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Biodiesel Production Promotion Croatia  
Contract No. 03/220

Technical report: First mission of the Austrian Biofuels Institute

Prepared for the United Nations Development Organisation

Based on the work of: Mr. Werner Körbitz, chairman Austrian Biofuels Institute

Project manager: Mrs. Fatin Ali Mohamed

United Nations Development Organisation  
Vienna

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## PURPOSE OF THIS REPORT.

The purpose of this short study is to screen all key factors influencing the potential establishing of a Biodiesel production industry in Croatia by evaluating the feedstock sources available, the development of the Diesel fuel market, a number of national activities already set so far and to provide UNIDO officials with a concise picture of opportunities and risks in entering a Croatian Biodiesel production project and the further actions needed.

### I. SITUATION ANALYSIS:

#### 1. Feedstock supply:

##### ❖ Sustainable availability of oilseeds and vegetable oils at reasonable prices and volumes from within Croatia and from imports:

##### ➤ National oilseed production:

National production of oilseed crops is focusing on 3 plants: soybean, sunflower and rapeseed, with soybean dominating in acreage and yield. The level of rapeseed yield per ha appears to be low and reasons for that as well as potential areas for improvement need further investigations. Fluctuation of yield levels is within normal variation.

Croatia Oilseeds production	1995	1999	2000	2001	2002
<b>Sunflower</b>					
<i>acreage ha</i>	19.358	28.642	25.715	25.336	26.835
<i>production t</i>	37.066	62.208	53.956	42.985	62.965
<i>yield t/ha</i>	1,91	2,17	2,10	1,70	2,35
<b>Rapeseed</b>					
<i>acreage ha</i>	10.982	15.010	12.886	10.319	13.041
<i>production t</i>	24.472	36.020	29.436	22.456	25.585
<i>yield t/ha</i>	2,23	2,40	2,28	2,18	1,96
<b>Soybean</b>					
<i>acreage ha</i>	15.018	34.015	47.484	41.621	47.897
<i>production t</i>	34.319	77.458	65.299	91.841	129.470
<i>yield t/ha</i>	2,29	2,28	1,38	2,21	2,70
<i>total oilseed in ha</i>	45.358	77.667	86.085	77.276	87.773

Source: FAO, EIHP

Oil from all three oilseed crops can be used for Biodiesel production, but technically rapeseed oil fits best, while soybean and sunflower oil needs blending with others (e.g. palm oil).

➤ **Farm structures by region**

Within the short time available for this contract no statistics were available for the regional farm structure evaluations apart from the national statistics shown below. It can be however assumed that the former state farms, which were located in the fertile region of Slavonia, represent the quite large and well organised farms with high productivity, while the small private farms can be found in the mountainous region having quite serious limitations in climatic and soil conditions and therefore rather limited tradition in rapeseed production.

From the figures as shown below one can see that approx. 83 % of the land is managed by family farms while approx. 17 % by legal entities i.e. large farms. Distribution for oilseed cropping shows however approx. a 50/50 split and in rapeseed cropping large farms dominate with a 79 % share. The more detailed rationale behind these figures needs to be investigated further. It can be assumed that the more complex and intensive cropping of rapeseed is better covered by the larger units of the legal entity farms.

Croatia			
Land sown in ha	2000	2001	2002
Total	1.071.573	1.091.211	1.096.601
Legal entities	187.407	184.951	182.596
Family farms	884.166	906.260	914.005
Oilseeds in ha			
Total	86.919	78.075	89.065
Legal entities	45.143	38.551	42.276
Family farms	41.776	39.524	46.789
Rapeseed in ha			
Total	12.886	10.319	13.041
Legal entities	10.588	8.115	10.309
Family farms	2.298	2.294	2.732
Source: Croatian bureau for statistics			

➤ **National production and consumption of food oils**

Coverage of national demand for vegetable oils has varied between 60 % in 1991, 83 % in 1993 and 71 % in 1995. In order to cover the gap oilseeds are imported for crushing in national oil mills.

National production of food oils in t					
	1995	1996	1997	1998	1999
margarine	10.320	12.374	14.676	15.370	15.370
rapeseed oil	6.221	3.063	2.731	6.725	11.951
soy oil	11.700	10.000	16.200	15.600	15.900
sunflower oil	10.800	14.100	16.500	16.500	16.500
olive oil	5.447	2.293	1.572	3.150	3.150
others	509	370	321	435	135
total	44.997	42.200	52.000	57.780	63.006

Source: FAO

In 1999 soybean imports reached 97.144 t and sunflower imports were 4.537 t; - while key oil imports in 1998 were 5.841 t sunflower oil, 2.983 t palm oil and 1.165 t rapeseed oil, a.o. (source: FAO).

➤ **Production industry**

From the literature available there are some conflicting informations about actual oil mills existing and in operation, e.g. an earlier mentioned plant (Olma in Makarska) could not be verified during the period of this study as being still active.

After verbal communication with the Energy Institute the following scenarios appears to be the most realistic one. It is however recommended for a next step to get in contact with the mentioned oil mills and oil processing industry and to search for actual existing capacity, capacity used and expansions planned.

There are 3 relevant oil mills in place:

1. Sojara in Zadar (~100 employees)
2. Zvijezda d.d. in Zagreb (~ 800 employees) - with a refinery
3. Tvornica ulja in Cepen (~160 employees) - with a refinery. Oil seed capacity of 182.500 t/y, refining capacity of 36500 t/yr.

The major player in purchasing, processing and marketing of vegetable oils in Croatia is however the Agrokor Group ( <http://www.agrokor.hr> ) with the following integrated subsidiaries:

- Sojara Zadar: a mid-sized oil mill for crushing soybeans, oil seed capacity 300.000 t/y, located at a sea harbour for unloading largest cargo ships from e.g. USA, Argentina. ( <http://www.agrokor.hr/subsidiaries/sojara> )
- Zvijezda d.d.: the major producer of edible oils with a market share of 58 % and a key role in production and processing of oil seeds into consumer products, located in Zagreb. ( <http://www.zvijezda.hr> )
- Agrokor Trgovina d.d.: covering approx. 95 % of the Croatian market in the segment of soybean and animal feed e.g. soybean meal, as well as sunflower seed and rapeseed. ( <http://www.agrokortrgovina.hr> )

➤ **Conclusion / recommendation:**

- Croatia is not self sufficient in food oil supply and needs oilseeds and/or vegetable oil imports from abroad.
- But latest when joining the European Union the Common Agricultural Policy (CAP) may demand to allocate set-aside acreages, on which only non-food crops such as oilseeds for Biodiesel production are permitted to be grown.
- According to this present short investigation there is no overcapacity in existing oil mills and no known plans to expand oil seed crushing capacities but it is recommended to complete here a detailed situation analysis in meetings with the key stakeholders.

❖ **Sustainable availability of recycled oils (restaurants, etc.) and volumes at reasonable cost:**

➤ **The present situation:**

- The existing routes of recycling oils from industrial users, restaurants and households are not yet examined in detail. The very well planned “Zagreb Biodiesel Project” of the Energy Institute (EIHP) however has already outlined an action plan, in which the establishment of an efficient system for collection logistics and education are mentioned, which may vary by region (e.g. big cities, touristy regions at the coast line). EIHP plans to start with the commercial recycling oil collection project beginning of 2005.

➤ **Conclusion / recommendation:**

- Larger volumes will not be available within the next 3 years to come.
  - It is recommended to investigate the most efficient and proven recycling oil collection system of the organisation ATM in Tyrol, which has developed the “OLLI”-system ([www.atm-online.at](http://www.atm-online.at) ; contact: [meyer@atm.or.at](mailto:meyer@atm.or.at) ), and licensed to the counties of Tyrol, Upper and Lower Austria, the city of Vienna, and Southern Bavaria.
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## 2. Diesel fuel market:

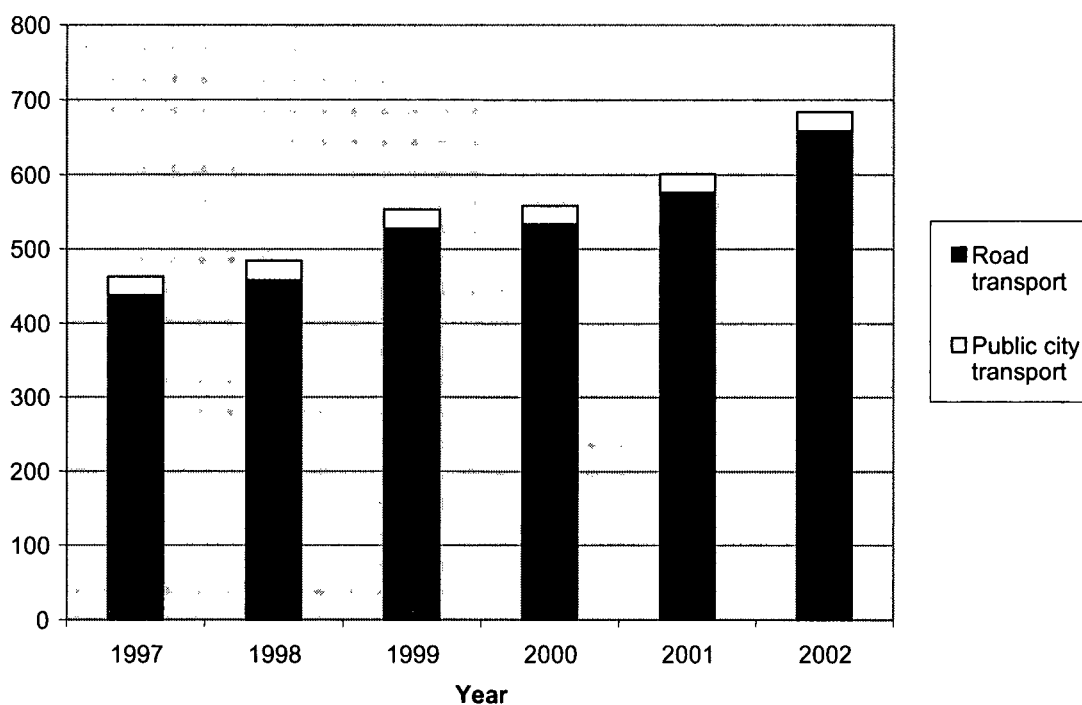
### ❖ Market research of the diesel fuel segment leading to the definition of a nationally agreed Biodiesel marketing strategy:

#### ➤ Supply of crude oil, refining capacity and final Diesel fuel products by national production, import and export.

- Local resources of crude mineral oil are covering approx. 40 % of the national demand with INA Industrija nafte d.d. being the key player in crude and final mineral oil production and distribution. INA covers approx 1/3 of all national economic activities and is the main exporter of Croatia. (Lit. 6)
- By 2001 there were 634 fuel pumps installed and 403 were owned by INA. The INA-Group is furthermore involved in fertiliser production, in engineering and in tourism. The 2 oil refineries (Sisak and Rijeka) have at a capacity of approx. 5 mill t/y each, while the 2 lubricants refineries (Rijeka and Zagreb) have the total capacity of 700.000 t/y. (source: Min. of Economy, 2003). INA, which employs 17.000 people, made a \$150 million profit on a turnover of \$1,7 billion in 2003. This compares with a loss of \$216 million in 1999. (source: INA, 2004).

- Final Diesel fuel demand for road and public city transport in 1.000 t/year:

diesel fuel demand in 000 t	1997	1998	1999	2000	2001	2002
Total incl. non-road	705,6	771,6	808,4	863,7	925,3	995,6
road transport	438,1	458,2	527,5	533,2	576,0	658,4
public city transport	25,1	25,9	25,5	24,6	25,0	25,2



(Source:EIHP, Ministry of Economy 2003)

➤ **Scenario for future Biodiesel consumption and Biodiesel production development.**

- According to the Energy sector development strategy of the Republic of Croatia, three possible scenarios for the energy sector development up to the year 2030 have been considered: S1 – present day technologies without state incentives; S2 – new energy technologies with state incentive mechanisms; S3 – markedly ecological scenario. Total diesel fuel consumption for the three scenarios is given below:

	2000.	2005.	2010.	2015.	2020.	2025.	2030.
S1 - Total diesel consumption in 000 t	864	1066	1211	1360	1544	1750	1871
S2 - Total diesel consumption in 000 t	864	1037	1150	1277	1466	1639	1780
S3 - Total diesel consumption in 000 t	864	1098	1249	1316	1397	1480	1484

(Source: Energy Sector Development Strategy of the Republic of Croatia, Ministry of Economy)

- Considering the recent EU-15 legislation (Directive for the Promotion of the Use of Biofuels) with the objectives to reduce European dependency on energy supply to the transport sector and to reduce greenhouse gas emissions resulting from road traffic, taking S2 (new energy technologies with state incentive mechanisms) as the medium reference scenario in this regard, and assuming the implementation of all European legislation in Croatia when joining the European Union in 2007 the following potential development for Biodiesel demand is outlined:

Development of the road Diesel / Biodiesel market (based on S2 scenario)	2000	2005	2010 est.
Diesel consumption in 000 t Assumed 4 % increase p.a.	557,8	678,6	825,7
Biodiesel market shares in % as per EU-Directive	0,0	0 %	5,75 %
Biodiesel in 000 t	0,0	0,0	44,5
Source : EIHP, Estimate : ABI			



- The assumption for total fuel growth and in specific Diesel fuel growth appears to be however on the conservative side.
- Present taxation policy: There is no specific Biodiesel tax exemption in consideration for the time being.
- The present quality of fossil Diesel sold complies with the European CEN fuel standard EN 590 and fulfils the demand of modern Diesel engines with common rail fuel injection equipment. Croatian standardisation committee recently approved European Biodiesel standard (EN 14214) as well as blending of Biodiesel with fossil Diesel (EN 590) up to 5 %.

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### **3. Conclusion / recommendations:**

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- Croatia is one of the most favoured candidate countries to join the enlarged European Union in the next round and will have to comply with most of the EU-regulations, also those related to the security in energy supply and transport, as well as to the reductions of greenhouse gas emissions and of locally harmful exhaust emission resulting from combustion engines.
- In order to cover the total national Biodiesel demand of approx. 45.000 t by the year 2010 one single mid-size Biodiesel production plant would be sufficient.
- It is recommended to carefully study the present trend of size of newly established Biodiesel production plants in Europe, which indicates that the originally favoured small scale farmers' cooperative Biodiesel plant with a capacity range between 200 – 6.000 t Biodiesel /year is disappearing or closing down and the industrial scale Biodiesel plant in the range of 50 – 250.000 t Biodiesel /year is favoured by investors.
- This report with its assumptions does not consider the further enlarged EU-25 markets including Croatia, which are open to trans-national trading and potential export opportunities to other countries within the European Union, and could justify 1 - 2 much bigger Biodiesel production plants, which take advantage of the Croatian strategic sites of access to sea harbours (Zadar) or river harbours (Danube, Sava, Drava) as low cost transport locations for commodities like oil seeds and vegetable and representing an opportunity for the future Croatian biofuels industry (both for Biodiesel and Bioethanol), for its agriculture and general economy.

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## II. RECOMMENDED OBJECTIVES

1. Get Croatia fully prepared for the time of accession the European Union by being ready to fulfil the European legislation, which enforces the use of liquid biofuels, which can include Biodiesel - but as well Bioethanol, which can be produced from maize, wheat and sugar beet.
2. Identify and describe in detail the commercial and macroeconomic opportunities and risks related to this preparation in order to make the best choice for the Croatian society and economy under a European perspective.

## III. RECOMMENDED STRATEGY

- ❖ Create understanding and identification for this challenge at key stakeholders, e.g. INA, Agrokor, Ministries (Energy, Environment, Agriculture, Taxation) by establishing a platform with an UNIDO appointed coordinator.
- ❖ Gain full understanding of all micro and macro-economic factors and the various possible options in a number of different scenarios.

## IV. RECOMMENDED ACTION PLAN

- Complete a detailed feasibility study, which includes all micro and macro-economic factors and elaborates a number of different scenarios under positive and negative assumptions integrating all the mentioned stakeholders and including existing European experience with an UNIDO appointed project coordinator.
- Investigate and identify potential size of one or more national Biodiesel production plants after reviewing various investment models, including consideration for optimal sites (e.g. Croatian coast harbour, river Sava harbour).
- Assure to obtain further support from UNIDO for this challenging task, which should end in finding the best Biodiesel (Biofuels) option for Croatia.

### Literature:

1. "Project BIOEN", Energy Institute Hrvoje Pozar, Zagreb, December 2002.
  2. "Zagreb Biodiesel Project", Energy Institute Hrvoje Pozar, Zagreb, November 2003.
  3. "Commercial Production of Biodiesel worldwide", Austrian Biofuels Institute commissioned by the International Energy Agency-Bioenergy, Vienna, February 2004 (yet unpublished).
  4. "Best Case Biodiesel Production Plants in Europe", Austrian Biofuels Institute commissioned by the International Energy Agency-Bioenergy, Vienna, February 2004 (yet unpublished).
  5. "New Trends in Developing Biodiesel World-wide", Austrian Biofuels Institute, paper at the Asia Biofuels Conference, Singapore, April 2002
  6. "Bioenergy Markets - Country Report Croatia", Industriewissenschaftliches Institut, Vienna, Austria, 1998.
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**Appendix:**


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**Meeting at the Energy Institute "Hrvoje Pozar"n Zagreb**
**on 19 December 2003**
**Participation list**


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	Name	Institution
1.	Branislav Percinlic	ABN Oil Company Ltd (edible oil)
2.	Ranko Dubenik	INA Maziva Zagreb Ltd (member of INA Group)
3.	Jasenska Necak	Ministry of Environment
4.	Marijan Andrašec	INA Maziva Zagreb Ltd (member of INA Group)
5.	Sandra Balent	UNDP – Zagreb office
6.	Biserka Šafran	Croatian Chamber of Economy – Industry Division
7.	Ivan Horvat	Croatian Chamber of Economy – Agriculture Division
8.	Zvonko Biluš	Zagreb public transport company
9.	Snjeana Fijan	EKONERG
10.	Sandra Krmpotic	Ministry of Environment
11.	Marijan Kljucaric	Zagreb City Municipality
12.	Zoran Lulic	Faculty of Mech. Engineering – University of Zagreb
13.	Stevo Kolundic	INA (Croatian Oil Industry) - Headquarters
14.	Miroslav Jednacak	Croatian Standardisation Institute
15.	Ankica Cimcik	Ministry of Economy
16.	Lovro Bosnic	ARCON (Trading company)
17.	Boris Labudovic	EGE Professional Magazine
18.	Milan Ervacic	PZ Osatina – agricultural cooperative
19.	Ivana Halle	Ministry of Economy
20.	Tea Ganza	Croatian Chamber of Economy
21.	Branka Jelavic	EIHP
22.	Velimir Šegon	EIHP
23.	Julije Domac	EIHP
24.	Davor Matic	EIHP
25.	Branko Vuk	EIHP

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**LATRECH, Mounira**

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**From:** sales@gtpservice.com  
**Sent:** Wednesday, April 21, 2004 3:01 PM  
**To:** LATRECH, Mounira  
**Subject:** Request for proposal no. 2004/045 MP/IRA/03/095

Dar Mrs M. Latrech,

we inform you that on Monday 19th 2004, we have just sent by DHL our quotations:

**no. 2004/045 MP/IRA/03/095 AWB DHLNo. 507 0611 044**

**no. 2004/043 MP/CMR/02/146 AWB DHL No. 507 0611 033**

Many thanks for your informations and cooperation.

GTP SERVICE SRL  
Sales Manager  
Alessandro Bacci  
Tel.++39 55 73 10 231  
[sales@gtpservice.com](mailto:sales@gtpservice.com)  
Fax ++39 55 73 11 11 6

**LATRECH, Mounira**

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**From:** SonalEnt@aol.com  
**Sent:** Friday, April 16, 2004 1:58 AM  
**To:** LATRECH, Mounira  
**Cc:** \_nngautam@mantraonline.com; vkgaba@datanetassociates.com  
**Subject:** Sonal Quotations against Project No. GN/IND/98/G34 for CBM Recobery

Dear Ms. Latrech:

This is further to our e-mail message of March 30, 2004, and your response on the following day.

Once again we have to bring to your attention that the steel prices have gone up significantly since February of this year and keep going up every week. These are unprecedented circumstances. In many cases, the manufacturers are refusing to accept the orders and are regretting to hold the prices quoted in January 2004.

In case Sonal Enterprises has been selected to receive some orders, against several quotations submitted by us, please fax or courier your detailed orders without any further delay so that we can take up the matter with the manufacturers who gave us the quotations. Any further delay may jeopardize the situation.

Regards,

K. L. Talwar  
President  
Sonal Enterprises  
Phone: 845-638-6775  
Fax: 845-638-6453  
E-mail: sonalent@aol.com