



RESEARCH ARTICLE

ALTERNATIVE USE OF TOBACCO

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ABSTRACT

According to the National strategy for environmental investments in the Republic of Macedonia 2007-2013, the country has enough green energy, sunny days, hydropotential, geothermal waters and biomass, i.e. potentials which are not sufficiently exploited, and it is bound to produce at least 20% renewable energy by 2020.

The fact that tobacco production is a major source of income to many Macedonian families and direct incentive of economic development of certain regions in the country has encouraged the experts to find acceptable solution that will follow the EU guidelines on finding green energy as a renewable source and will also contribute to the anti-smoking campaign by alternative use of tobacco.

Tobacco leaf is used for extraction of components for production of anti-inflammatory medications and drugs for treatment of Alzheimer's and Parkinson's disease, diabetes etc. It can be also applied in antibactericide, antifungicide and antiinsecticide preparations which proved their high efficiency in practice and are considered natural products for environmental protection.

The amount of biomass per unit area is an important component in the production of biogas and organic fertilizer. Composition of tobacco plant and the ratio between its constituents (oil, cellulose, starch, sugar) is considered an ideal combination for biogas production.

If we defeat our prejudices that tobacco is used only for production of cigarettes and make deeper analyses of its real potentials, it will be realized that tobacco is the food of the future and agricultural crop which deserves more attention.

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INTRODUCTION

Possibilities for alternative use of tobacco immediately after harvesting the leaves required for cigarette industry have been known long ago. It is known that the biomass of this crop is used only 25-30% and 70-75% remains unused in tobacco fields. In 2008, Dr. Hristo Bozukov from the Tobacco Institute - Plovdiv, Bulgaria suggested alternative ways to use tobacco biomass, following the EU recommendations No. 54 of 2003 in relation to Article 17 of the Framework Convention on Tobacco Control on possible shift of tobacco growers, primarily in the EU, to some other crops. WHO and its antismoking lobby have made decades-long efforts to reduce tobacco smoking as it is a leading cause of cancer. The application of Article 17, however, provoked internal dispute between EU members, especially among the non-producing countries which are not willing to pay contributions for tobacco stimulation in tobacco growing countries.

The reason for that is the possibility of an unlimited supply of tobacco from markets outside the EU, without paying any stimulations.

Possible alternative use of tobacco crop

Besides the basic use of tobacco or tobacco leaves in manufacture of cigarettes and other tobacco products, it can be used for other purposes, which further contributes to the increase of income of tobacco producers and users of alternative products. Possible ways for utilization of tobacco crop are:

- Cultivation of tobacco for regeneration of soils contaminated with heavy metals. Previous trials revealed that tobacco can be successfully used in contaminated areas which are serious environmental problem, especially areas that are producing crops for the food industry and are located near industrial facilities. Tobacco plant has a capacity to extract heavy metals from the soil significantly better than other crops. Tobacco extracts 0.2 - 3.6 mm/kg heavy metals while other agricultural crops extract 0.01 -

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0.1 mm/kg. It should be noted that the biomass obtained from tobacco grown in contaminated soil cannot be used into tobacco industry for production of cigarettes, but it can be used to obtain ethanol as a biofuel for the needs of other industries.

Related to this, Macedonia needs to grow tobacco to restore the solvency of highly polluted soils located near industrial facilities. These soils are well known to the Department of Pedology of the Faculty of Agriculture in Skopje and they are mainly located around the factories "Jugohrom"- Jegunovce, "Feni Industries" - Kavadarci, former zinc and lead smelting factory - Veles, nitrogen plant "HIV" - Veles, soils around power plants and soils near mines for exploitation of mineral ores. Relevant institutions responsible for environment protection can determine the extent of contamination and the size of the areas contaminated with heavy metals. Investigations on heavy metals content in tobacco raw and tobacco smoke were also conducted in Scientific Tobacco Institute-Prilep and the results are presented in the following table:

Lead content in the soils of Scientific Tobacco Institute – Prilep and in the location Mechanica – Veles

Samples	Istplot	IIndplot	IIIRDplot	IVthplot
	Prilep/ PPm	Yaka / PPm	Otlija / PPm	Mechanika/ PPm
A	2,00	1,85	2,11	57,5
B	3,00	2,34	2,84	43,50
Average	2,50	2,10	2,47	50,50

Source: "Tutun/Tobacco", No.1 - 2,1985

Lead content in tobacco grown in the location Mechanica – Veles

Element	Mechanika	Suva Kajsija	Otpad	Keramidna	Chaska	Izvor
Lead /PPm	97,0	60,3	72,0	30,8	13,0	6,25

Source: "Tutun/Tobacco", No.1 - 2,1985

Area under tobacco, number of growers and quantities of purchased tobacco

Year	Area / ha	Growers	Purchased tobacco / tons
2009	16.212	38.710	23.196
2010	18.846	40.743	26.393
2011	15.677	33.234	21.024
2012	14.609	29.090	27.993
2013	19.806	42.386	30.997
Average	17.030	36.833	25.921

Source: Review on raw tobacco purchase, April 2014, the Economic Chamber of R. Macedonia

According to the above results, the presence of lead in the soils of Tobacco Institute - Prilep is about 20 times lower than the lead present in the location Mechanica - Veles. The lead content of soils was reflected on the presence of lead in tobacco production and the most affected location was Mechanica - Veles. The data reveal that the presence of lead in tobacco is correlated with the presence of lead in the soil. The same study also stated that the lead concentration in tobacco reduces from the stalk to the top of the plant. The highest concentration was measured in the stalk and it was decreasing toward the lower, middle and upper primings, with the lowest concentration being measured in the inflorescence.

➤ Tobacco crop can be used as a source for energy fuel. What is left in the field after harvest are tobacco stems, suckers

and inflorescences, which contains 30-35% fat. According to the research conducted in the Tobacco Institute - Plovdiv, Bulgaria on an area of 40,000 ha, the rest of biomass after harvest, if processed into briquettes, is 753,621 tons, which is equivalent to an energy obtained from 150,757 tons of oil. Another important but underestimated source of energy from tobacco crop is its seed, which contains 30-35% fat. Roughly, the amount obtained from 40,000 ha is around 6,000,000 kg of tobacco seed, a quantity enough for 1.800.000 - 2.000.000 kg oil excellent for biofuel.

Similar calculations on biomass utilization from tobacco were made in the Republic of Macedonia. According to the data on the five-year tobacco production (2009 - 2013) presented in the table, 323,500 tons biomass, 2.555.000 kg tobacco seed and about 510 900 kg oil for biofuel can be obtained from an area of 17030 ha. How this biomass would be used in the country as a special source of energy, along with biomass from other crops, depends on the estimation of the optimum capacity and proper organization for utilization of this biopotential.

Tobacco Institute - Prilep 1995 - 1996 made analyses on dry stems of tobacco in the laboratory of the Paper factory - Kocani. The results of the analysis showed that the dry matter content of tobacco stems consists of 46% cellulose and the rest belongs to other compounds and minerals. Several countries have recognized the possibility of alternative use of tobacco mass. In Italy, a high-yielding tobacco variety was created along with necessary technology for its production, which yields 1,000 kg seed per decare, i.e. 10,000 kg per hectare. From this, 350-400 l oil per decare, i.e. 3500-4000 l oil per hectare can be obtained for production of biodiesel. This surpasses the yields of oil crops grown so far, as sunflower and oilseed rape, which can also be used for production of biodiesel. Besides oil, tobacco plant yields 25-30% protein (abumens), used in the production of animal feed. In the United

States, new tobacco variety with high sugar content in leaves was created by genetic modification and it is used in production of bioethanol. The use of biomass from tobacco crop depends significantly on the price and is in co-relation with the basic material, technology, and installed capacity etc., i.e. capacity that will provide optimum economic viability. The tobacco crop is alternatively applicable and very useful in traditional medicine; tobacco waste is used as substitute for artificial pesticides, extracts from tobacco dust and raw tobacco are used in pharmaceutical industry and in cosmetics, in production of perfumes.

The best alternative to tobacco is still tobacco

Article 17 of the Framework Convention on Tobacco Control requires parties to promote gradual replacement of tobacco with other agricultural crops. Tobacco producing countries have been under pressure to implement this Convention, but ten year-old discussions gave no vivid signs of progress, which indicates the impossibility of its execution in practice. According to tobacco growers, the imposed article is not effective because people who make decisions have no competence in this field. At the moment, replacement of tobacco with other crops is quite disputable and there is no good alternative to be offered to tobacco growers which can provide higher security.

It is hard and unreal to create alternative to tobacco cultivation at a global level. For tobacco manufacturers, global alternative solution is quite problematic. The alternative crop must have a permanent, continuous demand, starting from the primary production, over the whole reproductive cycle, ending with marketing. This is especially important for tobacco farmers from the non-developed and developing countries. The alternative crop must provide jobs or labor engagement as much as tobacco. Statistically, for almost all types of tobacco, especially for the small-leaf, it takes 2,500 hours per hectare. About 30,000,000 farmers are engaged in tobacco sector worldwide, which is of crucial importance and which creates strong reservations about the use of Article 17 of the Framework Convention. The decisions made so far have been far from reality. Tobacco farmers complain that this article deprives them of the right to decide on this important issue which concerns their existence. Solutions and obligations are proposed with no respect for farmers needs, misunderstanding the essence of the problem. Many of those who created this article are not sufficiently acquainted with the manufacturing process of tobacco, because they are representatives of other scientific areas: health, pharmacy, customs etc. Basically, they cannot understand the significance and dominance of tobacco from social, economic and political aspects. The WHO scheme for promotion of alternative use of tobacco in relation to Article 17 of the Framework Convention is based on the following:

- Limitation of the area under tobacco.
- Restriction of annual tobacco production
- Restriction of any form of technical or technological assistance
- Discouraging the farmers from starting to cultivate tobacco.
- Restrictions of public and private funds intended for support of tobacco growing.

These extreme postulates by the WHO are rejected and active involvement of farmers is required in search of appropriate solutions. Previous discussions on this article did not explain the absence and ignorance of the farmers and of the tobacco industry as a whole. There are certain countries in which tobacco cultivation was replaced by another crop. However, actions undertaken in this respect in 2005 proved unsuccessful. The Brazilian government made a program believed to be benefiting 80,000 farmers in the country, but the results did not correspond to expectations—tobacco production has increased. The reason for this is that the program was financed by the government and did not include the private sector. There are no data on crop yield by this program. Similar program was carried out in 2009 in Malawi for 6,000 farmers. According to data from 2014, the number of farmers under this program decreased to 1,600, which means that farmers stopped growing tobacco but did not accept the alternative. The reason, again, is that the project is regulated by the government which purchases the final product and does not represent a real market driven by a real sector. So, the programs for finding alternative to tobacco have no future. The failure of WHO to replace tobacco with other crops in global level can be seen from the following table:

Leading tobacco producing countries worldwide

Country	Production in2008, in tons	Production in2013, in tons
China	2.839.725	3.150.000
Brazil	859.058	850.000
India	490.000	830.000
USA	361.000	345.000
Argentina	157.786	115.000
Indonesia	169.668	260.000
Malawi	160.228	132.800
Italy	123.281	49.200
Pakistan	107.768	108.307
Turkey	93.403	90.000
Zimbabwe	81.952	150.000
Thailand	67.588	72.000
Mozambique	64.342	56.000
South Korea	74.469	80.000
Tanzania	50.800	86.360
Laos	31.103	40.600
Zambia	64.066	62.000
Canada	47.162	15.145
Bulgaria	42.161	34.000
Poland	41.200	32.000
Greece	20.500	24.000
Romania	2.360	1.357
Total production:	5.965.628	6.583.357

Source: FAOSTAT, 2008-2013

Most deviations in the production of raw tobacco in certain countries are due to the effect of natural conditions - droughts, floods, tobacco diseases, and not to the Article 17 of FCTC.

Conclusion

Tobacco crop gives great opportunities for alternative use of its biomass. Application of Article 17 of the Framework Convention on Tobacco Control is hardly applicable to tobacco growers as long as the portion of the used biomass (25-30%) provides a twofold and threefold profit ability at arid soils moderately supplied with nutrients. Often, tobacco is the only viable crop for many rural areas. The efforts made in direction

to replace tobacco with other crops are insignificant. It is difficult for the farmers to give up the traditional, centuries-old crop, in which all segments - production, processing and marketing, in almost all producing countries are legally regulated. States and their governments, even though they accepted the Framework Convention, are traditional partners in this branch and, above all, they respect its social, economic and political significance. The tobacco industry is the most organized global branch worldwide. It is flexible and adaptable to all social conditions in terms of economic crises, wars, natural disasters etc. Tobacco leaf industry remains stable and prosperous, providing many alternative possibilities to use other parts of tobacco in biomass production. The WHO and anti-smoking lobby should respect tobacco industry and take care its products to be less harmful to human health.

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