Croatia

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Summary

The main characteristics of the wood assortments sale are: a tendency of growth of quantity and a stagnation of value in the last three years, a growth of the share of sales on the basis of annual contracts and contracts lasting several years with domestic buyers, a growth of stacked wood export and problems with the collection of payments from domestic buyers.

Industrial wood processing is the significant segment of Croatian economics. The basis of its development is the exploitation of domestic natural resources and traditionally it is export-oriented. To confirm the strategy and revitalisation of industrial wood processing, its characteristics are very important.

The values of Croatian forests have been calculated on the basis of annual production of all forest goods and services. In the case of non-market values, the sheer existence of the forests has been taken into account and the flow of various services have been estimated based upon the actual state of forests, separated between its continental and Mediterranean part. It should be emphasised that there is the case of annual opportunity costs. Regarding the market values, the GDP for each group of goods and services has been monetarily estimated by means of the actual market prices which sometimes vary within the country.

1. Consumption

1.1. State of the art and historical development

Table 1. The Republic of Croatia, basic information for 2003

Land area, according to the graphic data base, situation as on 31 December 2002(1)	56,594 km^2
Surface area of territorial sea and interior sea waters(2),	31,067 km^2
Population, 2002 mid-year estimate	4,443,000
Population density per km^2	78.5
City of Zagreb, population, 2001 Census	779,000
Territorial constitution, situation as on 31 December, 2003:	Counties 21(3); Towns 124; Municipalities 426; Settlements 6,742
Gross domestic product per capita(4) (estimate at current prices)	6,377.4 US $
Average monthly paid off net earning	3,940 kuna (525.3 euro)
Average monthly gross earning	5,623 kuna (749.7 euro)
Retail prices (as a measure of inflation, average), 2003/2002	1.5%
Consumer price index, 2003/2002	1.8%
Coverage of imports by exports (5)	43.4%
Imports per capita(5)	3,196 US$
Exports per capita(5)	1,387 US$
International reserves of Croatian National Bank, end of period(6)	8,191.3 million US$
External debt, midpoint exchange rate(6)	23,672.0 million US$
Midpoint exchange rate(6), end of period	6.1185 HRK/US$

Notes:
1) Source: Surveying and Mapping Authority of the Republic of Croatia
2) Source: Faculty of Life Sciences and Mathematics, Geographical Department
3) Including the City of Zagreb
4) Data for 2003 are provisional (sum of quarterly data)
5) Provisional data
6) Source: The Croatian National Bank

Quarterly Gross Domestic Product estimate - the real Gross Domestic Product for the second quarter of 2004 is by 3.8% higher than in the same period of 2003 - based on the quarterly estimates, the annual GDP for the year 2003 showed an increase of 4.3%, as compared to the year 2002. Republic of Croatia has: 4,437,460 inhabitants (31 March 2001) and 448,532 agricultural households (1 June 2003).

The value of wood assortments sale depends on a number of elements: volume and structure of production of net wood mass according to the sorts of wood, technical, quality and thickness structure, supply and demand on the domestic and foreign markets, type of sale, place of delivery, quality of treatment and measurement, level and intensity of state regulation of commodity flow and domestic prices of wood assortments, exchange rate, etc. The situation on the wood market constantly changes, the demand for certain sorts or quality of wood falls or grows, the structure of buyers according to their purchasing power gradually changes, the intensity and extent of state regulations changes. There are always changes, although not drastic ones, with significant consequences on the amount of reserves of finished products, business results, even the financial stability and liquidity of the Company “Croatian Forests” Ltd.

The fact that strict regulations are not amended, especially the Regulations on Forest Management, does not make it any easier.

The income from selling wood assortment has a significant influence on the economic and commercial operations of the Company and it makes 75% of the financial income. The wood assortment is sold on domestic market (87%) and exported (13%). A half of the value of work on the biological reproduction and a significant part of long-term investments are financed with this income. Unfortunately, the selling of wood assortments is for the major part carried out in non-market conditions, i.e. at administratively regulated fixed prices. The principle of the distribution of the round wood buying rights (according to certain criteria) is being applied using the pricelist approved by the Ministry of Economy.

1.2. Forest products and service consumption

The main characteristics of the wood assortments sale are: a tendency of growth of quantity and a stagnation of value in the last three years, a growth of the share of sales on the basis of annual contracts and contracts lasting several years with domestic buyers, a growth of stacked wood export and problems with the collection of payments from domestic buyers.

Of the total production of 580,000 m^3 of sawnwood, exports account for 315,000 m^3. Total imports of sawnwood amounted to 180,000 m^3, of which 150,000 m^3 is coniferous wood. Forests and forest industry products, including wooden furniture, accounted for 7% of total exports in 2001, while imports represented 3.8%.

During the period of several years there has been an emphasised trend of growth of sold round wood quantities, but also oscillations in cubic wood sale, mostly between 1.45 and 1.85 billion m^3 per year. The average selling prices in the last five years have been maintained at about 41.73 euro/m^3, depending on the structure of the sold assortments. The average round wood selling price has been moderately oscillating between 65 and 71 euro/m^3. A moderate growth of cubic wood prices has been achieved with a greater share in export causing, however, higher transport charges to the place of delivery, when compared with the sales using only wood roads. A more significant round wood export would have a positive effect on business results, but it is very limited. The annual growth of prices of material, energy, services, spare parts, salaries and other expenses has been bigger, and only a growth in volume, i.e. quantity of sold wood assortments and a greater extent of work in forest cultivation enabled positive business results of the Company.

Table 2: Sale of wood assortments

Year	Round wood			Stacked wood			Total		
	1000 m^3	1000 euro	euro/m^3	1000 m^3	1000 euro	euro/m^3	1000 m^3	1000 euro	euro/m^3
1996	1,434	102,358	71.4	1,500	24,014	16.0	2,934	126,372	43.1
1997	1,527	103,758	67.9	1,605	24,109	15.0	3,132	127,867	40.8
1998	1,553	105,425	67.9	1,415	20,502	14.5	2,968	125,927	42.4
1999	1,710	113,980	66.7	1,530	19,686	12.9	3,240	133,666	41.3
2000	1,853	120,205	64.9	1,701	24,891	14.6	3,554	145,096	40.8
2001	1,798	120,334	66.9	1,587	25,140	15.8	3,385	145,474	43.0
2002	1,833	121,914	66.5	1,778	27,214	15.3	3,611	149,128	41.3

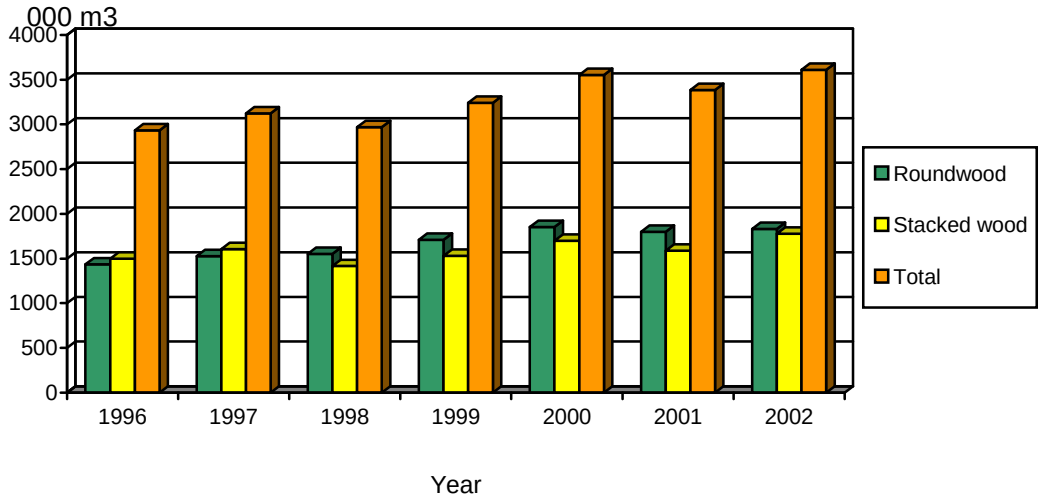

Figure 1: Presentation of sold quantities of wood assortments

The planned income from selling wood assortments in 2002 has not been realised, and the main reason is a 8.7% drop of sales of stacked wood. The realised average selling price of 40 euros/m^3 is 4.4% lower than planned, which results in lower income. Falling behind of the realised prices in comparison with the planned prices of round wood and stacked wood has had several causes and the main ones are: a growth of wood sales to domestic customers according to annual contracts or contracts of several years (the prices are approved by the Government of the Republic of Croatia according to the pricelist, progress payment in several months, and even rebates for some products), lower sales in auctions, and partly a poorer quality structure of the produced wood assortments (assortment structure, dry wood, previous growth).

Table 3. Consumption of furniture and other wood products of the Republic of Croatia in 2003 (euro)

Product	**Production**	**Export**	**Import**	**Consumption (P+I-E)**
Furniture	322,585,752	157,556,577	236,506,002	401,535,177
Other wood products	336,200,528	253,934,565	187,927,499	270,193,462

Figure 2: Consumption of furniture and other wood products of the Republic of Croatia from 1996 - 2003

1.3. Market demand for forest related products and services by urban population

Table 4. Personal consumption, average by households

Consumption group	Average annual personal consumption in a household, euro			Personal consumption structure, %		
	2000	2001	2002	2001	2002	2003
Personal consumption – total	7,682	8,174	8,729	100.00	100.00	100.00
Food and beverages	2,470	2,752	2,807	32.15	33.67	32.15
Alcoholic drinks and tobacco	298	332	347	3.89	4.07	3.98
Clothing and footwear	774	747	773	10.08	9.13	8.86
Housing and energy*	1,024	1,095	1,197	13.33	13.39	13.71
Furniture, equipment and maintenance	377	461	482	4.91	5.64	5.52
Health services	161	165	194	2.09	2.01	2.23
Transport	938	940	966	12.20	11.49	11.07
Communication	212	284	420	2.76	3.48	4.81
Recreation and culture	515	478	560	6.71	5.85	6.42
Education	56	68	59	0.73	0.83	0.68
Hotels and restaurants	282	243	276	3.68	2.98	3.16
Other good and services	574	609	646	7.47	7.46	7.41

***Expenditures of housing exclude the imputed rent.

In year 2002 total personal consumption was 8,729 euro, and for furniture, house equipment and maintenance is 482 euro, with trend of growth.

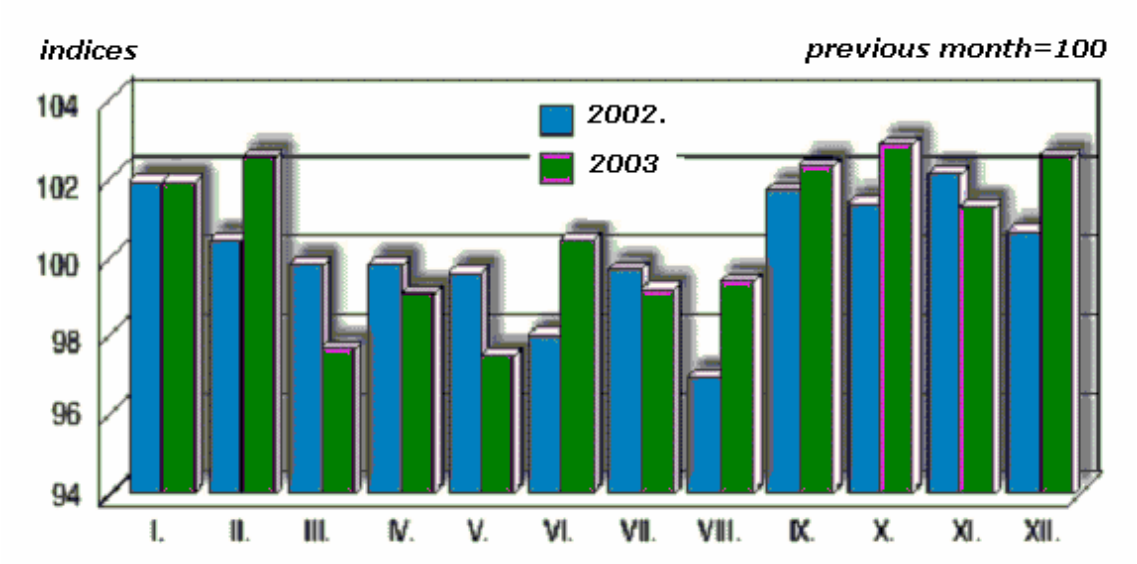

Figure 3: Producers price indices of agricultural, forestry and fishing products

In the researched period, the sale of wood assortments provided the income required for the Enterprise business activities as well as for simple and extended biological forest regeneration. However, these funds were not sufficient for the investments. This will cause technological lagging as well as the increase of business operating costs in the period to come. Therefore, it is necessary to continue with acquiring non-accessible forests in order to increase the production of the main forest products and harmonise the prices of wood assortments with the prices on the European market.

The Project of Restructuring of "Hrvatske šume", p.o. Zagreb is expected to ensure the increase of income of other forest products and other activities. The solution of these problems will probably facilitate the access of the Republic of Croatia to WTO. The above facts and problems require certain changes in the Croatian law (Forest Act, Law on Hunting, Law on Water Resources, Environmental Protection Act) related to forestry, hunting, water resources management and environmental protection.

The income from wood assortments sales have a significant influence on the economic and financial operation of the "Hrvatske šume" Company ltd. They provide 75% of the business income and are realised by sales on the domestic market (87%) and export of wood assortments (13%). Domestic wood processing industry is going through a transformation. Because of the new conditions caused by a planned membership in the European Union, there will be a greater pressure from foreign furniture producers, and consequently the structure of wood assortments trade. More attention will have to be paid to the marketing in forestry in the future, and following world trends in the production of furniture, as well as supply and demand of the wood products on the European market. The population should be informed about new products and services in forestry, which will influence prices of certain products. Adjusting to new needs for natural resources, it is necessary to predict new trends in forestry and wood processing, which are only indicated at the moment.

1.4. Main problems and research questions in consumption for enterprise development

Table 5. Main problems and research questions

	Strategic actions	Priority
A 1.	Undertake an inventory of unused biomass as potential energy source	I
A 2.	Identification of unused land, selection of the most favourable species and technology for the establishment of plantations	I I
A 3.	In co-operation with other sectors, defining and achieving incentives for biomass based on the implementation of the Kyoto protocol	I I
A 4.	Utilisation of biomass as a principal energy source in forested areas	I I
B 1.	Incorporate provisions into legal framework which facilitate the development and utilisation of non timber forest and forest land products	I I
B 2	Co-ordinate supervision regarding the implementation of regulations related to the utilisation of non timber forest and forest land products	I I
C 1.	Identify, evaluate and define the management principles for all non timber forest and forest land products	I
C 2	Undertake a national inventory of non-timber forest and forest land products	I
C 3.	Promote the economic utilisation of value added non-timber forest and forest land products	I
C 4.	Evaluate and assess the potential for the development of urban forestry	I I
D 1	Prepare a specific timber industry strategy	I
D 2	Support the development of institutional capacity to implement timber industry strategy	I
D 1.	Support the establishment of monitoring timber and timber products markets	I
D 2.	Promote measures for the creation of a recognisable trademark for Croatian timber and timber products.	I I
D 3.	Promote initiatives for the implementation of the highest quality standards	I I
D 4.	Intensifying quality control of delivered raw materials and imported finalised products and harmonisation of legislative regulations which define the quality control issues	I

Annex A: Organisations studying forest products consumption and main publications and information sources

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Tel: ++38512352555, www.sumfak.hr
Croatian Chamber of Commerce, Rooseveltov trg 2, HR-10000 ZAGREB
Tel: ++38514561555, e-mail: hgk@hgk.hr, www.hgk.hr
Croatian Employers' Association, Pavla Hatza 12, HR-10000 ZAGREB
Tel: ++38514897555, e-mail: hup@hup.hr, www.hup.hr
Ministry of Economy, Labour and Entrepreneurship, Ulica grada Vukovara 78, HR-10000 ZAGREB, Tel: ++38516106111, e-mail: info@mingorp.hr, www.mingorp.hr
Ministry of Forestry, Agriculture and Water Management, Ulica grada Vukovara 78
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2. Small-scale forestry practices

2.1. State of the art and historical development

Privately owned forests account for 461,137 hectares or 19% of the total forest area in Croatia and 11.7% of the growing stock. The number of owners is 599,056 and the average size of the property is 0.76 hectares. In practice, with some exceptions, private forests remain essentially unmanaged. The sector is characterised by:

- high degree of fragmentation not only in size of plots but also due to the fact that many owners reside in the cities,
- lack of sylvicultural skills and forestry tradition,
- insufficient number of owner associations,
- the majority part is degraded and major investments are needed.

2.2. Small-scale forest holding

Despite the fragmented nature and relatively small average holding, private forests have the potential to contribute more in terms of wood production and other forest services. It is highly unlikely to happen unless remedial actions are put in place as for example incentives for the establishment of owner associations, introduction of government subventions for management of private forests. There is one association that provides a useful model and indicates that such associations can work. There is one owners association on the territory of Medvednica (Sljeme), which includes 360 owners, who own 200 ha, which represents an average holding of 0.55 per owner, and it can serve as a useful model and evidence that associations like this can function.

2.3. Small scale forestry practices

According to the data on the working equipment and workforce, the entrepreneurs are divided into four groups. Table 6 shows the share of groups in the list.

Table 6. Basic structure

Group	Entrepreneur's frequency	
	N	%
Entrepreneur with employees and working equipment	197	36.62
Entrepreneur with employees, no/not mentioned working equipment	61	11.34
Entrepreneur with no/not mentioned employees, with working equipment	130	24.16
Entrepreneur with no/not mentioned employees and with no/not mentioned working equipment	150	27.88
Together	538	100.00

In the group no employees and no working equipment the notes "workers as required" and "equipment available as required" are very common. In case of contracting the provision of services, such contractors would probably engage temporarily the required workers and working equipment. In the Croatian entrepreneurial practice, and not only in forestry, it is quite usual to engage workers for temporary services. Entrepreneurs usually choose the workers with social welfare settled on some other grounds (retirement, waiting for work in an employment bureau, sick-leave). Very often, entrepreneurs take advantage of non-employment and low price of work at the expense

of workers, temporarily and/or permanently employed. Apart from unemployment, such conditions are also favoured by inefficient legal system, inadequate engagement of work inspection and lack of trade unions capable of protecting the workers' rights.

According to the number of employees and number of working equipment, and taking into consideration the notes in the list, the following forms of entrepreneurs in the Croatian forestry have been established:

- Part-time contractors with no machines and employees;
- Self-employees with one or two machines and no workers;
- Minor contractors with one or two machines and one or two employees;
- Contractors with work groups of 2 to 4 workers;
- Entrepreneurs – managers with work groups of 5 to 15 workers and significant mechanisation or working equipment;
- Enterprises dealing with the provision of services but not only in forestry, with significant mechanisation and a considerable number of employees, e.g. owners of building mechanisation.

Table 7. Data on workforce and working equipment of forestry entrepreneurs

Category	**Number, N**	**Average per entrepreneur**
Employees	998	1.9
Workers	977	
Engineers	21	
Chain-saws	608	1.1
Stihl	10	
Husquarna	2	
Not-classified	596	
Adapt. farm tractors	230	0.4
IMT	42	
Zetor	9	
Torpedo	9	
Steyr	2	
Universal	2	
Ursus	2	
Not-classified	164	
Skidders	215	0.4
LKT	91	
Timberjack	23	
Not-classified	101	
Horses	591	1.1
Forwarders	9	
Yarders	2	
Tractor assemblies	9	
Build. mechanisation	13	
Trucks	17	

The survey of a general entrepreneurs' power in terms of human resources and technical-technological equipment has been obtained by breaking down and counting the employees and working equipment by groups according to the list (Table 7).

This list has shown that 1/5 of all employees were employed by only three enterprises, whose main activity was not the performance of forest works. This means that the average number of 1.9 employees per enterprise is somewhat lower and could correspond to the average number of chain-saws (1.1). With approximately 0.9 mechanised means for wood extraction, it becomes clear that here we deal with small groups and it can be assumed that an average entrepreneurial unit is made of 1, 2 or 3 cutters, and if required hookers, of which 1 or 2 are operators of forest mechanisation.

A large number of entrepreneurs stated to have at their disposal different tools and devices for manual and motor-manual work, and the possibility of engaging workers as required. Such result should be related to the beginnings of entrepreneurship development when due to the risk of engaging third-party capital (related to insecurity of making long-term contracts involving serious business transactions), the entrepreneur rarely decided to employ a higher number of employees and purchase his own and, as a rule, expensive forest mechanisation.

2.4. Policy framework and production condition

The law prohibits selling of state owned forests or forest lands to third parties or granting concession(s) for management of these resources. It is strategically important for the long-term development of forestry sector that state assets remain the property of the government. This will ensure that multiple forest amenities are available to society and public purpose activities are maintained and funded.

Over the past 10 years, the majority of countries in Europe have either amended as is the case in European Union countries or rewritten their forest legislation as is the case for transition countries. Their experience in redrafting forest laws has shown that the drafting of sound and workable law requires genuine involvement of all categories of stakeholders. Without this involvement, the prospects of the existing laws to reflect reality are slim.

Currently any physical or legal entity can be established as forestry contractor, even if they have no professional qualification, competence or training. The quality and competence of forest contractors directly impacts on the activities in forests and forest lands. Many countries require either that forest contractors be registered or obtain national competency certification for their activities. It is necessary to insist on forestry contractors to be registered legal entities and to own certificate for their activities. In order to implement the aforementioned and taking into account the experiences of other professions, the establishment of forestry chamber becomes a necessity.

Table 8. Policy framework

Strategic actions		**Priority**
1.	Simplify management plans for private forests and secure funds for their implementation	I
2	Establish additional extension services to provide technical guidelines and facilitate associations of private owners	II
3.	Support and promote measures to ensure the sustainable management in private forests	III

2.5. Supporting and limiting factors for enterprise development in small-scale forestry and barriers to entrepreneurship

Current format and regulatory requirement for forest management plans are based on large management units and are not suited to small average private owner holding. Entrepreneurs in the Croatian forestry represent minor, poorly equipped, family enterprises, usually with no permanently employed workers, and without typical means of forest work, if any. Entrepreneurial organisations have short life, entrepreneurs' fluctuation is high and the number and type of services they provide are restricted.

The significance of entrepreneurs in the Croatian forestry is indisputable and considerable. Each year they perform on average 14% of felling and 44% of wood skidding. They take part in reforestation activities with a share of approximately 10%, and in wood transport with approximately 70%.

Forestry entrepreneurs, despite their ever increasing presence and significant share in the performance of production tasks, have not been properly organised or qualified so far and hence they could not have a stable role in the production segment of the Croatian forest management.

For upgrading the forestry entrepreneurship, it is necessary to provide a comprehensive system of information on forestry contractors and services they provide. Such system has not been established yet in the Croatian forestry, and this represents a serious defect in making a high-quality analysis of the actual position of forestry entrepreneurship and possibility of its upgrading.

2.6. Organisations studying small-scale forestry and their speciality

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Ministry of Forestry, Agriculture and Water Management, Ulica grada Vukovara 78
HR-10000 ZAGREB,Tel: ++38516106111, e-mail: office@mps.hr, www.mps.hr
Croatian Forestry Association

3. Wood-processing industries

Wood-products sector consists of a great number of small enterprises and quite a small number of big manufacturers. In 2003 there were 530 saw-mils and only 96 of them had more than 24 employed workers. The situation in furniture industry is similar with only 48 out of 234 enterprises which have more than 24 employed workers, and ten leading enterprises achieve 83% of the sector income.

Industry of wood processing in the Republic of Croatia shows negative economic trends in the last ten years, which is manifested in diminishing production, overall revenue, exports, number of employees and rising loses. However, the quality of infrastructure, raw materials, workforce and tradition of marketing on specific markets and reached level of privatisation (almost all companies have been privatised) in the industry of wood processing is satisfactory, which is good basis for assessment of development prospects, but insufficient for initialising a new development cycle in this branch of industry.

Technology has lagged behind other countries in Europe, especially in the sawmilling and furniture sectors. There are three pulp and paper enterprises producing refined mechanical pulp, paper, carton, corrugated paper etc. and one small particleboard mill producing product for the home market. Hrvatske šume, limited company, Zagreb, is dominant supplier of roundwood to the Croatian timber industry and supplies over 94% of the roundwood used. This situation will continue indefinitely into the future, due to the scale, quality and fragmentation of private forest supplies.

Total installed capacity in the sawmilling industry is estimated at 6.3 million m^3 of logs on an 8-hour shift basis based on a survey by Croatiadrvo and while this may be an overestimate, it is some 3 times more than the annual allowable cut in our forests. The industry and exports have traditionally depended on Europe, particularly the Italian market. Raw material and products exported to Italy are further processed and to other European markets.

Main method of procurement of roundwood by the sawmill industry is by annual and five-year contracts. Public auctions account for only 10% of all roundwood sold to the sawmills. The use of contracts has increased significantly since 1996. Prices are reviewed annually and approved by the Ministry of Economy. Prices have remained fixed for the last five years and have not responded to end market movements. All roundwood is harvested directly by HŠ or by contractors.

3.1. State of the art and historical development

Figures 4 presents dispersion of sawmills in Croatia, which have been taken in to the observation by questionnaire.

Croatian technology is behind other European countries modern technologies and this sector has got a lot of obsolete equipment especially in saw-mills and in furniture industry. The part of the wood products sector in GDP was 1.4% in 2002, with only 0.5% industrial manufacture of furniture, 0.4% of wood-pulp and paper and 0.5% of wood and wood manufactured products. The part of wood sector in GDP is estimated at additional 1%.

Figure 4. Present dispersion of sawmills in Croatia

The sector is an important source of jobs especially in rural areas and in 2002 there were 29,300 employed people with 11,500 who worked in wood processing, 11,600 in furniture manufacture and 6,200 in wood-pulp and paper industry. Croatian woods are a leading provider of roundwood for the wood industry in Croatia because they provide with more than 94% of exploited roundwood. This situation has been going on because of the rate, quality, and split provision of private woods.

The total capacity of the saw-mill industry is estimated at 6.3 million m^3 of saw logs based on eight-hour working shifts. This means that the possible capacity is more than three times bigger than the allowed annual cutting in Croatian woods. Industry and export traditionally count on Europe, especially on Italian market. Raw materials and products which are exported to Italy are further processed and exported with added values to other European markets.

Basically, the saw-mill industry provides roundwood through annual and five-year contracts. Public auctions account for only 10% of total roundwood sold to the saw-mills. The usage of raw material provision through contracts has significantly grown up since 1996.

Table 9. Number of sawmills in each counties in Croatia

Counties	Number of sawmills	Counties	Number of sawmills
Zagrebačka	29	Požeško-slavonska	7
Krapinsko-zagorska	4	Slavonsko-brodska	4
Sisačko-moslavačka	18	Zadarska	2
Karlovačka	42	Osječko-baranjska	25
Varaždinska	15	Šibensko-kninska	-
Koprivničko-križevačka	7	Vukovarsko-srijemska	12
Bjelovarsko-bilogorska	25	Splitsko-dalmatinska	2
Riječko-goranska	52	Istarska	6
Ličko-senjska	22	Dubrovačko-neretvanska	-
Virovitičko-podravska	4	Međimurska	2

The saw log prices are reconsidered only with the previous consent of Ministry of economics. The prices have been unchanged for the last seven years and they haven't been influenced by market trends. The industry started its work easily since there were no problems to deliver second-hand machines from countries like Italy. Moreover, the industry is split and that prevents the development of competitive advantages in sense of range and depth of entering the market.

The common ground between Croatian woods and industry is a low flow of market information. The low flow of exchanging information between the saw-mills is caused by the annual production plan which is not worked out in detail as far as different sorts of goods are concerned. To plan in advance in this surrounding is very hard, even impossible.

Such a centralised approach where the wood prices are defined by the Ministry of economics in spite of the market trends of supply and demand for round wood , has a significant influence on the competition and success of industry and on the competence of Croatian woods to co-ordinate demand with supply. In the meantime the strategy of wood and paper development industry has been brought out, so we expect the establishment of clear market relations when round wood is sold among all the partners from Croatian woods to ultimate raw material users.

Croatia is the marginal provider on the international market and most customers are quite unfamiliar with its products and supplies. Other countries experiences have proved that the development of strong and positive market image of some exporters is the process which requests a few years of systematic and persistent effort.

The estimated capacity of saw-mills and allowed annual cutting has almost reached the overreaching factor three. This situation can't keep up over the long term and there should be some kind of rationalisation to be conducted with the emphasis on those enterprises that can achieve the added value and show the competence of effective business.

Under the current trend of market globalisation, competition is becoming stronger and requirements for high quality combined with acceptable prices are gaining in importance. Since its beginnings, the Croatian wood industry and furniture manufacture has been oriented to exporting its products on the world market, the reason being that the Croatian market is too small to absorb all the resources and potentials contained in this field.

3.2. Wood processing industries

In 2003 Croatia manufactured the beech tree sawdust in the greatest amount (267,720 m^3 or 41.1%), and then the oak tree sawdust in the amount of 168,685 m^3 or 25.9%. The manufacturing amount of conifer tree sawdust is 103,171 m^3 or 15.8% and there are 2,858 m^3 (0.4%) of sawn thresholds. 109,102 m^3 or 16.8% is the amount of some other manufactured trees sawdust.

As far as plywood veneer and chipboards are concerned, the chipboards are manufactured in the greatest amount (61,376 m^3 or 55.8%). There is a smaller amount of manufactured plywood veneer sheets (28,910 m^3 or 26.3%), and the least manufactured are plywood boards and compressed wood blocks, boards, bands, etc.(6,359m^3 or 5.8%, i.e. 13,355 m^3 or 12.1%).

If we analyse the parquet manufacture in Croatia, conclusion is that the oak tree parquet is manufactured the most (2,704,308 m^2 or 79.9%). The manufacture of the beech tree parquet is 280,301 m^2 or 8.3%). Then, there is the ash-tree parquet with the manufacture of 272,226 m^2 or 8.0% and the manufacture of other trees parquet is 129,431 m^2 or 3.8%. In the table there is the aggregate value of export and import of primary wood processing from 1994 to 2003.

Table 10. Aggregate value of export and import of primary wood processing (1994-2003)

Year	The aggregate value of export (1000 euro)	The aggregate value of import (1000 euro)	Export/import ratio
1994	177,814	37,764	4.7
1995	175,060	54,867	3.2
1996	176,623	85,828	2.1
1997	199,858	110,963	1.8
1998	191,576	105,680	1.8
1999	212,832	88,403	2.4
2000	245,259	106,239	2.3
2001	230,105	134,981	1.7
2002	235,229	161,949	1.5
2003	253,934	187,927	1.4

If you consider the furniture and other final wood manufactured products, in 2003 Croatia manufactured chairs and seats in the greatest amount (2,063,834 pieces or 53.5%), other household furniture (dining rooms, children's rooms, bedrooms - 1,034,214 pieces or 26.8%), furniture for business and trade accommodation (481,017 pieces or 12.5%), armchairs, two-seaters and three-seaters (147,099 pieces or 3.8%) and kitchen furniture (130,545 pieces or 3.4%).

In the following table there is the aggregate value of export and import of furniture in Croatia from 1994 to 2003.

Table 11. Aggregate value of export and import of furniture (1994-2003)

Year	The aggregate value if export (1000 euro)	The aggregate value of import (1000 euro)	Export/import ratio
1994	116,795	45,354	2.6
1995	117,047	72,135	1.6
1996	95,807	73,085	1.3
1997	110,506	124,739	0.89
1998	95,483	132,880	0.72
1999	98,736	116,405	0.85
2000	112,719	124,369	0.91
2001	139,478	164,983	0.85
2002	154,917	216,334	0.72
2003	157,557	236,506	0.67

3.3. Wood-processing industries practices

Croatia is a small, export-oriented country. However, due to its structure, export consists of predominantly raw materials and semi-finished goods, for which importers do not require companies to join the ISO system. It is to be expected that furniture producers will also become export-oriented. The first step will be to join world chains, followed by the implementation of the ISO 9000 system.

Apart from the above, the quality of a product, combined with its competitive price, will become one of the decisive factors with which the Croatian wood industry and furniture manufacture will compete with the countries of Central and Eastern Europe on the ever more demanding European Union market.

Table 12. Number of companies in timber processing, furniture manufacture and paper processing

Field of wood production	Number
Production of sawn products and boards	**274**
1.1. Sawn products	251
1.2. Veneer and boards	21
1.3. Impregnation	2
Production of final wood products	**601**
2.1. Chairs and seats	32
2.2. Kitchen furniture	17
2.3. Office furniture	48
2.4. Mattresses	4
2.5. Other furniture	17933
2.6. Production of packaging	211
2.7. Wood construction elements	77
2.8. Production of other wood products	
Pulp and paper production and processing	152
3.1. Pulp and paper production	11
3.2. Paper processing	141

The size of a company is commonly measured with several parameters, such as:
- the number of employees;
- the amount of the realised total income;
- the amount of the realised profit;
- the value of fixed assets;
- the company share on the market of certain products and services and similar.

Each of these parameters has some advantages, but the one relating to the number of employees has more advantages than the others. In the last few years the structure of wood industry in the Republic of Croatia has changed profoundly in favour of small companies at the expense of large companies. This fact is further accentuated by the data showing that about 70% of the companies in the Republic of Croatia employ up to 20 workers.

Three groups of small and medium-sized companies in the wood industry in Croatia should be differentiated in terms of their roles. The first group includes traditional small companies that produce goods and services intended for the local market. The second group is made up of small companies – co-operators of large companies which compete directly on the regional, national or international market, but are faced with competition by other home producers. The third group consists of small independent companies which are present on the foreign market independently. It is the companies in this group that should become the leading exporters.

As mentioned, Croatian wood processing and furniture manufacturing firms have certified ISO 9000 quality management systems. In the year 2003 only 9 Croatian firms have certified ISO 9000 systems. That makes less then 1% (0.88%) of all wood processing and furniture manufacturing firms in Croatia.

A total of 758 firms of all industrial and service branches have certified ISO 9000 quality management systems. It means that wood processing and furniture manufacturing firms make only 1.19% of all ISO 9000 certified firms in Croatia. At the same time only 57 firms in Croatia have certified ISO 14000 environmental management system, and none of them is in a wood processing and furniture manufacturing branch. All those 57 firms have certified ISO 14000 in addition to ISO 9000 system.

3.4. Policy framework and production conditions

Industrial wood processing is the significant segment of Croatian economics. The basis of its development is the exploitation of domestic natural resources and traditionally it is export-oriented. To confirm the strategy and revitalisation of industrial wood processing, its characteristics are very important:
- very high share of domestic raw materials in all phases of processing;
- permanent export-orientation;
- growing and a long term tendency of the world demand for all phases of wood processing products;
- a large dispersion of enterprises and profitable centres in all Croatian counties;

- possibility of a high degree of employment in small areas where it is often the only source of income and where there are no infrastructure, other raw materials and technical staff to organise some other manufacture (a combination of individual agriculture and wood processing);
- relatively low investment value of individual manufacturing objects and of the employed person;
- quite ecologically acceptable activity.

The results that have been achieved in the sector of industrial wood processing are certainly the outcome of its comparative advantages (high share of domestic raw materials, relatively low investment value of certain manufacturing objects, etc.). But these comparative advantages are not enough for future existence and development. So, there is a future need to stimulate its competitive competence oriented to final manufacture.

To define an acceptable development, we have to take into consideration the current conditions of Croatian wood processing industry, its structure and dynamics, technological level, world trade involvement, international competition, employment, natural, human and capital potentials. The current condition of most above listed components of wood-products sector is unfavourable.

So far approach has been based on the old paradigm - from saw logs to final products and price consideration. A new paradigm has to be introduced – from the market and final products to saw logs and other inputs. Theoretically, the task is to fully activate the wood resources in wood processing manufacture to achieve the highest degree of final stages and export.

The approach and function which stimulate industrial development of these branches and a new system of measures, instruments and hypothesis must be systematic and not partial as now. The expected result is a new industrial policy of the sector whose function is the export and development of final wood products and which is effectively co-ordinated with wood policy.

Except the task to stimulate the export, there has been a constant fall in domestic furniture sales on domestic market, so it would be useful to connect manufacturers and traders, and invest into the trade centres where Croatian furniture will be sold.

3.5. Supporting and limiting factors for enterprise development in wood processing industries and barriers to entrepreneurship

The industry can be characterised by low barriers to entry, given the relative ease to acquire second hand machinery from countries such as Italy. In addition, the industry is fragmented, which prevents the development of competitive advantage in terms of scale and market penetration.

The interface between Hrvatske šume, limited company, and the industry is characterised by low market information flows. An example of this low level of information exchange is that the sawmills are given no detailed annual plan of

production in terms of species and assortments. In this environment, it is difficult if not impossible for the sector to plan ahead.

This centrally planned approach, where timber prices are set by the Ministry of Economy with no reference to either market developments or demand/supply for roundwood, has significant impact on the competitiveness and performance of the industry and on the ability of Hrvatske šume, limited company, to match supply with demand. For the future it will be important to establish clear and transparent market relations in the sale of roundwood along the lines of partnership between Hrvatske šume, limited company, and end users of the raw material.

In a current situation where Croatian exports to southern Europe are further processed and re-exported to higher value added markets reduces the net contribution of the sector to the national economy. Domestic industry has the potentials for developing direct trade links with these end use markets. Certification of forests and wood-processing industry chain is a useful tool in this process.

The Republic of Croatia is a marginal supplier to international markets and its products and supply potential are relatively unknown among buyers apart from a few exceptions. Experience of other countries has shown that developing a strong positive market image for a new exporter is a process which takes years of systematic and persistent effort by the industry.

The factor of exceeding the rated capacity of the sawmills and estimated annual allowable cut is almost three. This situation is untenable in the long run and some rationalisation will have to occur with increased emphasis on those companies that can add value and demonstrate an ability to operate efficiently.

4. Non-wood forest products and services

Croatia has a heterogeneous territory, as a result of its particular location at the junction of the Panonian, Alpine-Dinaroides and Adriatic-Mediterranean spaces, within the northern temperate zone. It occupies 56,540 km^2 and is divided into: the central part (34.8% of total area), the eastern part (19.6%), the mountainous region (14.0%), the northern littoral (10.8%) and the southern littoral (20.8%). The Mediterranean karst area stretches on 21,429 km^2, that is 38% of the total country area. Croatia has 4.38 million inhabitants, about 32% of which live in the Mediterranean-littoral area (Central Bureau of Statistics, 2001).

The country is shaped like an overthrown 'V', directed from the west to the east. The southern branch, the longest and narrowest, extends along Adriatic coast between Kotor Bay now in Montenegro, and Savudrija, at the Slovenian border, north of Istria peninsula (Castellan and Vidan, 1998). Three regions can be distinguished: Mediterranean or Adriatic region, Panonian region, and, between them, the mountainous region.

The **Adriatic region** comprises the Adriatic coast, with its 1,185 islands, islets and rocks. The small coastal fields are cultivated with leguminous and fruits, particularly vineyards and olives. The autochtonous vegetation is formed by Mediterranean plants. The climate is represented by mild winters, warm and dry summers. Precipitations are rare, however reaching 800 mm in the southern islands, up to 1,500 mm in the Rijeka region. Due to the mild climate, the coastal region (Primorje) is densely populated; regions around Rijeka, Zadar and Split go beyond 200 inhabitants/km^2.

The **Panonian region**, located in the north, covers half of the country area, with 66% of the population. It includes the huge plain between the rivers Sava and Drava, divided by hills and plateaus up to 500 m altitude. To the west and north from Zagreb, Croatian territory reaches the foot of Slovenian mountains hardly beyond 1,000 m. This region has a continental climate, with sharp differences between temperatures in winter and summer.

The **mountainous chain** of Dinara situated between the Adriatic and Panonian regions, is well endowed with forests (beech and fir) on its western part. Climate is characterised by abundant precipitations exceeding 3,000 mm. To the south-east, between the coast and inland, extends the beautiful mountain of Velebit. The whole region, except for the littoral part, is scarcely populated, especially after the war of independence (1991-1995).

4.1. State of the art and historical development

Table 13. presents the estimates of forest values grouped into direct and indirect use values, option, bequest and existence values as well as negative externalities linked to Croatian forest and its Mediterranean part. A more detailed description of the methods and indicators employed is given in the following sections.

Table 13. Values of Croatian forests

Valuation method/output	Total quantity	Total value (1000 euro)
Direct use values (total):		**684,016**
Market price valuation:		
Timber for trade (million m3)	2.3	188,260
Firewood (million m3)	2.4	331,600
Net growth of standing timber stock (million m3)	4.8	97,044
Forest fruits: chestnuts, walnuts, berries, other	...	7,583
Mushrooms (t)	1,000	2,000
Truffles (t)	20	1,600
Medicinal herbs and plants (t)	2,000	1,000
Fibrous materials (t)	2,500	1,000
Honey (t)	1,000	2,000
Surrogate market pricing: Fodder and forage (t of fodder)	261	13,066
Consumer surplus (benefit transfer, CVM, TCM):		
Recreation (no. visitors)		28,758
- in forest reserves		986
- in national parks		27,771
Hunting (no. hunters)	47,000	10,105
- Local hunting	42,000	9,030
- Foreign hunting	5,000	1,075
Indirect use values (total):		**180,078**
Cost-based method :		
Water protection and erosion control (million ha)	2	2,078
Carbon sequestration (tC)	8.9	178,000
- in forest soils	2.7	54,000
- in biomass	6.2	124,000
Option, bequest and existence values		**129,600**
Potential use of recreational services		18,000
Potential use of other environmental services		111,600
Negative externalities		**-38,683**
Damages caused by forest fires (ha)	4,600	-2,683
Damages caused by touristic use	...	-36,000
TEV		955,011

Direct use values

Several direct use values of Croatian forests, such as timber, firewood, forest fruits are estimated on market price basis. Fodder and forage for grazing are valued by means of surrogate market pricing, while the value of hunting and recreation are based on the Contingent Valuation (CVM) and Travel Cost (TCM) results and benefit transfer.

Timber and firewood. Timber from Croatian Mediterranean forests has little importance for wood industry, primarily because of the inadequate tree species for exploitation. Significant value is attributed to firewood, most of which comes from continental forests. Quantitative valuation of timber and firewood considers the annual cut with and without permits. Timber removals are about 2.3 million m^3, of which around 5.4% come from the Mediterranean forests. Firewood production is about 2.4 million m^3, to which Mediterranean forests contribute with 80%. Based on the roadside prices, the monetary value of timber and firewood results 188,2 million euro and 331.6 million euro

respectively. The value of wood forest products (WFPs) in the Mediterranean Croatia is only 9.7 million euro.

Net growth of standing timber stock. Quantitative valuation is the difference between the annual increment and total annual cut (4.8 million m^3). Estimated at half of the stumpage price, it gives a total value of 97 million euro.

Forest fruits. In Croatia there is a variety of forest fruits, firstly thanks to the close-to–nature sylviculture, secondly, due to the spread of berries – particularly blackberries – among other shrub vegetation on places where degradation progressed (as a result of forest fires, clearcutting, overcutting, grazing, overexploitation for fodder and forage) (Šatalić and Štambuk, 1997). Monetary valuation was undertaken for chestnuts, walnuts, berries and other (miscellaneous).

On average, the harvest of chestnut reaches 11.400 t/year, which valued at a market price of around 0.6 euro/kg, gives a total value of 7.13 million euro. About 1.5 t of walnut are picked from forests yearly, which leads to a total monetary value of 3,000 euro, considering an average price of 2 euro/kg. It is supposed that 80% of the total quantity of chestnut and about 30% of the amount of walnut are sold on the market, the rest being self-consumed.

The most common forest fruits in Croatia are a wide variety of berries as well as apples, pears, cherries, and less often, meddlers, which are mostly collected for self-consumption. However, it is estimated that only insignificant quantities of these products (100 t) are sold on the local market, with a total annual value of 150,000 euro. Other forest fruits collected from the forests for marketing and self-consumption are estimated at about 500 t, having a total market value of 300,000 euro. Adding up these figures, total monetary value of forest fruits attains 7.6 million euro, of which slightly less than half can be attributed to the Mediterranean forests part.

Mushrooms and truffles. Mushrooms are generally harvested by individuals for subsistence and/or recreational purposes. Nevertheless, significant quantities – most of them growing in the forest, except for champignons - are seasonally sold on the green market throughout the country. There is no official data on the quantities of mushrooms harvested from the forests. However, it can be assumed there are around 1,000 t, out of which one third is sold on the market and the rest self-consumed. The total value estimated for both uses at market prices attains about 2 million euro, half of which is collected from the Mediterranean part of country. In Istrian peninsula, about 20 t of truffles are annually produced, of which around 90% is exported, mainly to Italy, and the reminder is consumed domestically. At a price of about 80 euro/kg, it results a total value of around 1.6 million euro.

Medicinal plants. Forest and forest soil in Croatia are inexhaustible sources of medicinal plants, which for centuries have been collected for local use, and in later times, for industrial purposes. Among the most demanded medicine plants on the market, it should be reminded the foxglove (*Digitalis purpurea*), the belladona (*Atropa belladona*), the monkshood (*Aconitum napellus)*, the autumn crochus (*Colchicum autumnale)*, the common horsetail (*Equisetum arvense)*, *Potentilla formentilla*, the alchemilla

(*Alchemilla vulgaris)* and the chamomile (*Matricaria chamomilla*). Additionally, there are more than 80 species of herbs and plants collected for medicinal use, from the arid and semi-arid littoral and mountainous part behind the Adriatic coast (typical Mediterranean), up to the humid, rainy northern and north-eastern part of the country (continental). Before the IInd World War, the Dalmatian insect powder made from the flower of pyrethrum (*Chrysanthemum cinerariafolium*), was demanded as a high quality and efficient insecticide. Later developments of chemistry pushed it out of the market, while recently, new ecological movements seem to bring it back. Consequently, on the whole, the quantity of medicinal herbs in Croatia could considerably increase in the future.

It is assumed that about 2,000 t of various medicinal herbs are collected annually from the forests. At a market price of approximately 0.5 euro/kg, it results a total annual value of 1 million euro, of which 90% belongs to the Mediterranean part.

Fibrous materials. A Mediterranean bush of Spanish broom, or gorse (*Spartium junceum L.*) was in earlier times demanded as raw material for production of cottonlike fibrous material. It is hoped that gorse would be again an interesting product for industrial use, provided that the abandoned technology the Italians (Callonia) developed at the end of the IInd World War would be modernised. In the littoral and karstic part of Croatia, cultivation of gorse could be economically profitable. Reedmace (*Typha latifolia* and *Typha angustifolia*) is used locally as weaving material for baskets and mats. Common reed (*Phragmites communis*), rich of cellulose, is abundant in marshy terrain sand serves only locally for thatched roofs or similar. Sedge (Carex caespitosa) is found throughout the world as a component of marshy habitat. A limited number of about 1,000 species are used locally as food or bedding for animals, while few are cultivated as ornamental plants. Basket willow (*Salix viminalis*), almond-leaf willow (*Salix amygdalina*) and purple willow (*Salix purpurea)* are used in large quantities as a weaving material for baskets, an important Croatian exports item. It is assumed that about 2.500 t of textile fibrous plants are annually collected from forests. At an average price of 0.4 euro/kg, it results a total value of 1 million euro, all of which produced in the Mediterranean part.

Honey. The value of honey produced in about 100,000 beehives in Croatia might be by 50% considered as generated from forest and forest land. Taking 10 kg/year as the capacity of an average beehive and the price of 4 euro/kg, the value of honey yearly produced from forest and forest land is approximately 2 million euro, of which 40% is produced in the Mediterranean part.

Tourism and recreation. Access to forests is generally for free, except for national parks, some natural parks and special nature reserves where entrance fees are required. Results of TCM surveys show an average consumer surplus of 2.85 euro/ha for various forest sites with recreational value (Benc, 1997; Vuletić, 2002). Applying this benefit to the area of forest reserves and special reserves of 346,200 ha, it results a value of about 1 million euro. National parks extending on 61,700 ha have the highest recreational value in the country, of approximately 450 euro/ha (Benc, 1997; Vuletić, 2002), or 27.8 million euro in overall. Based on these results, the total recreational value amounts to 28.8 million euro. In times of peace, each of the national parks of Plitvice Lakes,

Paklenica and Krka waterfalls were visited annually by more than 500,000 people. Results of CVM applications show similar results. The recreational value of the Mediterranean forests is assumed equal to 40% of the total, calculated on the basis of the ratio of protected areas and the number of visitors.

Hunting. Income from hunting is a very important part of the national revenue. There is plenty of game almost in every part of Croatia, thanks to its relatively small population, to the extended forest cover and reserves areas and of course to the long term care of the right number of game per specific area. This includes high ethical hunting standards followed by domestic and foreign hunters.

Valuation of hunting is undertaken by several methods, among which the CVM seems the most reliable. Another valuation attempt is based on the prices of hunting permits sold to hunters by public authorities. Accordingly, the value of hunting, including various costs - wages of game keepers and other personnel, armament expenditures, ammunition, transport, insurance - comes much lower, of about 4.2 million euro. This is a highly underestimation, also because it is believed that there are also people hunting without permits.

Results of a CVM survey in Italy leads to an average consumer benefit of 250 euro/hunter (De Battisti *et al.*, 2000). This value is probably too high for Croatia, despite the large number of foreign hunters willing to pay for shooting trophies, in addition to other taxes and associated costs (accommodation). The benefit of 215 euro/hunter seems closer to the Croatian reality.

The number of national and foreign hunters has decreased during the recent war and will probably remain low due to the numerous mines scattered almost everywhere over the area formerly held by Serb rebels. Considering that annually there are about 5,000 foreign hunters and around 42,000 national hunters, the value of hunting could be assessed within the probability limits of ±20% at approximately 10.1 million euro. Based on the 25% ratio of game found in the Mediterranean part, the value of hunting in this area is 2.5 million euro. It should be noted that in numerous scientific papers, game hunting is often overvalued. An objective estimate of this value is needed.

Fodder and forage. The use of forest and other wooded land for fodder and forage to feed domestic livestock was once a very important activity in Croatia, particularly in semi-arid areas of the littoral hinterland and in the southern and south-eastern mountainous regions. Grazing in the forests is forbidden by law, rule very often disregarded. Recently, the trend of growing goats has been felt again, on the grounds that they prevent forest fires by clearing the lower layers of inflammable vegetation. Anyway, grazing in woodlands is generally tending to decline, as a result of more intensive animal husbandry. Besides, after the recent war, the marginal, poor areas of Croatia have practically been emptied: their population, previously relying on half-nomadic animal husbandry, have migrated to more fertile areas of the country. Thus the number and size of sheep flocks decreased as well.

It is estimated that there are 40,000 cattle, 1,500 horses, 50,000 sheep and 20,000 goats annually grazing in the forests. Grazing by cattle, horses, and sheep takes place 250

days/year, and by goats, 270 days/year. The daily consumption of forage (grass, leaves) is supposed to be as follows: 15 kg for cattle and horses, 5 kg for sheep, 8 kg for goats. The average market price of fodder is about 50 euro/t. Based on these data, the value of grazing is 7.8 million euro for cattle and horses, 3.1 million euro for sheep and 2.2 million euro for goats. Adding up these figures, it results a total value of 13 million euro, of which around 90% accrue to the Mediterranean part.

4.1.2. Indirect use values

Erosion control and watershed protection. About 55% of the total forest area, or 1.15 million ha, are located on soils which would be exposed to heavy erosion if no forest cover was available. The absence of the rest of forest cover would provoke only a moderate erosion level. Annual average precipitation in the country amounts to 1.13 billion m^3 water, one third of which is retained by forest. This diminishes the water impact by about one tenth which is sufficient to control floods most of the year (Common, 1988). The monetary value of such retention power is calculated by the use of cost-benefit method in 'with-without' situation, that is, what damage would cause a water impact of additional 11 million m^3 of rainwater throughout a year? Since there are no reliable studies to prove or reject the above assumptions, they should be accepted with utmost care.

Furthermore, the existing forest cover protects the soil against erosion, sometimes up to 100% and this should enter the same cost-benefit analysis, under the same assumptions as above. The forest has an enormous influence on water balance. Croatia has no great problems with the drinking water supply, even close to the relatively great urbane agglomerations. In the European industrially developed countries, like Germany, water protection cost amounts to DM 72/ha/year (Brill, 1994). In Croatia such a cost may be regarded more moderately, probably at no more than about 1 euro/ha/year (Prpić, 1992). Thus, the water protection and erosion control function of forests may be estimated at 2,078 million euro. Of this value, 60% is assumed to accrue to the Mediterranean part, based on the proportion of area with high risk of erosion occurring in this zone.

Carbon sequestration. Valuation of carbon sequestration is based on the quantity of carbon annually stored in forest biomass and soils of 8.9 million tC (Box 2) and a shadow price of 20 euro/tC (Fankhauser, 1995), leading to a total value of 178 million euro. It is considered that around 14% of this value can be attributed to Mediterranean forests.

Box 1. Value of carbon sequestration in forests biomass and soils

The total amount of carbon (C) sequestered in Croatian forest biomass and soils is calculated as follows:
Total C content = C content in wood + C content in the above ground vegetation + C content in dead trees and roots + C content in forest soil
- **C content in wood** = growing stock * expansion factor to include branches, thicket, leaves and roots (1.45) * coefficient of transformation from wood into dry biomass * conversion factor of biomass into C (0.5)
The growing stock of Croatian forests is 324.3 million m^3 and refers to the above stump wood with a diameter larger than 7 cm. Adding up the volume of trees outside forests, that is, 6.2 million m^3, one comes to the total growing stock of 330.5 million m^3. Of it, the growing stock is 284.2 million m^3 for broad-leaved and 46.3 million m^3 for conifers in and outside the forests. The coefficients of transformation from wood into dry biomass is 0.37 for broad-leaved and 0.55 for conifers. Based on these figures:
C content in wood = $(46.3 \times 1.45 \times 0.37 \times 0.5) + (284.2 \times 1.45 \times 0.55 \times 0.5)$= 125.74 million tC (1)
- **C contents in the above ground vegetation, dead trees and roots, forest soil** were estimated on the basis of the productive forest cover (2,078,300ha) and the following average indicators:
C content in above ground vegetation = 1 tC/ha
C content in dead trees and roots = 5 tC/ha
C content in the forest soil = 150 tC/ha
C content in above ground vegetation + in dead wood and roots = 2.0783 million ha × 6 tC/ha = 12.5 million tC (2)
C content in the forest soil = 2.0783 million ha x 150 tC/ha C = 311.7 million tC (3)
Adding up (1), (2) and (3), total C content in wood biomass and forest soil results 449.94 million tC. Applying a discount rate of 2%, the annual quantity of carbon sequestered is 8.9 million tC.

Source: Vuletić, 2003.

4.1.3. Option, bequest and existence values

Valuation of different option/bequest/existence values of forests was undertaken within a CVM survey of Korčula forest site. It aimed at making integral valuation of all non-tangible forest services, considered the principal components of forest amenity within the TEV framework (Sabadi, 1992). It shows an option value for recreational opportunities of about 9 euro/ha and for other environmental values (such as landscape) of about 29 euro/ha. Extrapolated at national level, it results a total option value of recreation of about 18 million euro (6.6 euro for the Mediterranean) and a total option value for other environmental values of around 111.6 euro (21.5 million euro for the Mediterranean).

4.1.4. Negative externalities linked to forests

Forest fires are the main negative influences on forests in the Mediterranean region of Croatia, affecting 70-90% of the country's burnt area. Valuation is based on the average burnt area (4,600 ha) and the restoration costs, which total amounts to 2.6 million euro. Of that, 2.2 million euro are attributed to the Mediterranean part.

Other negative externalities originate from the touristic pressure on forests and reflected by increased burden of pollutants from movable and immovable polluters (such as traffic and water heating). A local level survey on the island of Korčula estimated the damage created by emissions of pollutants of about 21euro/ha (Vuletić, 2002). Applying this estimate to the forest area subject to pollution, it gives a total value of 36 million euro, of which 13 million euro corresponds to the Mediterranean part.

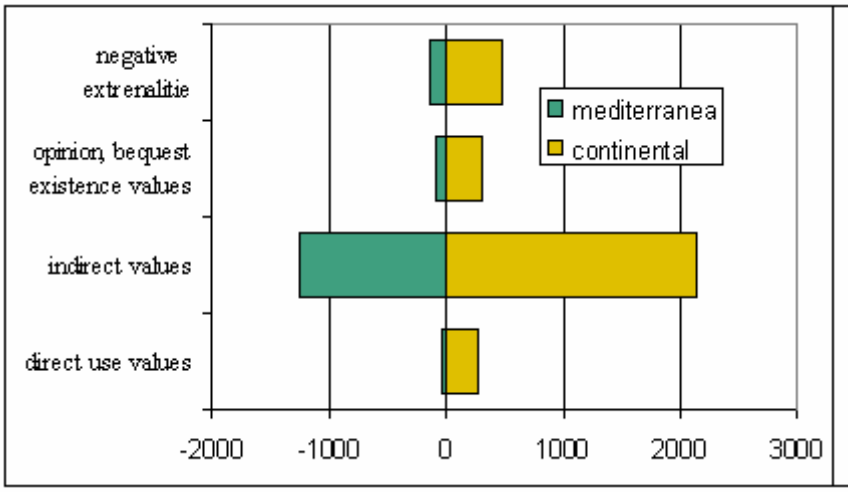

Figure 5. Towards total values of Croatian forests (million euro)

Table 14. Number of tourists for year 2004.

September 2004		
	Arrivals	Nights
Total	1,019,104	5,104,375
Domestic	132,036	387,727
Foreign	887,068	4,716,648
	January - September 2004	
	Arrivals	Nights
Total	8,735,126	45,845,888
Domestic	1,234,722	4,710,908
Foreign	7,500,404	41,134,980

The values of negative externalities were calculated for forest fires (reaching 130 million euro, of which 125 million euro belongs to Mediterranean part) and for pollution provoked by tourism (amounting 43.6 million euro, of which 15.6 million euro for Mediterranean part). At present, about 60% of the estimated annual indirect and 15% of direct use values are produced by the Mediterranean region, with an expected strong raise particularly in non-market values. Contribution of Mediterranean forests to estimated annual option, bequest and existence values is about 30%.

4.2. Case studies of successful marketing strategies

Summary

The paper analyses the supply and demand of non-wood forest resources in the area of Split Forest Administration and at the Faculty of Forestry, University of Zagreb. Some general data on Split Forest Administration are given, the concept of supply and demand defined, and the notion of non-wood forest services discussed. The working method applied to obtain information to be analysed involved the use of primary and secondary information sources. Research was aimed at investigating the supply of non-wood forest services in the area of Split Forest Administration and finding out to what degree the supply meets the demand.

Key words: supply, demand, non-wood services, forest resources

Introduction

The company "Hrvatske šume" Zagreb manages forests and forestland in the Republic of Croatia. It comprises 16 administrations, of which Split Forest Administration is a component part. The total area of Split Forest Administration, extending over four counties, is 555,032 ha. It should be pointed out that within the company "Hrvatske šume", Split Forest Administration is the largest in terms of area and covers almost one third of the territory managed by "Hrvatske šume". Its basic activity involves forest silviculture and protection.

The area that it covers includes the beautiful and highly indented Adriatic coast with a total of 986 islands and islets, a small part of which belongs to three insular forest administrations (Brač, Hvar and Korčula). It also comprises overall natural and national wealth consisting of 4 national parks (Paklenica, Krka, Kornati and Mljet) and 3 nature parks (Telašćica, Vransko jezero and Biokovo).

The basic organisational form of Split Forest Administration is made up of 17 forest offices, while the Administration's specialist services include 9 departments. Split Forest Administration has 280 employees of different profiles and educational backgrounds. Split Forest Administration also caters for 7 nurseries distributed over 6 forest offices, whose production focuses exclusively on conifers and deciduous container seedlings raised for afforestation purposes. The future of this Administration relies on forest ecology and on the preservation and protection of the existing forest fund, as well as on maximal involvement of its entire personnel in forest management issues.

Problem matter

The concept of non-wood forest services embraces a multitude of diverse benefits that people obtain from forests. These benefits result from spontaneous effects of forests on the living environment and from activities of man and nature in the field of production and services. These services belong to all members of the society and nobody can purchase them for their sole use.

A turning point in the affirmation of non-wood services is considered to be the Multiple Use Sustained Yield Act, adopted by the US Congress in 1960. The Act advocates a multifunctional principle of managing state forests. Forests should simultaneously be used for timber production, watershed management, outdoor recreation, wildlife and fish, and cattle grazing in a combination which will best meet social needs, ensure the most prudent use of land for some or for all purposes, and at the same time relinquish the obligation of achieving the highest monetary income or the highest production per unit by the combination of uses. Sustainable yield of several products and services means the achievement and permanent maintenance of production at a high level without aggravating soil productivity. The fundamental point of multipurpose forestry lies in the idea of equal importance of all forest services. The principle of production maximisation should be replaced by the principle of harmony and co-ordination in forest exploitation.

In the Republic of Croatia, non-wood forest services are regulated by the Forest Act. Based on the above, research is aimed at determining the supply and demand of non-

wood services in the area of Split Forest Administration. Other research aims involve finding out which categories of non-wood forest services are the most common when they are evaluated.

Working method

The working method adopted in this research involved the analysis of primary and secondary information sources relevant for this work. Primary data are those that are collected directly from research units. A research unit may be an individual, a household, an economic or a non-economic subject, an institution and similar. In practice, research is reduced to communicating with individuals who can represent themselves, their households, or some other economic or non-economic subjects or research units.

Research used to collect primary data is commonly called field research. Primary data are collected directly from respondents and may relate to:

- facts, states and situations, or to
- opinions, attitudes, feelings and similar psychological variables

Secondary data are data which were collected and recorded earlier in the course of some other research and for some other purposes. From the point of a researcher currently conducting research and using secondary data, these data are historical and do not require contact with respondents or research subjects. Still, secondary data are the result of previous collection of primary data. Collecting may have taken place several weeks, months or even years ago.

This work was based on the primary information source method, which involved questionnaires completed through personal surveys. The questionnaire consisted of six groups of questions:

- questions referring to general data on respondents;
- questions referring to the respondents' behaviour;
- questions relating to the current supply and demand and comments on past business activities of the company "Hrvatske šume" involving natural resource management;
- questions relating to the awareness of environmental actions;
- questions relating to future supply that would satisfy the respondents' demand;
- questions relating to regulating environmental pollution by economic subjects.

A total of 18 questions were asked. The survey included 181 respondents.

The balance sheet in Split Forest Administration shows that income from non-wood forest services was entered under the item 'income from the sale of products and services on the home market', but also that a part was transferred to the items 'income from the use of products and services for own needs', and 'income from the sale of goods on the home market'. However, the nature of the income was not stated and neither were the percentages or amounts represented in the final balance sheet.

The survey conducted among the students of the Faculty of Forestry in Zagreb and the employees of Split Forestry Administration yielded some concrete results showing the degree of their satisfaction with the supply, the kind of non-wood forest resources

included in their demand, and the most frequently evaluated categories of non-wood forest services.

The conclusion drawn from data analysis shows that both the employees and the students were interested in certain categories of non-wood forest services, and that these can be evaluated. According to the survey, students spend an average of 2 hours a day in the nature, whereas employees spend 4 hours. 90% of the respondents answered affirmatively to the question of whether they would pay admission of between 22.6 and 30.6 euro to a national park.

A total of 16% of those questioned would be prepared to travel to a desired destination a distance of 20 km, 30% would cover a distance of 200 km, and 54% of the respondents would travel regardless of the distance. They would be prepared to use all means of transport.

It was felt that resorts should offer a wider range of activities, such as riding, jogging, climbing, cycling, animal watching, photography, etc. 68% of the respondents expressed only partial satisfaction with the current offer, 8% reported complete satisfaction, while 24% expressed dissatisfaction. Among those questioned, 49% respondents graded the current quality of use (availability) of natural resources as good, while 25% considered the offer sufficient.

The question whether the company "Hrvatske šume" needed competition in managing natural resources divided the students: 41% gave an affirmative answer and 40% a negative answer. They explained that competition was good, but also that "Hrvatske šume" managed natural resources well. 29% of the respondents among the employees opted for the YES answer and 57% for the NO answer. They gave the same explanations for their answers as the students. 19% of the students and 14% of the employees chose the option I DON'T KNOW, emphasising that they were not sufficiently informed about the problem.

All those questioned were well informed about environmental actions, mostly via television, newspapers and radio, while other media were poorly represented. They would like to be informed in the same way in the future, but the students also mentioned the Internet and SMS messages, that is, the media which are currently present but will become an even more important method of communication in time to come.

The destinations suitable for a visit included mountains, forests, islands and lakes in the first place, while forests with water and broad-leaved forests constituted their preferred holiday choices. As much as 66% of the respondents expressed individual readiness to donate a certain amount of money for the preservation of forests for future generations. The amount the students were prepared to give ranged from 73.3 to 106.6 euro, with this sum increasing in accordance with improvement in their situation, while the employees were prepared to give about 20 euro annually. 11% of those questioned were prepared to invest only their knowledge, 7% their free time, and 16% were not prepared to give anything.

42% of the respondents would solve the problem of environmental pollution with fines, 22% would raise pollution standards for those that pollute the environment, 18% would

impose taxes and 18% would close down the pollutants' plants. Based on the obtained concrete results, it can be concluded that there is a possibility of monetary valorisation, but the offer should be defined in a better way in order to be valorised in monetary terms.

The offer should also be expanded so that considerable income from non-wood forest services can be achieved in view of the global trend of 'returning to nature'. Despite the fact that the company "Hrvatske šume" would benefit from competition in this respect, a large number of the respondents were of the opinion that the company itself should be capable of achieving the above, provided that this business segment was better organised. The replies of the second- and fourth-year students and the employees of Split Forest Administration do not differ significantly.

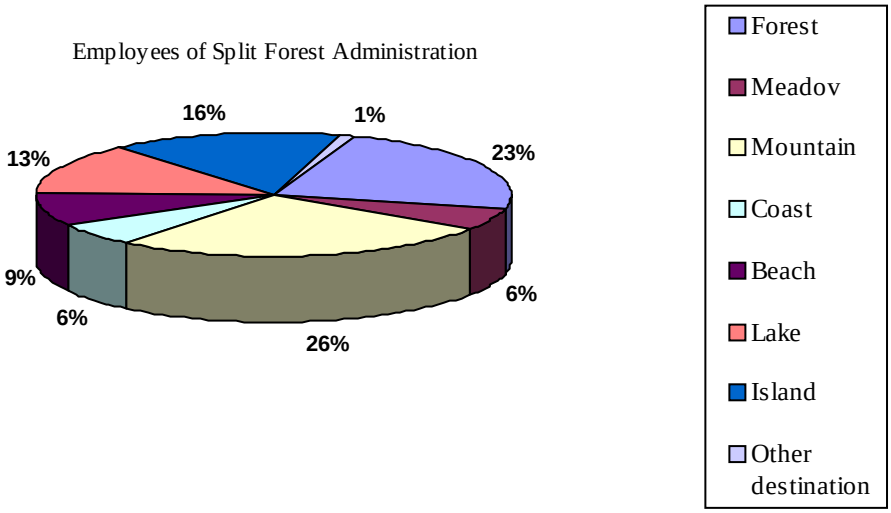

Figure 6. Review of most preferences destination in nature in opinion of the employees of Split Forest Administration, in percents

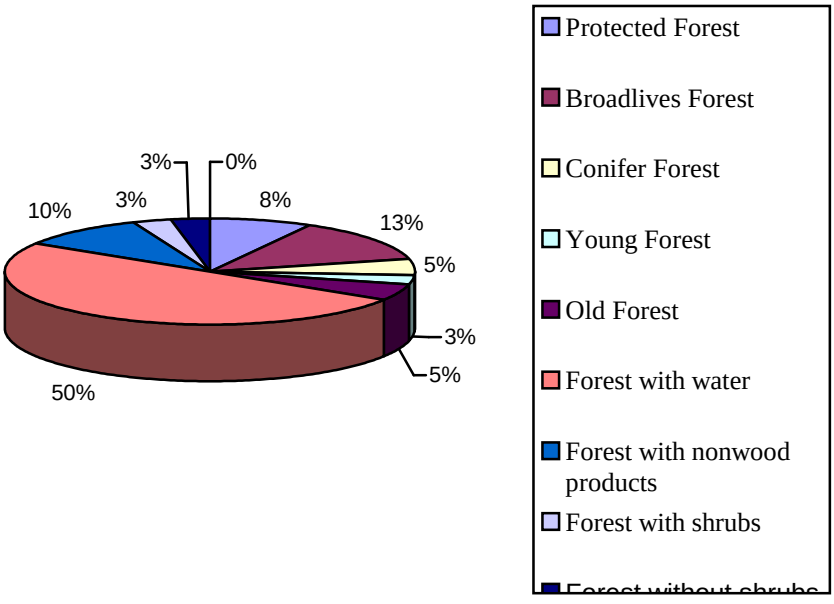

Figure 7: Review kind of forests which employees of Split Forest Administration prefers for vacation in nature, in percents.

5. Forests and ownership

Forests in Croatia have economic, environmental and social functions and have a major impact on the quality of life. Croatia is endowed with a great diversity of habitats (The Adriatic Sea, sub-mountainous regions and Panonian plain) and over 60 various forest communities are recognised. Our forests are acclaimed internationally for their natural composition on 95% of the forest areas and also for their great diversity of plant and animal life, resulting from more than 150 years of forestry tradition. The distribution of forests and forest land is as follows:

- areas covered by forests: 2,078,289 ha;
- forest land not covered by forests: 345,952 ha;
- infertile forest land: 61,370 ha;
- total: 2,485,611 ha.

Croatia is divided into 12 administrative regions and 16 forest regional units, totalling 171 forest offices. Total forest area managed by these forest offices covers 2 million ha, of which 0.9 million ha is karst forest area and 1.1 million ha are continental productive forests. The area administered by each forest office is divided into several management units. These are formed by numerous forest departments and sub-departments and represent the basic management and planning areas. This division is done according to the forest type, condition, stage of development, soil configuration, natural borders such as waters, hill peaks, roads.

For each management unit, there is a general management plan that applies for 20 years, must be revised at middle term and provides general directions for the next 20 years. For the first 10 years, the management plan is very detailed; however, operative management plans are made on annual basis. The revision of management plan has to be approved by the Ministry of Agriculture and Forestry.

5.1. State of the art and historical development

Forests in the Republic of Croatia occupy 2.5 million hectares or approximately 43.5% of total mainland area. Of the total area, the state owns 2,024,474 ha (81%) of forests and forest land, while 461,137 ha (19%) is privately owned. “Hrvatske šume”, limited company, Zagreb is responsible for management of state forests (1,991,537 ha), while some smaller areas (32,937 ha) are managed by other legal entities.

In the year 2000, the contribution of forest industry sector in GDP was 1.4%, with the furniture industry accounting for 0.5%, pulp and paper 0.4% and wood and wood products 0.5%. It has been estimated that the contribution of forests in GDP is additional 1% (source of data: Statistical yearbook of the Republic of Croatia 2002).

Forestry sector is a significant source of employment, especially in rural areas. In total, there are approximately 49,000 employed, out of which number 9,500 people work in company for forest management, 6,000 employees work as entrepreneurs for forestry works, 4,000 people are seasonal forestry workers, 11,500 people work in primary wood processing industry, 11,600 work in furniture industry and 6,250 work in pulpwood and paper industry.

"Hrvatske šume" ltd. Zagreb was founded on January 1st, 1991 as a public company for management of forests and forestland of the Republic of Croatia on the basis of provisions of the Law on Forests. When the Amendments of the Law on Forests were passed the company was restructured from a public into a limited trading company, the founder of which is the Republic of Croatia. Issuing a Statement of Foundation the Company was registered in the Register of Companies on April 8th, 2002.

The Company is structured in three levels: the Company as a whole with its management and main office in Zagreb, 16 regional forest administrative branches, 169 forestry stations and several work units for additional activities. The Company has five subsidiaries for complementary activities: wood processing, quarry, tourism and consulting.

The "Hrvatske šume" ltd. was founded for managing state owned forests of nearly 2 million hectares, which makes 35% of the territory of the Republic of Croatia and 80% of all Croatian forests. Annual cut for the period between 1996 and 2005 shows that 49.3 million m^3 of wood can be cut in ten years. In the area managed by the Company there are considerable hunting and tourist resources.

The basic capital of the Company is 146.5 thousand euro, the assets are 238.6 million euro, gross revenue is 253.3 million euro and the profit 5.25 thousand euro. The Company makes a profit by selling different wood assortments (58.1%), by works in the biological reproduction of forests (27.2%) and otherwise (14.7%).

The Law on Forests, Law on Companies and the Statement of Foundation regulate tasks, style of operation, organisation and other characteristics of the "Hrvatske šume", which in the existing form slows down the normal business dynamics. The main task of the Company is managing forests and forestland of the Republic of Croatia. It also ensures simple and a part of broader reproduction of state owned forests, i.e. in forests included in the forestial economic territory (Article 19 of the Law on Forests). The "Hrvatske šume" is a company and an economic subject and the main goal of the Company's business is, therefore: successful managing of state owned forests and forestland, as well as economically sound business. The economic goals of the Company were defined in 2002 as follows:

- business operation with a satisfying profit and providing funds for the activities of the biological reproduction of forests, protection from risks, maintaining the achieved level of average salaries and gross accumulation, which ensures the maintenance of the Company's property;
- financial stability, reducing short-term debts and a positive money flow from business activities in the amount that ensures prompt payment of long-term loans and financial means for planned long-term investments;
- balanced and selective investments aimed at further construction of forest roads and maintaining of property functions.

The "Hrvatske šume" ltd. was founded with a strictly defined goal and tasks regulated by the Law on Forests and other regulations and its business activities are regarded from two aspects:

- firstly, from the forestial economic aspect, when regarding managing state owned forests and forestland according to the planned cutting down of trees and production of wood products, and working on biological reproduction of forests belonging to the forestland territory;
- secondly, from the economic and financial aspect, i.e. through business results stated in financial reports.

5.2. Forest resources

Croatian forests cover 2.5 million ha (including productive and unproductive, covered and bare, fertile and unfertile areas), or 43% of the country's area, according to the national forest management plan. This places the country among those relatively richly endowed with forests in Europe, with more than 0.5 ha of forest per inhabitant.

The country's plant biodiversity is rich and heterogeneous, containing about 4,500 species and subspecies of vascular plants, almost 50% of which belong to the forest ecosystems. There are 260 autochthonous woody plants, among which more than 50 are economically significant. Besides, the vegetation comprises numerous species of bush, shrub, herbaceous plants, mosses and mushrooms, as well as a multitude of micro-organisms within the soil. The forest communities, zoo-cenoses and habitats include more or less natural and stable ecosystems.

From the phytogeographical viewpoint, Croatian forest vegetation can be divided in two regions: the Mediterranean one - with two belts and five zones - and the Euro-Siberian-North-American one - with six belts and 15 zones. There are 68 forest associations and sub-associations, from thermophytic and mesophytic to the cryophilic ones.

Forest soils are classified into automorphous and hydromorphous, and their formation was influenced by extremely different factors. The most productive soils are the automorphous luvisols, dystric cambisols, calceocambisols, brunipodsols and rankers, while less significant are podsolic colluvial, regosols and lithosols. Hydromorphous forest soils are dominated by eugley, semigley, pseudogley and fluvisol. The increasing water and air pollution caused by anthropogenic and technological factors has negative consequences on soil stability, with increasing negative influences on forest associations.

Croatian karst, or the Mediterranean-littoral region, including Adriatic islands, is among the richest regions of endemic European flora. For example, Velebit mountain littoral side contains 93 local endemic plants, Biokovo littoral slopes – about 31, Konavli archipelago – around 22.

Around 85% of the total growing stock and about 87% of the total annual increment is given by broad-leaved stands and the remaining by conifers. In total growing stock, the largest share is given by beech (36.3%) and various oaks (27.4%) among the broad-leaved; by fir (9.4%) and spruce (1.9%) among the conifers.

Total annual increment is 9.6 million m^3 and average allowable cut is 5.3 million m^3. Annual increment in state forests is 8.1 million m^3 and average allowable cut is 4.9 million m^3. Production has been steadily rising since the end of the war, from 2.6

million m^3 in 1995 to a planned 4.1 million in 2003, which is still less than pre-war level of production and allowable cut. Out of the planned quantity, 1.8 million m^3 is sawmill roundwood and the rest is pulpwood, fuelwood and wastewood.

The actual annual cut in public forests for 2003 is planned to be 3.6 million m^3 (it was 3.3 million m^3 during 1986-1990; 3.3 million m^3 during 1991-1995; and 3.5 million m^3 during 1996-2000.) The official data on annual cut in private forests is highly unreliable, since the owners of small forest holdings do not always possess cutting permits, to avoid tax payment. However, it is estimated that about 1.2 million m^3 is cut annually in private forests, out of which only one fourth is covered by permits. Therefore, total annual cut is about 4.8 million m^3, that is 50% of annual increment.

Croatian forests typologies can be divided into continental and Mediterranean forests. Of the **continental forests**, the even-aged stands represent the most valuable part from the economic viewpoint. They occupy 730,600 ha and have a growing stock of 177 million m^3 (Hrvatske šume, 1998). Due to forest diseases, their growing stock has diminished below the normal value, causing further drops in the annual growth and allowable cut. The uneven-aged continental forests extend mainly in the western mountainous part of Croatia and are mostly exploitable forests. They cover 294,400 ha and have a growing stock of about 76 million m^3 (Hrvatske šume, 1998). In addition, there are treeless areas, mostly including former pastures, covered by weeds or bush and envisaged for reforestation, as well as small areas of meadows within forests, envisaged for game and wild animals grazing.

The "Hrvatske šume" manage 1,991,537 ha of forests and forestland, which makes a third of the continental territory of the Republic of Croatia and 80% of the territory of all Croatian forests and forestland. 1,592,870 ha are covered in forests, while the rest are not overgrown. The most valuable spermatophytes cover 1,018,055 ha and make 64% of all overgrown territory, coppice 16% and different other simpler forms 20%. Economic forests cover 94% of the territory of uneven-aged and common forests. The rest are forests on karst, special-purpose forests and protected forests. Artificially grown plantations and cultures cover 1% of the overgrown territory.

Table 15. Wood reserves and exchange annual growth in volume

	Wood reserves		**Exchange annual growth in volume**	
Sort of trees	**1000 m^3**	**%**	**1000 m^3**	**%**
Common oak	43,307	15.6	1,004	2.31
Sessile oak	26,980	9.7	833	3.08
Beech	101,992	36.7	2,826	2.77
Ash-tree	10,089	3.6	316	3.14
OHL	41,205	14.8	1,526	3.70
OSL	11,076	4.0	503	4.54
Fir	28,133	10.1	539	1.92
Spruce	5,414	19	130	2.40
Other Čonif.	10,128	3.6	447	4.41
Total	278,342	100.0	8,123	2.92

Total annual cut is classified into the territory annual cut of common forests, further divided into main and previous growth and territory annual cut of uneven-aged forests. Annual cut is planned for forty years on the basis of forestial economy and is divided into two categories, according to the period. In the first half of the period, i.e. I/1 economic half of the period 1996 – 2005 the annual cut of the main growth of one-period forests is 20.8 billion m^3, the previous growth of common woods (thinning) 15.1 billion m^3, and the annual cut of the uneven-aged forests 13.4 billion m^3. In the first half of the period there were 49.3 billion m^3 available for cutting.

In the last five years the structure of the produced wood assortments has changed according to the sort of the trees and the quality structure of the produced net wood mass. These changes influence changes in the value of the produced net wood mass. The change of permanent price of certain sorts defined the value of the production of net wood mass in the last five years.

Table 16. Value of the production of net wood mass in the last five years in thousand euro

Sorts of wood	**1998**	**1999**	**2000**	**2001**	**2002**
Common oak	35,084	40,478	38,030	36,708	38,273
Sessile oak	7,870	8,069	8,348	10,061	11,482
Beech	41,620	44,121	49,690	47,313	46,611
Ash tree	9,204	7,419	11,396	13,324	12,849
Fir/spruce	17,075	16,659	17,226	18,218	19,000
Other sorts	15,074	16,920	20,406	19,850	20,913
Total	125,927	133,666	145,096	145,474	149,128
Round wood	102,449	110,239	115,812	117,875	119,056
Stacked wood	23,478	23,427	29,284	27,599	30,072
Total	125,927	133,666	145,096	145,474	149,128

Value of the production of wood assortment grew by natural growth until 2000 since when, with minor oscillations, it has maintained the same level. According to the realisation of the approved annual cut so far, it can be noticed that less demanded wood is behind and gives, so to say, less valuable sorts, while more valuable sorts, especially common oak, have a greater share than approved. The negative consequences will be felt in the following years, when the income from the sale of wood sorts will be smaller, which will be connected with lower business efficiency. A trend of growth of the physical extent of cutting and production of wood assortment is clearly seen in the five-year period, while positive changes in the quantitative elements (exploitation, assortment structure) is somewhat more modest. The above-mentioned movements and results in the realisation of the forestial economic tasks have a corresponding influence on the business and the position of the Company.

A trend of income and expenditure growth has been present in the last four years as a result of a growing business activity, as well as gradual change of the income structure and a growing share of own products and services in the income. The Company makes its income, which makes 95% of total income, by selling products and services in Croatia and abroad, mostly selling wood assortment and working on the biological reproduction of forests.

5.3. Forest ownership

About 81% of Croatian forest area is public property, while the rest of 19% is private. Most public forests are managed by **Hrvatske šume Ltd**. (Croatian forests), a large State company and the remaining public land is managed by other governmental institutions or authorities (Table 17).

Table 17. Forest area ownership (1000 ha)

Ownership type	Forest land Stocked	Forest land, unstocked			Total	%
		Productive	Non productive	Non fertile		
Hrvatske šume Ltd.	1,592.9	323.1	14.5	61.0	1,991.5	80%
Other public institutions	31.3	1.2	0.1	0.3	32.9	1%
Private ownership	454.1	7.0	0.0	0.1	461.1	19%
Total	2,078.3	331.3	14.6	61.4	2,485.6	100%

Source: Hrvatske šume, 1998

Private forests are dispersed in numerous small holdings which size hardly exceeds 2 ha/holding. Except for the stands in Gorski Kotar region, private forests in a degraded state, some of which, devastated. There are three reasons for such a situation: fragmentation of holdings, totalling 599,056 with an average size of plots equal to 0.76 ha; overextended woodcut with the aim of widening agricultural areas and providing investment means for mechanization in agricultural holdings; uncertainty of private ownership dominating for the 50 years of communist rule, pushed owners to wood overcutting activities, regardless of consequences for the biological state of their forests.

Table 18. Croatian forests according to ownership and structure

Forest ownership	Structure of forests	Area	Growing stock	Annual growth
		1000 ha		million m^3
Public Corporation Hrvatske šume Ltd.	Even-aged forests	890.6	190.3	6.0
	Uneven-aged forests	394.9	88.1	2.1
	Without management plan	330.0	...	...
	Subtotal 1	**1,615.5**	**278.3**	**8.1**
Other public institutions	Even-aged forests	10.1	1.4	34.8
	Uneven-aged forests	18.3	6.5	133.0
	Subtotal 2	**28.4**	**7.9**	**167.8**
Private ownership	Even-aged forests	393.9	34.8	1.3
	Uneven-aged forests	40.5	3.6	0.1
	Subtotal 3	**434.4**	**38.4**	**1.4**
Total	Even-aged forests	1,294.6	226.5	7.3
	Uneven-aged forests	453.7	98.2	2.3
	Without management plan	330.0	...	...
	Total	2,408.3	324.6	9.7

Note: Totals might not add up exactly due to rounding.
Source: Hrvatske šume, 1998

Forest classification according to ownership and structure is given in Table 1. Total growing stock is 324.6 million m^3, of which 88% belongs to public forests. Total annual increment is 9.7 million m^3, that is, 2.9% of the growing stock. Even-aged forests account for 74% of total forest area, 70% of the growing stock and 76% of the total annual increment. According to the **Rules of forest management**, during the next ten years, part of uneven-aged forests will be converted into even-aged stands.

5.4. Main problems and research questions in forest resources and ownership for enterprise development in the forest sector

Although the health status of forests continues to improve (with the exception of fir and peduncled oak), the Republic of Croatia cannot afford to be complacent. There is no national inventory of forest habitats. Further work and research will be required if valuable forest habitats are to be maintained, enhanced and protected.

The Karst region represents a special case for forest management. The principal aims of management for the Karst areas are soil protection and water. Given the low volume of wood and value of timber, the region is not economically viable in the absence of state intervention. Approximately 12% of the forests and forest lands are still inaccessible due to the contamination of land mines. This means that basic management tasks cannot be undertaken. Unless mine clearance is carried out, this portion of forests will lose its function.

State forests managed by Hrvatske šume represent an exceptionally valuable national resource and have the potential to make positive contributions not only to rural development but also to the social well-being of all citizens of the Republic of Croatia. The restructuring study highlights the need for Hrvatske šume, limited company Zagreb, to reorganise its activities and to adapt to free market conditions and become more efficient. Ignoring main recommendations of the study could result in Hrvatske šume, limited company, Zagreb, becoming economically unviable with consequent impact on the quality of forest management and development and growth of the forest industry sector.

Annex D: Organisations studying forestry and main publications and information sources

The Faculty of Forestry at the University of Zagreb, provides forestry education and training for graduate and post graduate studies. There are two main departments, one for forestry and the other for wood technology. Annually some 120 new students are admitted, although in recent years there has been a marked decline in line with the downturn in the forest sector.

Vocational secondary education in forestry is provided in a relatively large number of schools – there were nine in 2002, as well as five schools for carpenters and timber designer. These schools are under the authority of the Ministry of Education and are organised on a county level. Hrvatske šume, limited company, Zagreb, is registered to provide education and capacity building for its workers and provides a number of in-house courses.

Capacity building for emergency interventions is carried out in College for Fire-Fighting and Civil Protection an in other authorised institutions. The Ministry of Education and Sports, Institute for Education and other interested institutions are engaged in intensive preparations for the unification and modernisation of three-year schools.

The majority of forestry research is undertaken by the College of Forestry in Zagreb, Forest Research Institute in Jastrebarsko, Institute for Adriatic Culture in Split (Department of Land Reclamation on Karst) and the Centre for Scientific Work of the Croatian Academy of Science and Arts. In 2000, there were 105 forest scientists and researchers (51 PhDs and 54 masters of Science and postgraduates).
Current research activities include silviculture, forest planning, ecosystems, forest husbandry, nursery and plantations, protection of forest ecosystems, biomass and water monitoring and many others. Research results and findings are published in scientific and specialist journals e.g. Journal of Forests and reports of the Forest Research Institute, Jastrebarsko.

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