domestic charcoal market and ability to sell the product at price 10 to 15 percent higher than the competition.

Nevertheless, it should be mentioned that the Belišće group (established in 1884) is a regional company with factories in Slovenia and Macedonia (FYR). Belišće group is engaged in a wide array of business activities and charcoal production represents only a minor production unit among the rather diversified bundle of products (production of spiral and plastic containers, electrical equipment, primary and final wood processing and dry wood distillation plant) whereas the company's core business is the production of packaging paper and corrugated board boxes. In 2006, Belišće group had 1 538 employees among whom there is a high share of educated and skilled employees (Belišće, 2007).



Map 1 *Charcoal production sites (areas)*

Charcoal production in Belišće

Out of the total number, 26 employees are working full time in the charcoal production line and 10 employees in grill briquettes production (Dry distillation unit within Wood processing factory). The production season starts at the beginning of March and ends in mid December, with the other two and a half months being reserved for maintenance and cleaning operations. The typical charcoal monthly production ranges from 300 to 340 tonnes, which results in total yearly production of approximately 3 000 tonnes. The maximum production capacity is limited to 3 600 tonnes per year, which can additionally be increased to 4 200 tonnes if only wood logs are used as feedstock. The costs of labour and utilities are represented as general costs distributed according to the company's practice over all production units and they do not reflect the actual cost of charcoal production. Similarly, storage, marketing and distribution of charcoal are undertaken through well established sales infrastructure of other products. Packaging is supplied from the sister factory which also reduces the charcoal production cost for Belišće (Vuksanić, 2006).

Belišće is also the major producer of grill briquettes in Croatia. About half of the charcoal dust which is utilised for briquettes production comes from its own charcoal production and the rest is either procurred from other domestic charcoal producers or, more often, from neighbouring countries. Maximum capacity for grill briquettes production is limited to 1 150 tonnes per year. The factory sustains its briquette production above 95 percent of the full capacity with an average of 1 120 tonnes. The limiting factor for further expansion of briquettes production is the capacity of briquette driers.

Other charcoal producers

Other registered charcoal producers in Croatia produce in kilns or, in some instances, in pits with carbonisation efficiency varying from 5 to 15 percent. Kilns are made mostly out of bricks or concrete with an average capacity of 5 tonn per production process that lasts 15 days. One of the small-scale producers had improved the kiln with its personal design so that the production process is shortened to 3 days of carbonisation and 3 days of cooling. Storage capacities are seldom at non-registered producers while the registered producers are storing charcoal together with other goods that they deal with. The quality varies as well as the production quantities that are more or less of seasonal character. According to small charcoal producers, charcoal production is perceived as a good additional income from secondary business activity of a rural household but not lucrative enough to become an independent business venture.

In order to obtain accurate and up-to-date information and data, telephone interviews were undertaken with all medium and small charcoal producers indentified in retail sector through retail shops (including all sizes of retailing) survey. All of the producers share an important attribute: none of them has charcoal production as core business. Even if they have started as a charcoal producer, the charcoal became supplementary bussines. The summarised results, including the producer name, location and annual production of charcoal and briquettes are as follows:

- **Šumooprema Ltd**., located in Duga Rijeka. Charcoal production season depends on climate conditions, but usually starts in April and ends in September. Šumooprema employs 6 full time workers for charcoal and grill briquettes production and during peak production additionally employs 4 part time workers. The company operates two charcoal kilns which produce approximately 200 tonnes of charcoal per year. Due to its relatively well developed distribution line and connection with several large market chains, Šumooprema is also able to purchase and distribute charcoal from local small producers in the amount of 700 to 800 tonnes per year, which in the end results in approximately 1 000 tonnes per year of sales. Additionally, the company also produces 100 to 150 tonnes per year of grill briquettes;

- **Križevci-produkt Ltd**, located in Križevci, is a family operated business dealing mainly with food production and distribution, while charcoal production is a secondary activity. Charcoal production is performed in several kilns, with total annual production of 300 tonnes;

- **Hormar Ltd.**, located in Garešnica, operates 4 charcoal kilns and employs 4 full time workers. Total annual charcoal production in own kilns amounts to 400 tonnes, while the company also purchases all available quantities of charcoal from local small producers;

- **Poljošum Ltd.**, located in Našice, is a family operated business dealing with a wide array of activities including food and agriculture, restaurants and other related businesses. The company operates one charcoal kiln producing 100 tonnes per year and additionally purchases charcoal from local small producers in the amount of 10 tonnes per year;

- **Trgostil Ltd.**, located in Križevci, operates 4 charcoal kilns for which employs exclusively part-time workers. Charcoal is produced mostly from wood residues from private forest owners and last year production amounted to approximately 50 tonnes.

- **Obrt Startuk**, located in Cerovlje, is family operated and produces 150 tonnes of charcoal per year in 2 charcoal kilns. Production is located in the Istrian peninsula, and as such it is the only large producer not located in continental Croatia, as shown in Map 1. The owner is oriented on production of high quality charcoal exclusively from hardwood, which is obtained from private forest owners and bought on the market.

- **Obrt Franc**, located in Jakovlje, operates two charcoal kilns and several years ago produced over 150 tonnes per year. However, production is steady declining and in the last year amounted to 30 tonnes.

Registered producers are commonly cooperating with several non-registered producers. They are facing difficulties in meeting the market demands. Some of the registered producers (i.e. Hormar, Šumooprema) purchase most of their charcoal sales from more than 100 non-registered charcoal producers.

A typical (non-registered) production site is a backyard of a rural household located in vicinity to the forest. A family or entrepreneur would own a brick kiln or two and produce charcoal by involving the labour of the household members. The production quantity depends on the market needs and weather conditions since storage facilities rarely accompany the production. The market for this segment of producers is either a local catering facility such as restaurant or a larger charcoal producer that has wholesale distribution network. Majority of those producers are neither registered nor have any ambition to advance. The only quality measurement is given by the buyer since, in general, they do not posses facilities for assessing the quality of charcoal and their charcoal is not of homogeneous quality.

3 RAW MATERIALS COSTS AND CHARCOAL PRICES

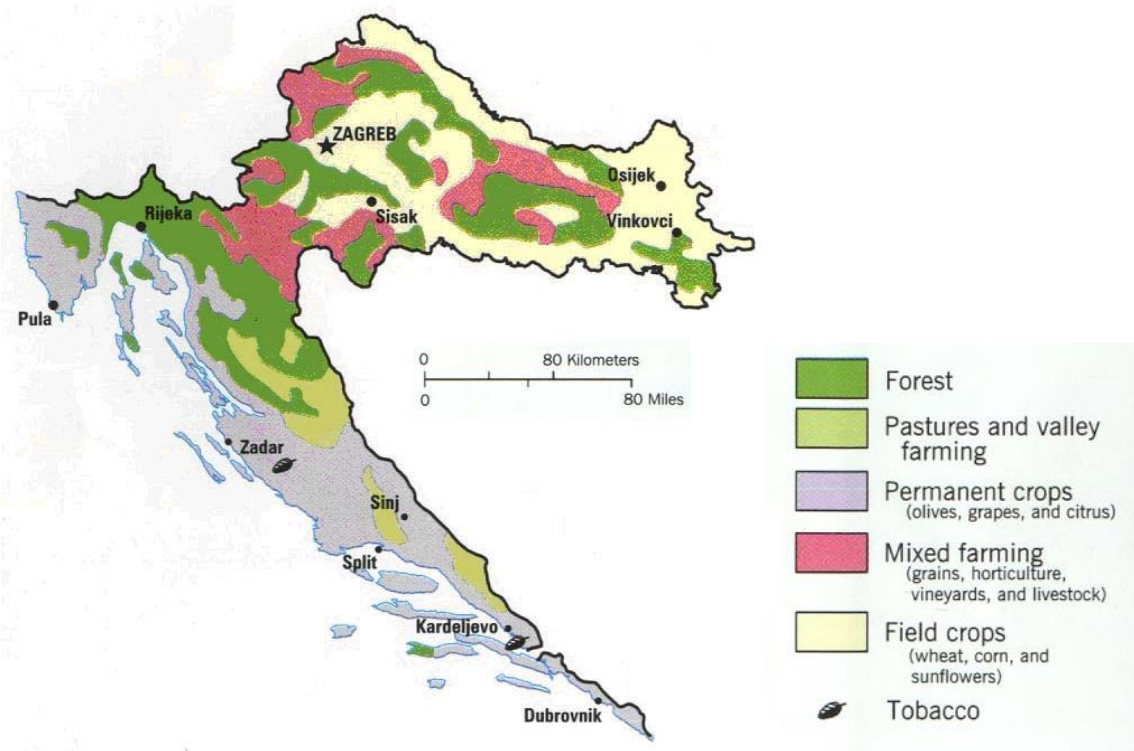
3.1 BIOMASS COSTS IN CROATIAN MARKET

Charcoal production is resource based industry carrying the burden of inelastic supply. In Croatia, there are three main parameters that shape the feedstock availability and they are:

- Forestry residues
- Wood processing residues
- Competing industries for residues.

Due to the lower moisture content and practically no need for additional processing like debarking and sawing, wood processing residues are more suitable and economically viable for charcoal production. However, their quantities are limited and, thus, utilisation of low quality wood and forestry residues turn out to be a necessity for a larger size charcoal production factory.

On the Map 2 below, it is possible to see the general distribution of natural resources in Croatia and get the general impression of feedstock availability. It is interesting to notice that the charcoal production is occurring in those micro areas where agriculture is not perceived as profitable activity (Kalnik area) or in forest areas of the Panoninan plane and Istria whereas Gorski Kotar and Lika do not have any charcoal production at present despite the vast availability of forest feedstock. Telephone interviews with economic units of local authorities revailed only one non-registered charcoal producer in Gorski Kotar. Coastal region, despite the existing demand for charcoal (tourism being the dominant industry), does not record charcoal production.



***Map 2** Land use of Croatia*

A rough estimation of the total available quantities of wood waste and wood residues in Croatia gives the amount of 1 000 000 tonnes per year, of which approximately 50 to 60 percent is hardwood suitable for charcoal production (Domac et al, 2004). Softwood for charcoal production can also be an option if other possible uses (for example, use in cement industry, graining to grill briquettes together with charcoal dust) are considered. However, over the past years, and especially in 2006, there is a rather fast raise of interest in this type of biomass provoking harsh competition for the available quantities, both domestic and abroad. Export of wood waste to Hungary and Austria is boosting due to their better purchasing power. Sources from Belišće estimate that in 2007 around 200 000 m^3b[1] will be exported for the needs of Pécs biomass heating plant in Hungary, and additionally 600-700 000 m^3b will be exported to Austria.

Traditional charcoal production is naturally located in the vicinity of feedstock supply: micro-producers are traditionally located in the area with forest cover. They usually retrieve wood residues (usually II and III class of wood such as stumps, thin branches) for their one or two kilns or earth pits with an agreement or one-time permission of the forester. Typically, after the cutting and yielding the high quality wood about to be sold on a public bid, the charcoal producers are collecting the remainings – thin branches and other residues of wood that would not be economically utilised otherwise. The price of feedstock obtained in such a way is the lowest while it requires substantial time and manual labour. As micro-scale charcoal

[1] m^3b = bulk cubic meter;

In order to obtain solid cubic meter (m^3s) from bulk cubic meter (m^3b) a conversion factor must be used which depends on the type of wood product – for example, for wood logs 1 m^3b = 0,69 m^3s

production being a secondary income for low income households and engaging the whole family members, time and labour are not the parameters that such a charcoal producer would mind. Poachers could be other profile of obtaining the feedstock but, with strict forest management, that would be rather an exception than a rule.

In terms of competition from the supply side, the biomass market in Croatia is at the moment dominated by one producer/supplier, namely **Hrvatske šume Jsc.**[2], being in an almost monopolistic position. The expanse of Croatian woods and timber-land amounts to 2 485 511 ha, with more then 80 percent managed by Hrvatske šume, and a minor part (less then 20 percent) run by private proprietors and other institutions and companies. However, in recent times due to the process of privatisation and restitution of properties confiscated during the planned economy, the share of private forest owners is increasing.

Hrvatske šume sells wood and wood waste from forestry operations to three categories of customers:

- Small domestic and foreign customers, for which official prices of Hrvatske šume. apply. The prices are published yearly in the company 'Wood price list' which is publicly available;
- Larger domestic customers, for which prices are negotiated and usually a longer term contract is signed;
- Larger foreign customers, where prices are usually negotiated over a one year period.

A regular way of wood trading in Croatia is through public bids of Hrvatske šume. However, given the inflexibility of wood supply, most of the agents in the wood industry are signing the long-term agreements with Hrvatske šume. in order to have certain advantages over a spot-buyer. The advantages differ from agreement to agreement but they usually refer to priority conditions, reservation of supply in terms of future purchasing plans, price hedging, rebate, etc. It is common practice of Hrvatske šume. to settle on the prices of wood on the annual basis. Even if a long-term agreement is signed, it does not contain the fixed price. Here is good to underline that being a secure and reliable buyer is not the single prerequisite for obtaining the agreement. Lobbying and fringe benefits to the forester could be the drop that prevailed for signature.

The latest available Wood price list from Hrvatske šume for this study dates to April 2006 and specifies a range of topics including the following:

- Conditions of sale, defining the various modalities of payment, delivery, general provisions regarding quality control, measurement and sorting. Additionally, conditions under which the deviation of prices is possible are also specified, particularly for fuelwood due to its importance in household heating;
- Wood standards and norms, specifically Croatian norms HRN and HRN EN[3], which specify all wood species sold by Hrvatske šume, sorting according to both final use and quality grading;

[2] Hrvatske šume, Joint stock company, owned completely by the Republic of Croatia, is the company responsible management of state owned forests

[3] HRN – Croatian norm defined according to Ordinance on development and publication of Croatian norms (Official Bulletin 74/97)

- Conversion factors for various measurement units, including cubic meter solid, technical logs, wood chips, standard fuel wood, and other types;
- Sales parity and costs of sales party, according to international parity rules INCOTERMS 2000, which includes the following parity standards:
  - EXW: EX WORKS
  - FAS: FREE ALONGSIDE SHIP
  - FCA: FREE CARRIER
  - DAF: DELIVERED AT FRONTIER
- Prices of main wood products, determined by parity EX WORKS, franco at forest road, whereas for other delivery points the prices are modified according to previously defined parity conversion costs.

The Wood price list specifies prices for all wood species sold by Hrvatske šume, which includes a total of 15 hardwood, 7 softwood and 6 conifer types, while each wood species is further divided into 27 product and price categories. The price variations for different categories are quite large, the following table provides a selection of categories and their prices ranges for illustrative purposes.

Table 2 *Price range for wood products sold by Hrvatske šume, Ltd.*

Category type	Price range	
	From	To
Lowest quality wood for chipping	77 kn/m^3 (app. 10.41 €[4]/m^3)	94 kn/m^3 (app. 12.7 €/m^3)
Lower quality fuelwood (II category)	93 kn/m^3 (app. 12.58 €/m^3)	165 kn/m^3 (app. 22.30 €/m^3)
Higher quality fuelwood (I category)	105 kn/m^3 (app. 14.19 €/m^3)	209 kn/m^3 (app. 28.24 €/m^3)
Sowing timber lower quality (III and II category)	170 kn/m^3 (app. 22.97 €/m^3)	928 kn/m^3 (app. 125.41 €/m^3)
Sowing timber higher quality (I category)	222 kn/m^3 (app. 30 €/m^3)	1 989 kn/m^3 (app. 268.78 €/m^3)
Furniture timber	308 kn/m^3 (app. 41.62 €/m^3)	4 005 kn/m^3 (app. 541.22 €/m^3)

Source: Hrvatske šume, Ltd., Wood price list

3.2 COMPETITION FOR RAW MATERIALS

Being the primary input for charcoal production either directly or indirectly, through wood processing industry, it is important to describe the price development of wood feedstock. There was a period from 1997 to 2004 of stable wood prices. The 2004 price list of forest products delivered prices that were significantly lower than the prices at the neighbouring markets. On 1st of April 2006, the prices went up and the

HRN EN – Croatian norm adopted from European norms

[4] Exchange rate on February 25, 2007 was 1 € = 7.39 HRK

last increase in prices occurred in February 2007. Hrvatske šume reports that the forest products from the Croatian forest still do not meet the real market price in comparison to the corresponding markets in the region (Dundović, 2006). The price increase is a respond to significant increase in demand for wood and other forest products.

At present, the biggest challenge for a sustainable charcoal production in Croatia is the raw material price competition with biomass heating plants in Hungary, other EU countires like Austria and Italy as well as Croatia.

This will further increase when Croatia adopts ordinances related to utilisation of renewable energy sources, especially those defining tariffs and subsidies for cogenerations and electricity production.

The biomass feedstock from the Croatian North-eastern parts is affected mostly by Pannon Thermal Power Plant Inc. (established by Pannonpower Holding Inc.), a combined heat and power generating system situated in Pécs, Hungary. The Pécs power plant was able to offer 15 percent higher price than the existing market price when they entered the market. In October 2006, the power plant was importing wood processing residues at a price of 18 €/t (fco wood processing industry) and fuelwood at 35 €/t (fco border).

In the respect to the wood processing industry in Croatia, it is fair to say that many plants have a pending plan for installation of cogeneration plants primarily for their own purposes with possibility of selling the excess electricity to the grid. On the other hand, Hrvatske šume. has been already started to implement their plan to open a biomass district heating plant for each of their management. Until now, two plants – Gospić and Ogulin were installed.

Another competition comes in the form of the production of another biomass solid fuel – pellets. The raising demand of households from Croatia and abroad for the new generation of biomass boosted by positive governmental measures enables wood processing industries to add value to wood residues previously concerned as waste. Wood pellet industry in Croatia is developing rather quickly during the last few years and several wood processing companies announced their plans to start pellets production during 2006, as shown in Table 3. In comparison, data for 2005 show only one pellet production company with total capacity of 10 000 tonnes per year.

***Table 3** Pellet production capacities in Croatia in 2006*

Company	Location	Production capacity (t/y)
ADRIADRVO	Vrbovec	10 000
FINVEST CORP d.d.	Čabar	15 000 (expected in 2008)
SOLTECH D.O.O.	Gospić	16 800 (expected in 2008)
DRVENJAČA	Mrkopalj	15 000
SPAČVA	Vinkovci	60 000 (expected in 2008)

Source: EIHP field research; direct communication

Wood briquettes production gains its value which is also recognised by Belišće. Namely, Belišće already produces about 8 000 tons per year of wood briquettes and they report an increase in selling price from 80 €/t to 135 €/t within a year period.

The largest charcoal producer in Croatia, Belišće, supplies wood waste feedstock from wood processing industries within 100 km radius and amount to 10 000 tonnes per year. Additional 50-100 t/y is collected as waste from own production of wood elements (boards, panels and similar). Belišće has a five year contract with Hrvatske šume for the supply of 10 000 m^3s/year of distillation wood and can obtain these quantities at a more favourable price then available on spot-market. However, wood prices are subject to change by Hrvatske šume, which in the last few months led to a considerable increase. In October 2006 the price for wood waste which Belišće procured ranged from 102.5 kn/t (app. 13.85 €/t) to 140 kn/t (app. 18.92 €/t), while the price of distillation wood procured from Hrvatske šume amounted to 140 kn/m^3b (app. 18.92 €/m^3b). The latest data obtained from Belišće in February 2007 indicate that the company is currently paying up to 25 €/t for distillation wood obtained from Hrvatske šume. The following table shows a summary of the prices and quantities of wood feedstock for charcoal production in Belišće (Kaptalan, 2007).

Table 4 *Quantity and price of feedstock for charcoal production in Belišće*

Feedstock	**Quantity (estimate)**	**Price (October 2006)**
Own waste	50-100 t/y	0
Wood waste from wood processing industry	10 000 t/y	102.5-140 kn/t (13.85-18.92 €/t)
Wood residues and distillation wood	10 000 m^3b/y	140 kn/m^3b (18.92 €/m^3b)

Source: Belišće, direct communication

The production costs and sales prices of charcoal could also be attributed according to the type of the producer. Belišće sells charcoal at the domestic market at prices 10 to 15 percent higher than the competition, due to the ability to assure product of homogeneous quality and stable supply. Despite being more expensive, Belišće places about 35 percent of its total production or 1 050 t of charcoal and about 650 t of briquettes (55-60 percent of total briquette production) on the domestic market.

The following table provides a list of packages and prices of products Belišće places on the domestic market.

Table 5 *Prices of charcoal products sold by Belišće*

Product	Price	Packaging
charcoal packed in paper bags	4.20 kn/kg (FCO factory); 4.50 kn/kg (FCO buyer)	2.5 kg
charcoal packed in paper bags	4.00 kn/kg (FCO factory); 4.30 kn/kg (FCO buyer)	10 kg
briquettes packed in paper bags	6.30 kn/kg (FCO factory); 6.80 kn/kg (FCO buyer)	2.5 kg
briquettes packed in paper bags	5.80 kn/kg (FCO factory); 6.30 kn/kg (FCO buyer)	10 kg

Source: Belišće, direct communication

The presented values represent the basic prices, excluding special deals on rebate and other benefits for the buyer. The remaining quantities of charcoal and briquettes are exported at prices lower for 20-25 percent than those achieved at the domestic market.

Small charcoal producers are forced to sell at prices that are settled by the buyer. The retail chain of large supermarkets (supermarkets like Konzum, Kerum, Metro, Plodine, Brodokomerc…) dictates wholesale charcoal prices and fewer and fewer charcoal producers are willing or able to stand the price pressure. The largest among the small registered producer, Sumooprema Ltd. is able to pursue price strategy due to its special position on the market because it has certain bargaining power over the non-registered producers (its business activity includes a bundle of agricultural inputs and outputs). As some 80 percent of its total charcoal sales come from the non-registered producers, Šumooprema Ltd. feels the pressure but it is still able to follow the price cutting. It buys the packaging from Belišće at prices of 0.20 kn for 3 kg paper bag and 0.15 kn for a 10 kg paper bag. The packaging is manual and the workers are paid by the bag at price of 0.15 kn and 0.22 kn per 3 and 10 kg bag, respectively. The wholesale prices are 3 kn/kg and 2.80 kn/kg for 3 and 10 kg bag, respectively, while the briquettes are packed in 2.5 kg bags and sold at 5 kn/kg. All prices are FCO buyer, without intermediary.

Most of the registered producers in kilns have a family tradition in charcoal production. They all agree that the golden period of charcoal was from mid 1980s to mid 1990s. At that time, the charcoal market was blossoming partly due to the presence of the UN peace corps UNPROFOR that had one day per week grill menu and partly due to the transitional period when the supermarkets were not that powerful as they are today. In 1993, Croatian economy started to experience a period of an overall non-liquidity and the charcoal producers were locked in with the bankrupts of the retail shops. After governmental measures, the situation improved significantly but, simultaneously, supermarket chains gain the power on the retail market. At present, supermarkets are offering around 2.33 kn/kg for a 3 kg bag including transportation costs and, sometimes, they demand buying the sales place at the shelves of the supermarket. In addition, rebate changed from 10 to 32 percent. Most of the interviewers are either pushed away from the supermarkets or planning to do so. All of them are stating that they were able to provide themselves a decent life from charcoal production while the present situation is far from that. They are turning to other markets such as restaurants, private gas stations, agricultural cooperatives etc.

The supermarkets are importing the difference in charcoal supply mostly from Bosnia and Herzegovina since 1 percent of custom duty is not a barrier for importing cheap charcoal from Teslic area. Some of the registered producers in kilns are reporting prices such as 4 kn/kg for a 3 kg bag of charcoal excluding transport as a reference price and production of at least 20 tons per year for small scale production profitability. The production cost at small producers are estimated at 1.90 – 2.00 kn/kg of charcoal which with costs of packaging, labour and transport gives 9.00 kn for 3 kg bag of charcoal. Notice that there 3 kn/kg of charcoal does not include trade margin, which indicates that the supermarket buyout price is below the production costs.

The situation of small charcoal producers could be explained as *closed circle*. The major market for charcoal are supermarkets followed by restaurants. The small charcoal producers do not have bargaining power to negotiate better sales conditions. Instead of organising themselves in associations, they are applying retreat strategy with buying out charcoal from illegal producers in order to meet the supermarkets' conditions. The difference between retail price and wholesale price for 3 kg bag of charcoal varies from 150 to 250 percent excluding transportation costs that also fall on the producer. The retreat strategy is not sustainable in the long run since it impoverishes the legal producers and boosting illegal charcoal producers. It is interesting to note that all of the interviewed producers spoke about a necessity to form an association of charcoal producers without an incentive from the interviewer side.

Approximately 10 percent of the total quantity of charcoal produced falls on charcoal dust and pieces of charcoal that are smaller than 20 mm of diameter. Continuing the charcoal production with grill briquettes production is additional business opportunity for a charcoal producer. Its profitability greatly depends on the economy of scale, from the one hand, and the optimisation of the drying chambers capacity, at the other hand. Only few charcoal producers are producing the briquettes and only Belišće is taking it as a continuous business activity. It acquires charcoal dust from its own charcoal production, buys it from the Croatian charcoal producers and imports it from Bosnia and Herzegovina, Serbia, Poland, Czech Republic and Switzerland at average price of 110 €/t. To the best of our knowledge, there is only one small scale charcoal producer that makes briquettes from its own charcoal residues or, when it is necessary, buys charcoal dust from the non-registered producers at price of around 80 €/t, depending on the cleanness and moisture content. However, its production capacity is limited by the capacity of drying chamber to 25 t of briquettes per month. The remaining charcoal dust is sold to Belišće at price of 0.70 kn/kg. Starch, an additive in the gill briquettes production, is imported either from Serbia or Slovenia at and 450 €/t and 600 €/t, respectively.

The phone interviews indicated that all of the charcoal producers have had considered briquetting but gave up due to insufficient supply of charcoal dust from their own capacities and market positions of Belišće and Šumooprema.

4 MARKET AND INVESTMENT OPPORTUNITIES

4.1 POTENTIAL INVESTMENT OPTIONS IN CROATIA

Currently charcoal consumption in Croatia can be divided in the following categories:
- fuel for barbeque in households and restaurants;
- source for production of activated carbon;
- energy input for some industries (cement, blacksmith)
- drawing material for artists and in schools.

In terms of quantities consumed but also of potential for increased consumption the first category is by far the most important and hence the other three will not be analysed in detail within this study.

Given the data on the national production of charcoal and data on the international trade of charcoal (detailed in the Chapter 5), it is possible to estimate the total national charcoal consumption as follows:
- total national charcoal production amounts to approximately 6 000 tonnes in 2005;
- total charcoal import in 2005 amounted to 2 237 tonnes;
- total charcoal export in 2005 amounted to 1 061 tonnes.

From the above the total national charcoal consumption for 2005 can be estimated to approximately 7 180 tonnes, based on the official data.

Regarding investment opportunities for new and existing charcoal producers, the following options were identified:

- grill (charcoal) briquettes production;
- new industrial charcoal production facility;

Grill briquettes production could be an interesting addition for existing small charcoal producers, which is confirmed by the experience of Šumooprema Ltd. Due to transport and handling of charcoal, the quantity of produced fines which could be used for briquetting usually amounts between 10 and 20% by weight. Currently, small producers are either selling these fines to Belišće or in the worst case simply dumping them near their production sites. Briquetting the fines could thus improve not only the economic side of their production but could also have a positive impact on the environment.

When considering the economic side of briquetting for small producers, it can be found that the cost of briquetting depends on three factors:
- The cost of the charcoal fines used for briquetting;
- The cost of the binder;
- Investment costs for briquetting equipment.

Fines normally have little value, and in the case of small producers it is reasonable to assume for fines to have zero cost. The binder which is normally used is starch, which is also a food material and costs considerably higher then the cost of raw lump charcoal. Hence, even though only a rather small addition of starch to charcoal fines is needed to make the briquettes, it is a very significant cost item.

Experience from developed countries show that for a successful briquetting operation the following factors need to be present (FAO, 1987):

- An established high priced household market for barbecue fuel;
- Ability to produce fine charcoal for briquettes at very low cost, close to major markets, and in steady volume through the year;
- A high volume of sales adequate to absorb the potential production of the plant;
- Adequate capital for good equipment and skilled labour for operations and maintenance;
- A proper marketing, packaging and distribution system to enable the product to achieve adequate market penetration at a rewarding price.

Even though some of these requirements are not entirely satisfied in Croatia, it is still safe to assume that charcoal production is a quite reasonable option for small producers.

Investment in a **new industrial charcoal production facility** could be an interesting option for the existing large charcoal producers both in Croatia, i.e. Belišće, and abroad. As mentioned in the previous chapter, one of the most important limiting factors in regard to the expansion of charcoal production in Croatia is the feedstock cost, which has been constantly increasing due to the competition for the available wood resources from both domestic and foreign companies. Investing in a modern charcoal production facility with higher conversion efficiency represents one possible solution to this problem, as it allows to increase the feedstock price which the producer is able to pay while attaining the same profitability.

Regarding the possible technologies which could be used, the obvious option is to adopt one of the several variations of the retort system, as confirmed by the fact that most modern industrial charcoal producers use retorts for their process. There are many methods of implementing the retort principle. Most of them have been developed by the charcoal producers themselves, and few of them are commercially offered. In order to present an illustration of the investment costs and related payback period for such an investment, the following paragraps presents a short description of one of the retort systems vastly used today in several countries, namely the Carbo Twin Retort developed by the Ekoblok/Carbo group.

The Carbo Twin Retort is a semi-continuous production module. This so called “twin-retort” concept, has a capacity of approximately 900 tonnes of charcoal per year. Each carbonisation unit exists of two kilns, in each of which a vessel with fresh wood is placed alternately. The pyrolysis vapours released from one hot carbonizing vessel, are combusted to heat-up another vessel freshly loaded with wood. When, after several hours the latter has reached carbonization temperature and emits pyrolysis vapours suitable for combustion, the charcoal in the first vessel is ready, that vessel removed, and replaced by another that has been filled with fresh wood. The direction of gas flows is switched by making use of valves.

The hall, in which the kilns are mounted, is provided with a monorail and overhead crane that enables to lift the vessels into and out of the carbonisation kilns. The hot charcoal vessels are placed outside the hall in a sand lock and left for a 20-24 hours (natural) cooling period before emptying. This means that spare vessels are needed to keep the carbonisation system running.

On average $33\%_{wt}$ of wood input (30% m.c.) is converted to charcoal (depending on the wood species), hence high conversion efficiency is one of the characteristics of Carbo twin retort system. Additionally, there are low emission levels as all harmful pyrolysis gases are completely combusted internally and vapours are completely combusted into CO_2 and H_2O. Thus the emission of other polluting gases, such as CH_4, CO and higher C-compounds is negligible. It is also worth to mention that the Carbo system has a high thermal efficiency and after start-up with external heat source the system is operating auto-thermally. The main economic performance indicators are presented in Table 6.

Table 6 *Economic performance indicators of the Carbo Twin Retort system with 900 t per year capacity*

Capacity	[ton/year]	900
Project time	[years]	10
Investment	[EUR]	548000
Civil works	[EUR]	80000
Kiln (Carbo Twin Retort)	[EUR]	300000
Working capital	[EUR]	80000
Vessels (6 units, 3000 EUR per unit)	[EUR]	18000
Project prep/assistance	[EUR]	70000
Total Greenfield Investment (without equipment)	[EUR]	230000
O&M costs	[%_Investment]	10%
Discount rate	[%]	10%
NPV	[EUR]	248.197
IRR	[%]	20,65%

An important aspect of any market commodity, including charcoal, is the desired and prescribed quality standards and quality control. Due to their long term orientation to export on EU markets, charcoal production in Belišće meets the DIN standard norms DIN EN 1860-2:2005 *Appliances, solid fuels and firelighters for barbecueing - Part 2: Barbecue charcoal and barbecue charcoal briquettes - Requirements and test methods*. However, it is questionable whether this can be said about the charcoal coming from small producers and especially from import, which is coincidentally less expensive. A specific problem which allows this situation lies in the fact that currently charcoal quality standards in Croatia are not established through legislative acts and standards. This results in poor quality control and consequently, relatively large variation in the quality of charcoal placed on the national market.

4.2 MARKET REGULATIONS

The present situation with lack of quality regulation is in fact worse then in the past, whereas the first legal document which represents an organised and formal approach to the production of charcoal as fuel and industry product can be traced to the *Temporary ordinance on charcoal*, declared by the Department for industrial development of the Planning Committee of the former People's Republic of Croatia in 1949 (Anon, 1949). The topics and aspects regarding charcoal production are covered in accordance to the chapters, which include the following:

1. Definition of charcoal
2. Feedstock for charcoal production
3. Characteristics of charcoal
4. Charcoal types and sorts

4.1. According to production type
4.2. According to quality categories based on charcoal size (dimensions)

5. Technical conditions (including moisture content, ash content, volatile constituents)
6. Sampling procurement for testing and quality determination

6.1. Transport in train wagons
6.2. Transport in bags of smaller quantity

7. Testing methods

7.1. Determination of moisture content
7.2. Determination of ash content
7.3. Determination of volatile constituents
7.4. Determination of remains of carbonisation

8. Quality control according to size
9. Loading equipment

It can be seen from the topics mentioned above that the Ordinance covered most of the relevant aspects related to charcoal production, distribution and use, which also confirms the fact that, in the past, charcoal represented an important product in Croatia.

The easiest and most obvious solution, which will be recommended by this study, would be to adopt the EU standards regarding barbecue charcoal and related products, which include the following:

- **EN 1860-1:2003**: Appliances, solid fuels and firelighters for barbecueing. Barbecues burning solid fuels. Requirements and test methods
- **EN 1860-2:2005**: Appliances, solid fuels and firelighters for barbecueing. Barbecue charcoal and barbecue charcoal briquettes. Requirements and test methods

- **EN 1860-3:2003**: Appliances, solid fuels and firelighters for barbecueing. Firelighters for igniting solid fuels for use in barbecue appliances. Requirements and test methods
- **EN 1860-4:2004**: Appliances, solid fuels and firelighters for barbecueing. Single use barbecues burning solid fuels. Requirements and test methods

Even though, it is reasonable to say that the charcoal market in Croatia is relatively well developed and distribution channels are well established. Charcoal is available at most of the larger stores, in specialised shops as well as in gas stations. Table A1 in Annex I shows charcoal prices in a range of shops and stores obtained by 'on-the-field' investigation. As it was expected, charcoal prices are higher in coastal parts of Croatia with developed tourist industry, like Dubrovnik. However, there is also considerable difference among charcoal price from store to store in the same city or region.

The information obtained from Belišće indicates that approximately 50 percent of their charcoal sale on the national market is realised through one gross seller, while the remaining is sold to several market chains and individual customers. Small producers tend to sell a large part of their charcoal to individual customers, whereas a few of them also have contracts with large market chains. As a conclusion of the above it can be said that, in order to create opportunities for increased charcoal consumption of domestic origin on the national market, activities aimed at two goals have to be performed:

- establishment and implementation of quality control standards and measures, which would either reduce charcoal import or increase the quality of import;
- promotion activities.

Looking at the data regarding charcoal import and export presented in the next chapter, it is evident that charcoal is also exported in significant quantities, compared to total consumption. Due to the limited national market size, it is expected that more opportunities exist for domestic charcoal producers to increase their production and revenues through export.

4.3 INVESTMENT OPPORTUNITIES AND INSTITUTIONAL ASPECTS

Before investing in charcoal production, it is crucial that the production gains its legal acknowledgement. Namely, charcoal is not directly recognised as a type of biomass, thus, a renewable and zero carbon energy source. Once that the status is recognised, it would be possible for a charcoal investor to get a loan benefits from banks as other investments in renewable energy sources.

It is important for an investor in charcoal to know the industry classification number (NKD[5] code) in order to verify the compliances with the minimum technical requirement. Together with production of forest woods, forestry comprises those productions that involve low extent of processing such as fuelwoods or wood for

[5] Nacionalna klasifikacija djelatnosti (NKD) – National classification of business activities, a national standard corresponding to purpose of ISIC (International Standard of Industry Classification) but not necessarily synchronised in the coding system.

industrial purposes (i.e. pit construction, wood for celluloses, etc.). Further wood processing, starting from sawing and shaping of wood, which is generally executed outside of forest cutting area, is attributed to *Wood and wooden products processing* (section 20) and *Wooden charcoal production* (section 24). Section 24: Chemicals and chemical product production covers transformation or organic and inorganic crude materials in a chemical process and formation of products. It differs from production of basic chemicals. Wooden charcoal production is classified under 24.14.0 and does not have the minimum technical requirements. Retail sale of fuels includes retailing of wooden charcoal and it is classified under the number 52.48.6. This activity requires a certificate of compliance for minimum technical requirements.

As charcoal production is resource based industry, it is important to know that both domestic and foreign legal entities and persons may not become owners of certain types of real estate such as natural resources and other assets of interest to the Republic of Croatia but they can obtain a concession – a right to commercially exploit these assets. However, a concession may not be granted for the exploitation of forests and some other assets (those owned by the state are governed by a special law). The terms for obtaining the concession are regulated by the Concession Rights Acts (OG 89/92). The Croatian Parliament is responsible for delivering the concessions but it can delegate the decision – making rights to the Government. It is granted to a domestic or foreign legal entity or natural person on the basis of a public tender or bid invitation for a maximum period of 99 years (40 years for agricultural land). The party granting the concession and the applicant sign an agreement that is entered in the register of concessions of the Ministry of Finance. An annual fee is paid for each concession. A complete overview of the legal framework for a domestic or foreign investor is given in Annex 2.

5 IMPORT AND EXPORT OF CHARCOAL IN CROATIA

5.1 IMPORT

Charcoal is by far the most important processed biomass fuel in Croatia and it is used in its simple form or often densified in charcoal briquettes. Charcoal is also an important subject of export/import activities of Croatian companies. According to official statistics available from Croatian customs, the main national producer – Belišće - exports almost 30 percent of its production with an increasing trend, and its import activities account for over 40 percent of the total national import. The remaining charcoal import is undertaken by a large number of small companies/dealers.

Table 7 *Charcoal imports by countries in 2005*

Country	Quantity (kg)	Price (kn)	Price (US$)	Average price (US$/kg)
Bosnia and Herzegovina	1 714 181	3 194 945	538 112	0.314
France	261 500	337 547	56 349	0.215
Spain	130 215	367 699	62 044	0.476
Bulgaria	60 800	172 987	29 526	0.486
Romania	24 465	22 748	3 686	0.151
Slovenia	22 220	28 160	4 868	0.219
Austria	18 721	55 987	9 862	0.527
Other	4 639	N/A	N/A	N/A
TOTAL	**2 236 741**			

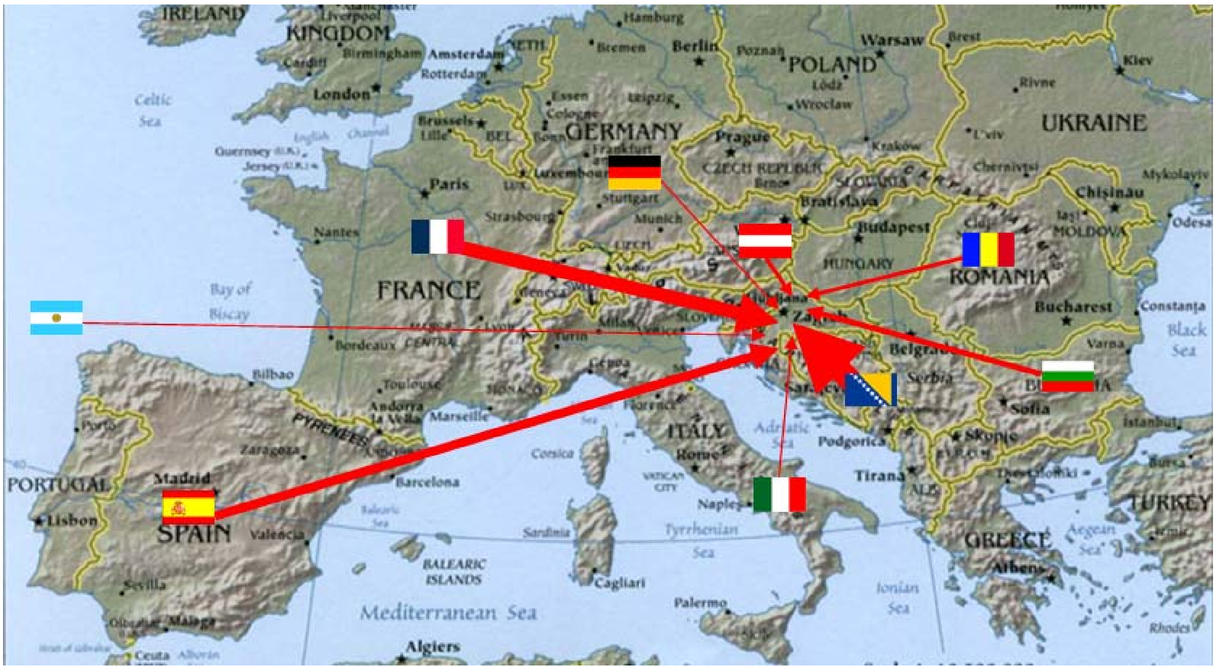
Source: Customs directorate of the Republic of Croatia

Table 8 *Charcoal imports by countries in 2006*

Country	Quantity (kg)	Price (kn)	Price (US$)	Average price (US$/kg)
Bosnia and Herzegovina	2 291 894	2671 168	435 470	0.190
Austria	123 880	282 217	47 333	0.382
Yugoslavia	119 500	247 783	41 991	0.351
Slovenia	93 462	79 912	11 988	0.128
Bulgaria	36 420	189 267	32 118	0.882
Spain	32 781	155 531	26 282	0.802
Romania	14 400	39 030	6 323	0.439
Other	8 233	N/A	N/A	
Total	**2 720 570**			

Source: Customs directorate of the Republic of Croatia

Tables 7 and 8 present the data regarding charcoal import in Croatia for 2005 and 2006. It can be seen that by far the largest quantity is imported from the neighbouring Bosnia and Herzegovina, which is due to the lower transport costs but also mainly to the lower charcoal price. Looking at the 2005 data, it can be seen that considerable quantities of relatively cheap charcoal were also imported from France, which was done exclusively by the Belišće Company and therefore it is reasonable to assume that this charcoal passed certain quality criteria. The example of France, where a number of larger charcoal producers is able to produce quality charcoal at relatively low price could be taken as a reference point for the direction in which charcoal industry in Croatia could develop.



Map 3 *Charcoal imports in 2005, based on data from Customs directorate of the Republic of Croatia*

5.2 EXPORT

The data regarding charcoal export from Croatia are presented in Tables 9 and 10. It can be seen that the export is concentrated in three or four countries, and more then 50 percent is sold to Switzerland. Currently, by far the most important exporter is the Belišće, which in 2005 covered almost 95 percent of the exported quantities. Consequently, the data shown in the tables below represent the business activities and established business channels of only one company. One of the main goals of this project is to increase the competitiveness of all national producers and thus also to facilitate and enable the introduction of producers other then Belišće in exporting activities. It is evident that there is a demand for charcoal on the EU market and it is expected that the export potential for increased production for domestic producers is much larger then the national market potential.

Table 9 *Charcoal exports by countries in 2005*

Country	Quantity (kg)	Price (kn)	Price (US$)	Average price (US$/kg)
Switzerland	557 150	1 352 592	228 093	0.409
Bosnia and Herzegovina	191 271	363 225	60 246	0.315
Slovenia	182 330	539 680	91 541	0.502
Italy	111 450	297 609	49 932	0.448
Other	18 368	N/A	N/A	N/A
TOTAL	**1 060 569**			

***Table 10** Charcoal exports by countries in 2006*

Country	Quantity (kg)	Price (kn)	Price (US$)	Average price (US$/kg)
Switzerland	892 016	2 044 882	349 467	0.392
Italy	402 256	922 565	161 550	0.402
Slovenia	130 270	471 206	81 630	0.627
Bosnia and Herzegovina	511 307	1 180 233	205 797	0.402
Other	231	N/A	N/A	
TOTAL	**1 818 004**			

Source: Customs Directorate of the Republic of Croatia

***Map 4** Charcoal export in 2005, based on data from Customs directorate of the Republic of Croatia*

When compared with the official data presented above, the data obtained directly from the Belišće, presented in Table 11 below, show a considerable discrepancy regarding charcoal export. Looking at the official data for year 2005 in Table 9, the total charcoal export amounts to 1.060 tonnes, while data from Belišće indicate 1.750 tonnes. The discrepancy is also present for 2006 data, with official data for export indicating 1.818 tonnes while Belišće data indicating 2.489 tonnes. Furthermore, according to official data most of the charcoal was exported to Switzerland, whereas Table 11 shows that almost 60% of total export from Belišće goes to Italy. Taking that in consideration, there is therefore a valid reason to question the reliability of official data regarding charcoal import and export in Croatia.

Table 11 *Charcoal export by Belišće, figures for Italy and Switzerland*

Export in 2005		
Country	Charcoal (t)	Grill briquettes (t)
Italy	1 200	0
Switzerland	550	250
Export in 2006		
Country	Charcoal (t)	Grill briquettes (t)
Italy	1 798	0
Switzerland	691	333

Source: Belišće, direct communication

6 CONCLUSIONS AND RECOMMENDATIONS

The demand for charcoal is fairly large and it is increasing rapidly. Worlwide consumption is estimated at 40.5 million tonnes annually, with 19.8 million tonnes just for Africa according to FAO statistics. Charcoal production in Croatia, used only as a barbecue fuel in households and restaurants, has been relatively stable while demand has been rising steadily over the last few years. Export possibilities for charcoal produced in Croatia are expanding but the price competition with producers from Latin America makes the export aspirations rather challenging.

Charcoal production in Croatia is a well-known process with significant experience accumulated. The main producer, Belišće, is an industrial producer which uses retort system and dominates the national market. Other registered charcoal producers in Croatia produce in kilns with significantly lower carbonisation efficiency. The quality varies as well as the production quantities that are more or less of seasonal character. For most medium-size charcoal producers, charcoal production is perceived as a good additional income from secondary business activity of a rural household but not lucrative enough to became an independent business venture. There are also 400 small-scale charcoal makers scattered in forest areas who are responsible for around half of the national charcoal production who use low productivity charcoal making techniques consisting of traditional charcoal pits, mounds and kilns which cause health problems for the workers involved. As a result of this situation, both small and medium-scale charcoal producers are slowly losing competitiveness in internal and external markets.

From the long term perspective, the key issue for a sustainable industrial charcoal production is the possibility of paying a higher price for feedstock (wood residues from wood processing industry and forestry waste) as described in previous chapters. This can be achieved by increasing the price of charcoal sold on the market and by increasing the efficiency of charcoal production. In a situation of growning global market where Croatian producers will hardly be able to compete with producers from Argentina, Brazil and other world major charcoal producers, the increased efficiency of charcoal production seems to be the best solution.

A reference technology which achieve efficiency of 30 percent can be found around Europe (for example CARBO in the Netherlands) and their experience should be used in further development of charcoal industry in Croatia. Some preliminary analysis show that if Belišće could achieve 30 percent charcoal production efficiency they would be able to pay 50 percent higher price for feedstock. This would enable to compete on fast developing biomass market where, at the moment, biomass heating and CHP plants, even from Hungary and Austria are able to pay more for the same feedstock.

An important recommendation would be to introduce and enforce quality EU standards regarding barbecue charcoal and related products which could be a short-term follow up activity of this TCP project. Other recommendations should address problems of placing charcoal on domestic and international market and include:

- Introduction of *Croatian quality charcoal* brand;

- Forming a cluster of small and medium producers who can not ensure sufficient quantities to make a market impact alone.

Croatian quality charcoal brand could be an initiative led by the Croatian Chamber of Economy or Ministry of Agriculture and Forestry and should guarantee sufficient quality level expected and requested by consumers. This initiative could be linked to rapidly developing Croatian tourist industry which could be a very promising selling point (invisible export) for Croatian charcoal. Such development could include extensive marketing and promotional campaign, design of appropriate logo and other graphic elements, easily recognasible packaging material and other activities.

A cluster or association of small charcoal producers whose major market are supermarkets and restaurants could help them to have bargaining power to negotiate better sales conditions. At the moment, they are simply buying out charcoal from illegal producers in order to meet the supermarkets' conditions which is not sustainable in the long run since it impoverishes the legal producers and boosting illegal charcoal producers. During a number of telephone interviews and site visits conducted for this study, almost all of the interviewed producers spoke about a necessity to form an association of charcoal producers without an incentive from the interviewer side.

Future charcoal concepts appear to be modestly to very interesting for Croatia, from an economical and environmental point of view. Nonetheless, a breakthrough in charcoal production technologies will have to be forced. Awareness of the economical and environmental benefits of sustainable charcoal production with the Croatian people will have to be raised.

An encouraging trend is that Croatian policy makers are beginning to perceive the potential economic benefits of commercial production of biomass fuels including charcoal e.g. employment/earnings, regional economic gain, contribution to security of energy supply and all others. This could represent a significant policy shift with regards to the old view in which charcoal was viewed as a non-commercial rural activity reserved for poor with no other income opportunities.

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ANNEX 1

Table A1 *Charcoal prices and packaging in shops and stores*

Shop name	Location	Package (kg)	Producer	Importer	Price (kn)	Unit price (kn/kg)
Cavtat	Cavtat	2,5	Belišće d.d.		19,00	7,60
Prima	Dubrovnik	2,5	Belišće d.d.		17,90	7,16
Jadranka	Dubrovnik	3	BiH	Veletrgovina Konzum	29,00	9,67
Konzum d.d.	Dubrovnik	3	BiH	Veletrgovina Konzum	12,99	4,33
Konzum	Kutina	3	Veleprodajni centar		12,00	4,00
Pevec	Kutina	5	Hormar garešnica		18,00	3,60
Pevec	Kutina	10	Hormar garešnica		29,00	2,90
Pevec	Kutina	3	Šumooprema Duga Rijeka		13,00	4,33
Lonia	Kutina	3	Hormar garešnica		12,99	4,33
Nerete Commerce market	Opuzen	2,5	Belišće d.d.		17,90	7,16
Konzum d.d. maxi	Rijeka	3	Križevci - produkt d.o.o.		12,99	4,33
Konzum d.d. maxi	Rijeka	3	BiH	Veletrgovina Konzum	12,99	4,33
Konzum d.d. maxi	Rijeka	3	Hormar garešnica		12,99	4,33
Brodokomerc	Rijeka	3	Kalnički ugljen, Trgostil d.o.o.		16,1	5,37
Brodokomerc	Rijeka	3	Kalnički ugljen, Trgostil d.o.o.		16,1	5,37
Gracijani	Rijeka	2,5	Startuk, obrt: vl. B. Prar, Cerovlje		19	7,60
Kerum d.o.o.	Rijeka	2,5	Belišće d.d.		14,98	5,99
Tommy	Solin	3	Best d.o.o. Travnik BIH	Tommy, Solin	12,99	4,33
Konzum d.d.	Solin	3	BiH	Veletrgovina Konzum	14,99	5,00
Kerum d.o.o.	Split	2,5	Belišće d.d.		16,00	6,40
Fenix	Split	2,5	Best d.o.o. Travnik BIH	Tommy, Solin	11,80	4,72
Maxi Konzum	Virovitica	3	Križevci - produkt d.o.o.		14,99	5,00
Maxi Konzum	Virovitica	2,5	Belišće d.d.		14,99	6,00
Trgocentar	Virovitica	3	Grill Holz	Veleprodajni centar, Rajlovačka bb, Sarajevo	12,99	4,33
Opeco d.d.	Virovitica	3	Šumooprema		14,99	5,00

			Duga Resa			
Plodine	Virovitica	3	Šumooprema Duga Resa		11,99	4,00
Kaufland	Virovitica	3	Žega d.o.o., M. Korenovo 63, Bjelovar		10,99	3,66
Kaufland	Virovitica	10	Žega d.o.o., M. Korenovo 63, Bjelovar		34,99	3,50
KTC	Virovitica	3	Križevci - produkt d.o.o.		11,99	4,00
Diona	Zagreb	2,5	Best d.o.o. Travnik BIH	Meteor d.d. Đakovo	16,99	6,80
Konzum d.d.	Zagreb	3	Križevci - produkt d.o.o.	-----------------	14,99	5,00
Getro	Zagreb	2,5	Belišće d.d.	-------------------	16,49	6,60
Konzum d.d.	Zagreb	3	BiH	Veletrgovina Konzum	12,99	4,33
Vindija	Zagreb	3	Križevci - produkt d.o.o.		14,48	4,83
Žitnjak d.d.	Zagreb	3	Kalnički ugljen		14,98	4,99
Metro	Zagreb	3	Šumooprema, Rijeka		10,72	3,57
Metro	Zagreb	10	Šumooprema, Rijeka		36,48	3,65
Radoš Grupa	Zagreb	2,5	Belišće d.d.		17,90	7,16
Prehrana	Zagreb	2,5	Belišće d.d.		18,79	7,52
INA Benzinska	Zagreb	2,5	Belišće d.d.		19,99	8,00
Diona	Zagreb	2,5	Belišće d.d.		18,91	7,56
Diona	Zagreb	2,5	Meteor d.d. Đakovo		17,39	6,96
Getro	Zagreb	10	Vejzprom-inex d.o.o. Zenica, BiH	Getro	38,49	3,85
Getro	Zagreb	3	Vejzprom-inex d.o.o. Zenica, BiH	Getro	11,99	4,00
Union	Zagreb	3	Šumooprema Duga Rijeka		13,83	4,61
Merkator	Zagreb	2,5	Belišće d.d.		16,13	6,45

***Table A.2** Grill briquettes prices and packaging in shops and stores*

Shop name	Location	Package (kg)	Producer	Price (kn)	Unit price (kn/kg)
Diona	Zagreb	2,5	Belišće d.d.	29,63	11,85
Žitnjak d.d.	Zagreb	2	Križevci - produkt d.o.o.	23,69	11,85
Žitnjak d.d.	Zagreb	2,5	Belišće d.d.	31,92	12,77
Getro	Zagreb	2,5	Belišće d.d.	24,99	10,00
Konzum d.d.	Zagreb	2,5	Belišće d.d.	25,99	10,40
Kerum d.o.o.	Split	2,5	Belišće d.d.	14,68	5,87
Supermarket Kerum	Solin	2,5	Belišće d.d.	20,98	8,39
Konzum d.d.	Solin	2,5	Belišće d.d.	16,99	6,80
Tommy	Solin	2,5	DELETE d.o.o.	24,99	10,00
Vindija	Zagreb	2	Križevci - produkt d.o.o.	20,98	10,49
Žitnjak d.d.	Zagreb	2,5	Belišće d.d.	31,92	12,77
Žitnjak d.d.	Zagreb	2	Križevci - produkt d.o.o.	23,69	11,85
Maxi Konzum	Virovitica	2	Križevci - produkt d.o.o.	-	-!
Maxi Konzum	Virovitica	2,5	Belišće d.d.	25,49	10,20
Trgocentar	Virovitica	2	Križevci - produkt d.o.o.	18,99	9,50
INA	Virovitica	2,5	Belišće d.d.	28,50	11,40
KTC	Virovitica	2	Križevci - produkt d.o.o.	14,99	7,50
KTC	Virovitica	1,4	Three star grillbag, Swedish match, Bugarska	17,49	12,49
Prehrana	Zagreb	1,4	Three star grillbag, Swedish match, Bugarska	29,89	21,35
INA Benzinska	Zagreb	2,5	Belišće d.d.	28,49	11,40
Diona	Zagreb	2,5	Belišće d.d.	29,63	11,85
Konzum d.d. maxi	Rijeka	3kg	Križevci - produkt d.o.o.	-	-
Konzum d.d. maxi	Rijeka	1,4	Three star grillbag, Swedish match, Bugarska	15,00	10,71
Getro	Rijeka	2,5	Belišće d.d.	11,50	4,60
Diona	Zagreb	2,5	Belišće d.d.	29,99	12,00
KTC	Kutina	2	Križevci - produkt d.o.o.	14,99	7,50

KTC	Kutina	1,4	Three star grillbag, Swedish match, Bugarska	17,49	12,49
Konzum	Kutina	1,4	Three star grillbag, Swedish match, Bugarska	15,00	10,71
Konzum	Kutina	2,5	Belišće d.o.o.	25,99	10,40
Pevec	Kutina	3	Hormar garešnica	21,00	7,00
Lonia	Kutina	2,5	Belišće d.d.	24,95	9,98
Lonia	Kutina	2,5	Hormar garešnica	21,35	8,54
Golija	Pag	2,5	Belišće d.d.	30	12,00
Kerum d.o.o.	Rijeka	2,5	Belišće d.d.	20,98	8,39
Merkator	Zagreb	2,5	Belišće d.d.	27,79	11,12

ANNEX 2

The Investment Promotion Act

The Investment Promotion Act (OG 73/00) regulates investment by domestic and foreign legal entities or natural persons. It also provides measures, tax relieves and customs benefits. Relieves and benefits may be granted only to newly established companies for their registered activities. Exceptionally, in the case of an investment in tourism, an already existing company may also be the beneficiary.
The incentive measures are divided into three groups by the target of the measure:

1) Boosting economic activities - lease possibilities, granting of building licences, the sale of and permits to use real estate or other infrastructures owned by the Republic of Croatia and units of local government or self-government under commercial or favourable conditions, including free of charge.
2) Encouragement in the creation of new jobs - the beneficiary of incentive measures may be granted a single amount of up to 15 000 kn per employee in order to cover the costs of job creation and re-training. Incentives may be used only for the creation of new jobs, provided that the number of new employees is not reduced over a period of at least three years.
3) Incentive in assistance for vocational training or re-training - the investor invests in vocational training or in the retraining of his/her employees, he/she may be granted an amount that covers up to 50percent of related costs.

Apart of the targeted incentives, there are also tax relieves (Table A.3) that is given according to the size of the investment and the number of newly employed persons:

Table A.3 Tax incentives

Investment (m kn)	Corporate income tax rate (%)	Relief period (years)	Minimal number of employees
4	10	10	10
10	7		30
20	3		50
60	0		75

Source: HGK, 2007

The incentives also include custom benefits for importing the equipment necessary to execute the investment. When equipment is imported as part of an investment, customs duties do not apply to goods under Chapters 84, 85, 86, 87 (except automobiles with a cylinder capacity exceeding 1 500 cm^3), 88, 89 and 90 of the Customs Tariff.
A company that intends to use an incentive measure or benefit submits a standard application form to the Ministry of the Economy, Labour and Entrepreneurship – Investment Promotion Department. Based on this request, the Ministry issues a certificate of compliance with the conditions set in the Investment Promotion Act, and the applicant obtains the status of a beneficiary of incentive measures, tax relieves and tariff benefits.

Apart of the legislation that is valid for both domestic and foreign investments, foreign investors should be aware of the additional rules specific for investments in Croatia such as:

4) Repatriation on profits - the Foreign Exchange Act (OG 96/03) regulates the transfer of profits to a foreign country. Under this Act, the transfer of profits is unrestricted and may be effected after all legal obligations in Croatia have been settled. If a company with profits to be transferred generates income in foreign currency from the export of goods and/or services, the transfer of profits is effected through the company's own foreign currency account. The foreign investor may keep the profits generated in Croatian currency in his domestic currency account held with an authorised bank. Besides the transfer of profits abroad and payments in Croatia, such profits may also be used for loans to domestic entities, as provided by law, and for transfers into the domestic currency accounts of other foreign persons.
5) Property rights of foreign entities - whether established with domestic or foreign capital, legal entities established and registered in Croatia are considered domestic legal entities and they have the right to acquire real estate irrespective of whether it is acquired for a business or some other purpose. Mortgage on real estate is possible in favour of foreign entities, too. Provided the condition of reciprocity is met, foreign natural persons and legal entities are free to acquire real estate in Croatia. The acquisition of real estate is regulated by the Property and Other Proprietary Rights Act (OG 91/96, 73/00, 114/01), and it needs approval by the Ministry of Foreign Affairs.
6) Business operations of foreign companies - the Companies Act (OG 111/93, 34/99, 118/03)has special provisions that govern foreign companies and sole traders (headquartered outside Croatia) carrying out business activities in the territory of Croatia. As a rule, foreign companies and foreign sole traders enjoy the same rights as domestic legal entities in their operations in Croatia. The only condition for doing business in Croatia is the establishment of a branch. Branches do not have the status of legal entities. All the rights and obligations coming from their operation belong to the founding company. Branches may engage in any operations that fall within the scope of company business activities.
7) Representative offices of foreign companies - under the Trade Act (43/03), a foreign person may establish a representative office in order to carry out market research, promotional and information activities, and also for its own representation. The representative office does not have the status of a legal entity. Therefore, it is not authorised to conclude contracts. Foreign representative offices may begin operation after entry in the Register of Foreign Entities' Representative Offices at the Ministry of the Economy, Labour and Entrepreneurship. For the purpose of their business transactions, representative offices are allowed to hold with authorised domestic banks both foreign and domestic currency accounts.