Oil seed rape as bio-diesel

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Abstract

Oil seed rape is the basic raw material for production of bio-diesel. The production of bio-diesel from oil seed rape is possible with higher production of oil seed rape on our plowed fields, by which the dependency on oil import would be reduced. Bio-diesel is the best alternative for oil. Lack of oil in European Union in the World is a big problem, as well as the pollution of environment due to the use of fissile oil. According to the estimations, the reserves of fossil oil, respectively, oil from the non renovated holes, are sufficient for the next 30-40 years. This means that significant shortage of oil can be expected in the next 15 years, followed by important price increasing (Kondić, J., 1998, 1999).

Because of that, Bosnia and Herzegovina must work more on improvement and increasing of oil seed rape production in the following period. With more use of genetic potential of varieties and hybrids. In order to achieve that, we must work intensively on the following: usage of new cultivated land under oil seed rape on state owned, as well as on privately owned sector, appliance of the contemporary soil management measures with new varieties, economic policy measures, etc.

Key words: oil seed, bio-diesel, production, Bosnia and Herzegovina

Condition and possibilities of oil seed rape in Bosnia and Herzegovina

Bosnia and Herzegovina has favorable agro-ecological conditions for higher and more lucrative production of oil seed rape, which represents comparative advantage. The climate is humid with optimal monthly average temperatures and total precipitation quantities during vegetation (Table 1. and 2).

In the past 24 years, the sown areas of oil seed rape in B&H have significantly varied from 5.000 ha in 1983 to 1.000 ha in 2005. Also The average yield varied from 1.00 t/ha in 1996 to 2.86 T/ha in 2004 (Table 3). At the same time variety and hybrid yield of oil seed rape in macro – trials were over 4 t/ha (Kondić J. 1988 i 1990).

Table 3. Condition of oil seed rape production in B&H

Year	In pre-war period		Year	In post-war period	
	Area (ha)	Yield (t/ha)		Area (ha)	Yield (t/ha)
1983.	5.019	2,15	1995.	1.364	2,00
1984.	4.817	1,84	1996.	1.201	1,00
1985.	5.423	1,68	1997.	1.749	1,20
1986.	4.246	2,19	1998.	705	1,50
1997.	4.848	2,30	1999.	767	1,60
1998.	4.201	2,18	2000.	30	1,40
1989.	4.155	1,82	2001.	-	-
1990.	3.210	2,37	2002.	-	-
1991.	-	-	2003.	49	-
1992.	-	-	2004.	141	2,86
1993.	10	-	2005.	1.000	-
1994.	1.621	2,20	2006.	-	-

Bio- diesel production

The interest for bio-diesel production has significantly increase, with higher crude oil price and in the world market, higher oil production from oil seed rape as well as from sunflower and soybean. The existing economic crises in our country related to the lower possibility of purchase of sufficient diesel oil quantities from the import, encourage the idea how to produce oil seed rape for processing in bio-diesel.

Bio-diesel fuel from the oil seed rape oil by the technological procedure esterification trygliceride of plant oils. The oil from oil seed rape and other oil plants are not suitable for diesel motor running because of the high ignition point (approx. 200°C) and other negative characteristics. Bio-diesel fuels derived from esterification have lower ignition point, nearly the same as the diesel fuel (60°C). Therefore bio-diesel fuel is methyl-ester fatty acid of plant oils which have similar physical-chemical characteristic to diesel fuel (D-2), (Đonlagić, 2002)

Bio diesel fuel is biological crude oil which does not pollute the environment because during fuel combustion there is no smoke, sulfur evaporations and other damaging fractions, and the biggest advantage its productions from renewed recourses. Now days, in the time of lacking and very expensive fuel from drill-holes, the possibility of our own bio-diesel production on

our plowed fields is of grate importance. Thus, agriculture would be freed from imported fuel dependency (Marijanović et. al. 2006).

One hectare of oil seed rape can give average yield of 2,5 t/ha, respectively 1,1 t/ha of oil seed rape oil. For production 1 t of bio-diesel, 1,12-1,14 t oil seed rape oil is needed. However, in Banja Luka area oil seed rape producers reached the yield up to 3 t/ha, and in the trials yield reached approx. 4 t/ha. With that kind of oil seed rape yields (3-4 t/ha), possible production of bio-diesel is approx. 1,5 t/ha bio-diesel. It is calculated that for performance of cultural measures at sowing certain crops, from 100-150 l/ha of diesel fuel is needed in average.

Therefore one hectare of sown oil seed rape can provide bio-diesel fuel for 7-11 ha of arable land.

Out of all oil plants, the oil seed reap oil is the most suitable for bio-diesel because it contains a good ratio of curtain fatty acid. It is very important that oil contains less important percentage of lower fatty acid which provides easier evaporation of methyl-ester on a working temperature of engine. That kind of bio-diesel has favorable-low ignition temperature, which is very important for the engine work especially in the winter period (Furman et. al., 1995, 2006).

Not all oil seed rape varieties equally suitable for bio-diesel production. The most favorable oil seed rape varieties are those which high content of erucic acid and low content glycosinolate.

Quality distribution of oilseed rape varieties

No.	Variety label	The content of erucic acid and glycosinolate
1.	++	Varieties with high content of erucic acid and glycosinolate
2.	0+	Varieties with low content of erucic acid and high content of glycosinolate
3.	+0	Varieties with high content of erucic acid and low glycosinolate
4.	00	Varieties with low content of erucic acid and glycosinolate.
5.	000	Varieties with low content of erucic acid, glycosinolate, row fibers and lower fatty acid

Double zero varieties (00) do not contain neither poisonous erucic acid in oil nor harmful glykosinolate in seed pellets. These varieties are the most cultivated ones currently. Single stranded – Zero – variety do not contain erucic acid in oil, but they have glycosinolate in seed pallets. The oil derived from the varieties that contain both erucic acid and glycosinolate (++), are used for technical purposes. **Varieties with (+0) label have high content of erucic acid and low glycosinolate and are the best for bio-diesel production**. The present methyl ester of erucic acid in bio-diesel does not an obstruction, and the side product of the seed pellets is suitable for cattle feeding because it does not have the harmful content of the glycosinolate.

Table 1. Perennial mean monthly temperatures (°C)(Meteorolgical stantion Banja Luka)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	∑	average
1980	-1,5	02,9	07,6	07,9	12,7	18,6	19,9	20,1	15,6	11,6	04,2	-1,2	118,9	09,9
1981	-4,0	00,0	08,9	10,8	15,7	18,7	20,2	20,2	16,9	13,2	04,2	01,6	127,4	10,6
1982	-1,5	-0,1	05,4	07,9	16,8	21,0	21,6	20,2	19,0	12,9	06,2	05,3	134,7	11,2
1983	07,5	00,3	07,3	14,2	18,0	18,4	22,5	20,3	16,0	10,4	03,3	01,1	133,9	11,2
1984	00,7	00,4	04,6	10,0	15,0	18,0	19,5	18,7	16,6	12,4	06,7	01,3	124,1	10,3
1985	-4,6	-8,8	05,2	11,6	17,5	17,6	21,4	21,0	16,6	09,9	04,1	05,0	122,5	10,2
1986	01,3	-2,7	04,0	12,9	18,0	17,9	19,4	21,8	15,5	10,3	05,9	00,0	124,3	10,3
1987	-2,7	01,3	01,6	11,4	14,5	19,4	23,4	21,6	20,0	12,4	06,5	01,7	131,2	10,9
1988	04,3	04,4	05,5	10,5	16,4	19,1	23,2	21,4	16,3	10,7	01,5	01,8	135,1	11,2
1989	-0,6	05,3	09,6	13,3	14,6	17,6	21,0	20,8	16,0	10,3	05,2	03,2	136,3	11,4
80-89	-0,6	00,3	06,0	11,0	15,9	11,6	21,2	20,0	16,8	11,4	04,8	02,0	127,4	10,7
1990	00,8	06,7	09,4	10,9	16,6	19,2	20,5	20,5	15,1	12,3	07,4	00,5	139,9	11,6
1991	01,2	-1,1	09,2	08,4	12,2	19,6	21,8	20,3	17,7	09,6	06,9	-1,4	124,4	10,4
1992	00,9	03,9	06,9	12,1	15,8	19,6	21,4	24,6	17,0	11,3	07,7	01,6	142,8	11,9
1993	00,2	-0,4	05,1	12,3	18,1	20,0	21,2	21,2	17,0	13,1	02,3	03,4	133,5	11,1
1994	03,4	01,8	10,5	11,4	16,7	19,6	22,7	22,9	19,2	09,4	07,9	02,2	147,7	10,8
1995	00,2	06,5	06,0	05,8	15,4	18,5	23,3	19,9	15,5	11,9	04,7	02,1	129,8	10,2
1996	-0,7	-0,7	3,0	11,0	17,4	20,4	19,4	20,7	13,5	11,8	08,3	-0,7	123,4	10,2
1997	-0,7	03,8	06,0	07,2	16,9	20,6	20,7	20,3	16,1	09,2	06,8	03,2	131,5	11,0
1998	03,2	04,8	05,4	13,4	15,4	21,2	22,6	22,1	16,1	12,7	04,0	-2,6	138,3	11,5
1999	00,7	01,8	09,0	12,5	17,0	19,8	21,2	21,3	18,4	11,9	04,3	01,9	139,8	11,6
2000	-1,7	04,1	07,4	14,2	17,4	21,4	21,8	23,2	16,7	13,9	10,7	04,6	153,7	12,8
90-00	00,6	02,8	07,1	10,1	16,3	20,0	21,5	21,5	16,6	11,6	06,5	01,3	136,6	11,2
1980-2000	00,1	01,6	06,5	10,9	16,1	19,3	21,4	21,1	16,7	11,5	05,6	01,6	132,2	11,0

Table 2. Perennial precipitation quantities (Meteorological station Banja Luka)

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	∑	average
1980	66,5	55,6	98,2	122,5	192,0	144,0	36,2	93,3	57,6	81,4	196,0	137,8	1281,2	106,8
1981	112,9	64,5	137,6	57,7	77,9	149,5	46,8	48,0	106,5	70,8	80,8	172,4	1125,4	93,8
1982	27,0	13,7	118,7	77,1	39,4	112,4	103,3	90,5	49,8	102,4	54,3	206,9	995,5	83,9
1983	21,6	102,0	54,7	63,7	40,9	130,0	57,0	75,8	126,8	63,8	23,4	52,0	811,7	67,7
1984	135,6	86,8	112,2	76,9	137,6	126,1	106,3	158,3	97,2	99,7	80,3	28,2	1252,2	104,4
1985	69,5	37,4	122,9	149,5	46,2	91,8	33,0	94,6	27,3	34,6	161,6	66,8	935,2	80,6
1986	92,2	80,3	76,7	66,4	104,1	127,4	144,6	68,1	21,9	115,9	66,7	40,8	1004,7	83,7
1987	91,4	29,2	101,2	90,6	163,2	61,2	64,8	56,7	33,7	31,1	108,5	51,3	887,9	73,6
1988	96,9	75,5	123,4	58,9	83,3	111,4	25,5	75,3	91,7	60,9	66,9	50,8	924,9	77,1
1989	10,3	12,6	73,4	75,6	175,9	92,2	109,6	13,1	120,7	88,1	47,6	40,5	955,2	79,6
80-89	72,4	56,3	102,6	73,8	106,1	114,6	72,7	88,4	73,3	74,8	88,6	84,7	1008,3	84,0
1990	69,5	41,6	59,7	85,6	41,4	87,5	76,7	32,9	66,0	57,0	105,6	156,2	819,7	68,3
1991	50,4	41,8	91,6	125,8	171,9	90,9	273,4	64,9	39,7	181,1	134,0	41,0	1306,5	108,9
1992	20,2	45,1	102,5	77,2	36,1	181,7	81,9	06,4	49,5	197,6	155,8	61,1	1015,1	84,6
1993	49,5	29,3	135,8	55,7	47,5	107,1	106,7	106,8	160,4	79,2	149,2	143,3	117,5	97,5
1994	102,3	98,5	53,1	90,9	48,9	116,3	69,8	55,8	121,0	101,7	11,9	91,6	961,8	80,2
1995	148,7	74,3	128,3	68,8	70,6	163,8	38,6	126,9	120,2	02,1	69,2	137,0	1148,5	95,7
1996	33,4	56,5	107,2	63,5	203,4	76,1	60,3	53,6	225,0	67,0	165,6	97,1	1208,7	100,7
1997	81,7	74,5	59,0	122,1	90,1	87,7	103,4	103,5	43,8	116,7	124,5	139,3	1146,3	95,5
1998	108,1	08,8	50,1	83,3	82,7	104,3	81,1	37,4	167,3	102,0	99,3	69,0	993,4	82,7
1999	54,7	120,3	40,2	117,6	74,9	191,5	127,2	19,5	108,5	75,8	160,3	160,2	1250,7	104,2
2000	42,9	38,9	73,7	58,1	67,2	35,7	83,2	13,2	68,7	47,7	92,3	81,3	708,2	59,0
90-00	69,2	61,0	81,9	86,2	85,0	113,0	100,2	56,4	106,4	93,4	119,5	104,0	1075,2	89,6
∑ 80-00	1484.7	1232.7	1927,8	1686,3	1995,0	2387,7	1829,1	1503,6	1902,6	1776,6	2093,3	2024,1	21844,2	1040,2
sr.vr. 80-00	70,7	58,7	91,8	80,3	95,0	113,7	87,1	71,6	90,6	84,6	99,7	96,4	1040,2	86,7

Stead of the conclusion

Bosnia and Herzegovina has favorable agro-ecological conditions for lucrative oil seed rape production. There are all technological solutions and certain production experience for production of rape. However, there is a lack of necessary organization of producers and necessary stimulating measures of the organizers (bearers) of the production and government. Today, without the fuel the agricultural production is unimaginable. With higher shortage of fuel from holes, the significance of bio-diesel is increasing, because it is real alternative (replacement) for the oil. Bio-diesel does not pollute the environment as the oil does.

Europien Union gives grate importance to bio-diesel. The EU obligates its members to increase the bio-diesel production up to 5% out of the total use of common diesel fuel until 2006 and 12% until 2010. Therefore, for entrance to EU, certain quantities of bio-diesel must be produced in B&H as well.

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