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Evaluation of Biodiesel Production Problems In Turkey By Swot Analysis

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Abstract -Problems experienced in energy supply and use make renewable and alternative energy resources in the world attractive, and it is seen that countries rapidly turn to these resources so that they are not dependent on foreign energy. One of the most important examples of the quest for fuels which will replace fossil fuels is initiation of using alternative energy fuels such as biodiesel, bioethanol and biogas worldwide at an increasing rate. In the study conducted for this purpose, the reasons for the failure to produce biodiesel although there is biodiesel production potential in Turkey, and the problems encountered during biodiesel production were examined and itemized. As a result of the information obtained, suggestions were made in order to remedy the problems, and those need to be done to promote biodiesel production in Turkey were given.

***Keywords*:** Swot analysis, Renewable energy, Biodiesel, Tax, Turkey

1. Introduction

Nowadays, alternative fuels to gasoline and diesel are biodiesel and ethanol. Biodiesel is a product obtained as a result of converting organic oils into diesel fuel by mixing them with base and alcohol. Typically, it is obtained as a result of the reaction of oils derived from oil seed plants such as rapeseed (canola), sunflower, soybean, safflower or animal fats with a short chain alcohol (methanol or ethanol) in the presence of a catalyst, and it is used as fuel in all types of vehicles. Household frying oils, frozen oil and animal fats such as fish oil are also used as raw material for biodiesel (Acaroglu, 2003; Türe, S., 2001).

Biodiesel is produced by reacting vegetable oils and animal fats with an alcohol and a catalyst. Waste vegetable oils and animal fats can also be used as raw material for biodiesel. In terms of its physical and chemical properties, it is similar to petroleum-based diesel fuels. Biodiesel can be used as pure or by mixing it with petroleum-based diesel fuel in diesel engines. When used as pure, biodiesel is called B100, whereas a mixture of 20% biodiesel and 80% diesel fuel is called B20 (Celik and Koc, 2011; Anonymus, 2012a; Anonymus, 2012b).

Although worldwide energy demand increases gradually, renewable energy sources are supported with an increasing demand, biodiesel production is supported by the government in most countries, there are many problems in use and production of biodiesel in Turkey.

In the study conducted for this purpose, biodiesel production potential in Turkey, advantages and disadvantages of biodiesel and the problems encountered during biodiesel production were examined and itemized. As a result of the information obtained, suggestions were made in order to remedy the problems, and those need to be done to promote biodiesel production in Turkey were given(Keskin, 2013).

2. Previous Work

Numerous national and international studies on biodiesel were conducted. However, most studies are based on production of biodiesel from different raw materials and materials.

In the article by Aksoy (2010) entitled "Biodiesel as an alternative energy source and its production processes", disadvantages of fossil fuels were mentioned and usability of biodiesel as an alternative to fossil fuels was suggested.

The book entitled "Biodiesel, the fuel of the third millennium" by Öğüt and Oguz (2006) includes the following topics: challenges arising from use of fossil fuels, renewable energy, historical development of use of biodiesel in diesel engines as a fuel, worldwide status of biodiesel, definition of biodiesel, advantages of biodiesel, drawbacks of biodiesel, technical features of biodiesel, growing certain oil plants, obtaining oil from seeds, methods for conversion of biological oils into fuel, glycerin separation method, implementation of automation system in biodiesel production, biodiesel production cost, standards and technical specifications of biodiesel, biodiesel environment and health, the legislation on biodiesel in Turkey, current state of biodiesel production in Turkey.

In the article by Yasar and Eren (2008) entitled "Environmental impact of petrodiesel used in the agricultural sector in Turkey and its comparison with biodiesel alternative", energy problems in Turkey were represented and it was also mentioned that Turkey imports 90% of petrol, the most important source of energy, and 70% of Turkey's total energy is met by importing.

3. Research and Findings

All problems in the production of biodiesel in Turkey were investigated from the standpoint of producers, consumers and supervisory agencies. As a result, these problems were reduced to 11 items, which are

- Problems associated with biodiesel in terms of high emission value of NOx in fuel emissions,
- Problems in supply of raw materials,
- Difficulties in supporting biodiesel investments,
- Problems in logistics activities in terms of distribution of biodiesel,
- The impact of SCT(special consumption tax) on biodiesel cost,
- Definition of biodiesel and problems related to corporate identity,
- Disputes arising from the standards used in the production of biodiesel,
- Challenges associated with unregistered production,
- Problems experienced in utilization of waste vegetable oils during production,
- Inadequate community awareness about use of biodiesel,
- Problems in use of rape plant in biodiesel industry in Turkey.

When the problems indicated in 11 items were examined, 6 important items were analyzed in detail, and suggestions for solution were made. Then, the problems in biodiesel production were modeled by SWOT analysis and a further assessment of the problems was made.

3. 1. Raw Material Supply Problem

The first of the problems encountered in the production of biodiesel are the problems in the production of plants, including canola, soy, etc. which are used as the raw material of biodiesel or in the collection of waste oils. The most important problems in supply of raw material are that manufacturer people do not have enough knowledge about this subject, production is not supported sufficiently, post-production marketing problems, legal loopholes in the collection of waste oils, which are considered as another raw material resource, and lack of user awareness.

Other than the lack of raw materials, the importance of oilseeds is increasing in Turkey and in the world. In addition to raw material requirement of biodiesel sector, oil consumption will increase depending on increasing population. Activities that will develop agriculture of oilseeds should continue increasingly so that Turkey meets this requirement with its own domestic resources without depending on foreign resources.

In this context, energy agriculture farmers should be given incentive premiums, tax credits, agricultural support (seeds support, fuel support, fertilizer subsidy, etc.), idle unused lands should be utilized for energy agriculture, purchase guarantee should be provided to energy agriculture, contract farming should be expanded and lands should be allocated to energy agriculture by alternating cultivation method. Turkey should allocate funds to R&D work in this field, and biofuel work as well as R&D work should be supported. Thus, business opportunities will arise for farmers, rural-urban migration will be reduced. Increasing yield of vegetable oils to be used for biofuel production will also enable the development of vegetable oil industry.

As a result, Turkey will save energy and its dependence on foreign resources will be reduced. Furthermore, migration to metropolitan districts will be prevented, and improper urbanization, traffic jams, increased crime rates, educational and economic issues arising from migration will be remedied.

3. 2. Definition of Biodiesel and Lack of Corporate Identity

Although biodiesel is an alternative energy source derived from vegetable oils, animal fats, domestic and industrial waste oils, it is evaluated pursuant to Petroleum Law 5015 in Turkey. Biodiesel is considered as an oil-free, clean and renewable alternative energy resource in the world and in Turkey, however, EMRA(Energy Market Regulatory Authority) classifies biodiesel as a petroleum product, which adversely affects development of biodiesel.

We can briefly describe institutionalization as a form of self-expression of an organization. Responsibility for biodiesel, in its current form, rests with Ministry of Finance, Ministry of Industry, Ministry of Environment and Forestry, Ministry of Agriculture and Livestock, and Ministry of Energy. It is not possible to remedy the problems related to biodisel because it is in the area of interest of many institutions, and it is not completely bound to a single institution. Binding biodiesel to an institution will allow Turkey to make faster breakthroughs on this matter.

3. 3. Problem of Biodiesel Standards

Biofuel -producing countries grow their own agricultural products and use them in the production process rather than importing raw materials. Countries particularly specialize in agricultural products conforming to their climate conditions. For example, the EU countries used rapeseed oil in biodiesel production and developed a standard according to this raw material. The USA preferred corn as raw material in bioethanol production, whereas Brazil preferred sugar cane. Asian countries of Indonesia and Malaysia use palm oil in biodiesel production.

Biodiesel was included in the blended products section of Oil Market Law No. 5015 in 2003, thus work related to the standard to be used in production has begun. On October 13th, 2005, the standard "Automotive fuels - Fatty acid methyl esters (FAME/BIODIESEL) - For diesel engines - Requirements and test methods" was adopted. Then, this standard was revised by TSE (Turkish Standards Institute) in 2009 and 2010. Currently, TS EN 14214+A1 "Automotive fuels - Fatty acid methyl esters (FAME/BIODIESEL) - For diesel engines - the standard for specifications and test methods", which was adopted on March 2nd, 2010, is in force. In line with this, TS No. 13314 "Biodiesel Fatty Acid Methyl Esters (FAME) Production Facilities - General Rules" was prepared and put into force on December 6th, 2007. While creating these standards, standards created by the EU for biodiesel production was taken as the basis.

Problems are experienced due to these standards, which began to be used without considering Turkey's agricultural product portfolio, climate conditions, etc. The EU countries use raw material oil as raw material in the production of biodiesel. Rapeseed oil is a raw material which is not produced to a large scale in Turkey, and little is known about its details. It is clear that Turkey will be an importer in the first stage, if rapeseed oil is used as the raw material. This is in contrast with the logic of meeting our energy needs by ourselves.

For this purpose, it will make more sense if standards aiming at using plants conforming to Turkey's agricultural conditions are developed.

3. 4. The Problem of Lack of Awareness of the Community on the Use of Biodiesel

Many countries worldwide are using biodiesel effectively. In addition, they establish policies to increase the use of this fuel and constitute a biodiesel vision. However, there are two reasons for limited use of biodiesel in Turkey, which are wrong policies implemented on biodiesel and Turkish people's lack of knowledge about biodiesel. Although many academic studies have been carried about biodiesel, several professional organizations and co-operatives have been actively engaged with it and R & D work has been carried out, it is sad that the public is unaware of this subject. In this context, several activities should be undertaken to raise public awareness with regard to biodiesel.

Firstly, courses on this subject should be included in secondary and high school curricula, the mass media of radio, television, magazines, newspapers, the internet should be utilized, even short films under the name of public spotlight should be prepared and broadcasted in national and local television channels.

3. 5. The Problem of Special Consumption Tax in Biodiesel Cost

Special Consumption Tax (SCT) is an expenditure tax deducted on a fixed or proportional basis over certain goods or products in Turkey. First, it came up with amendments to law in the framework of harmonization with the European Union and was adopted by Law No. 4760 in 2002. The purpose of applying this tax in the European Union is to provide social benefits rather than generate revenue. Therefore, SCT is applied on luxury items (jewelry, fur, etc.), items harmful to health (alcohol, cigarettes, etc.) and items harmful to the environment (gasoline, etc.). SCT is not payable each time the same item is transferred, as in the case of VAT (value added tax). SCT arises when an item is imported or a piece of manufactured goods is delivered to its initial purchaser. In the case of motor vehicles, SCT is payable on behalf of the final consumer. Importers and first suppliers are taxpayers (Anonymous, 2012c).

SCT is one of the obstacles to widespread adoption of biodiesel throughout Turkey. Under normal conditions, considering that SCT should pursue a social objective, the best decision would be not subjecting biodiesel to SCT because biodiesel doesn't cause greenhouse effect, it will reduce dependence to foreign resources, increase employment as well as agricultural production, and reduce migration to metropolitan districts. Considering the positive effects of biodiesel, Ministry of Finance should waive tax revenues from SCT. EMRA should approach to exemption of biodiesel from SCT with the logic "the one who pollutes is the one who will pay", rather than unfair competition.

Biodiesel was initially included in products blended with liquid fuel in article 7 of Oil Market Law No. 5015 dated 30.12.2003. In addition, it is stated in article 9 of the law that products blended with liquid fuel are subject to the equivalent tax rate imposed on liquid fuel, and that products obtained from domestic agricultural products and blended with liquid fuel are exempt from this provision. Then, on April 4th, 2006, in Law 5479 on Income Tax, Law on Public Debt Collection Procedure, Law on Special Consumption Tax and in article 16 of Law on Amending Tax Procedural Law, a SCT of 0.6498 TL per liter has been introduced. However, with the decision of the Council of Ministers on December 8th, 2006, exemption from SCT, which applies to 2% of biodiesel obtained from agricultural products produced in Turkey, was introduced by article 2 of Special Consumption Tax Law No. 4760. Only biodiesel derived from waste cooking oil are excluded from this tax exemption. In the following years, SCT has continued to increase. Imposing a SCT of 0.72, 0.80, 0.91 and 1.1209 TL on biodiesel which is not obtained from waste oils and domestic agricultural products as raw material was introduced by the decisions of Council of Ministers dated November 2nd, 2007, July 15th, 2009, December 31st, 2009 and September 20th, 2012, respectively.

When foreign trade figures by years are examined, it is evident that the share of imports in foreign trade volume constantly increased. Imports in 2000 were around USD 54 billion, while this figure reached USD 240 billion as of 2011. On the other hand, when crude oil import figures by year are examined, an average of 21 million tonnes of oil was imported between 2002 and 2011. When it is considered that the average price of a barrel of crude oil is USD 120, crude oil import of around USD 20 billion is carried out per annum.

When foreign trade volume of coke and refined petroleum products by years are examined, imports of approximately USD 18 billion were carried out in 2011. Turkey imports oil and petroleum products of

approximately USD 40 billion in total. Furthermore, the increase in consumption of oil and petroleum products in years is known to increase exhaust emissions that will cause greenhouse effect.

When greenhouse gas emissions by sector are analyzed, they were equivalent to a total of 187 million tons of CO_2 in 1990 and 401 million tons of CO_2 in 2010.

In this context, if SCT on biodiesel is reduced or annulled completely, our foreign trade deficit thus our dependence on foreign resources as well as greenhouse effect causing global warming will be significantly reduced.

3. 6. The Problem of Biodiesel Distribution and Logistics

Logistics is one of the most important factors affecting biofuel cost and covers transport to sales station, storage of the final product, and organization and planning of these functions.

For fulfilment of these activities, the government should support companies with incentives, including tax deduction, meeting insurance premiums, VAT refund, exemption from VAT, land allocation, and provision of funding with low interest rates to logistics investors. As a result, biofuel production costs will be reduced and accordingly logistics industry will become active.

3. 7. Recent Developments Related to Biodiesel

Energy Market Regulatory Authority (EMRA) introduced an obligation to add local contribution to be increased gradually every year as from 2013 in gasoline and diesel fuel. Fatty acid methyl ester (FAME) content produced from local agricultural products (biodiesel) of types of diesel fuel supplied to the market as liquid fuel must be:

- At least 1 percent as of January 1st, 2014,
- At least 2 percent as of January 1st, 2015,
- At least 3 percent as of January 1st, 2016.

EMRA's decision makes addition of agricultural products to liquid fuel compulsory, while this decision implies promotion of production of domestic biofuels. In 2011, if density of diesel is taken as 0.845 gr/cm^3, about 14.7 million tons or 17.4 million m^3 of diesel was consumed in Turkey. If a blending of 3% to diesel is made compulsory, 522 thousand m^3 or 441 thousand tons of biodiesel are needed.

EMRA's positive attitude about local contribution should also support other matters referred to as problems herein. This will reduce energy import, which is one of Turkey's most important import items, and make a big contribution to Turkey's progress at a rapid pace toward becoming a self-sufficient state.

4. Assessment of Problems in Turkey by SWOT Analysis Technique

SWOT is an analysis technique which covers internal and external state analysis and helps one determine current state of the process, accordingly, set forth its strengths and weaknesses, opportunities faced by the process and elements of threat (Table 1).

Table. 1. Description of Swot analysis techniques.

Abridgment	Mean	Description
S	Strength	Identification of strengths/superior qualities of biodiesel industry
W	Weakness	Identification of weaknesses/weaker qualities of biodiesel industry
O	Opportunity	Identification of opportunities of biodiesel industry
T	Threat	Identification of threats and hazards faced by biodiesel industry

4. 1. Strengths Of Biodiesel Industry

- Suitable climate conditions and soil structure for cultivation of many oil plants
- High potential of waste vegetable oil
- Widespread use of modern agricultural machinery in Turkey

• Sufficient level of potential population to be employed in agricultural work of Turkey

4. 2. Weaknesses Of Biodiesel Industry

- Raw material problem
- High Special Consumption Tax and Value Added Tax
- Absence of a law only related to biofuels, including biodiesel; that biodisel is included in the oil law although it has plant and animal origin
- Putting quality standards prepared by the EU countries into effect without considering Turkey's potential for raw material
- That biodiesel is in the area of interest of Ministries of Finance, Environment and Energy; absence of an institutional structure that will organize all of them
- That many municipalities are not actively involved in collection of waste vegetable oils and informing the public in Turkey

4. 3. Potential Risks And Threats That Biodiesel Industry Will Face

- General price increase in vegetable-based products
- Food security
- That non-standard production and unregistered production become widespread
- Import of vegetable oil
- Increase in foreign trade deficit in line with shortage of vegetable oils
- Spread of waste vegetable and animal oils to the environment because of failure to effectively collect them or making them available for consumption again after they are passed through a number of processes
- Increase in shortage of vegetable oils

4. 4. Opportunities That Biodiesel Industry Has

- Evaluation of waste vegetable oils and animal fats, and its positive contribution to the environment
- Ensuring increase in employment in agriculture sector
- Reduction in crime rates, problems in education, health and traffic in metropolitan districts due to the reduction of migration from rural areas to metropolitan districts
- Increase in the amount of glycerin and pulps obtained as a result of production of biodiesel and, accordingly, decrease in the overall price for these products
- Export of biodiesel produced, and accordingly ensuring a decrease in foreign trade deficit
- Production of vegetable oil crops in the lands covered by Southeastern Anatolia Project

5. Conclusion

Biodiesel industry involves activities, including supply of raw material to be used, installation of industrial facilities where raw material will be processed and final product will be obtained and delivery of the final product to the consumer. Considering employment to be created by agricultural, industrial and logistics sectors, which will reduce Turkey's dependence on foreign resources, its positive contribution to the environment, any support and incentives to be provided by Turkish government for development of such sector are important. It is particularly important that the government provides funds with low interest rate to be required for infrastructure and equipment investment of facilities to be established, and makes insurance premium payments in addition to land allocation, supports to be provided by the government in energy costs, provision of customs duty exemption for equipment imported, exemption from VAT, and VAT refund.

On the other hand, activities in biodiesel industry should be facilitated by incentives, including provision of tax deductions and insurance premium payments by the government also in the logistics sector, VAT exemption, VAT refund, provision of funding with low interest rate for investments in the

logistics sector. It would be more appropriate to spread such incentives and subsidies throughout Turkey, rather than focusing on certain areas.

An independent society is only possible with an independent economy. Turkey meets its energy demand by imports so investing in Turkey's alternative energy resources and supporting initiatives in this sector will be an important step in the name of creating an independent society. Widespread use of biodiesel will provide major advantages to Turkey such as expansion of agriculture sector, increase in variety of products, better pay for farm workers, etc. Other than creating employment in the agricultural sector, it will prevent migration from rural to metropolitan districts. Facilities to be installed for production will create significant employment. Production of glycerin and pulp obtained as a result of production will provide relief in sectors utilizing these by-products (cosmetics and feed industries) in terms of cost. In this context, continuous and permanent policies should be created in respect of biodiesel and targets should be established. With the widespread use of biodiesel, it will be possible to take action with the world in the fight against greenhouse gas and an environment-friendly society will be created. On the other hand, Turkey will acquire the position of a country that exports its biodiesel in addition to overcoming obstacles related to energy.

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