


Reaching the Biofuels Target in Small EU Member States:- Opportunities for pre-blending

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***Carbon/Efficiency Labelling &
Bio-Blending for Optimising Benefits
of Biodiesel & Additive Use***

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The views contained in this report reflect only the Author’s position in regard to the matters expressed therein. They should in no manner whatsoever be understood as being the Government of Malta’s official policy.

Prelude

In 2005 the European Commission (CION) set the goal that by the end of 2005, 2% of the energy used in transportation should be coming from biofuels. The ambition was to have 5.75% of biofuels in transportation by 2010. Although this goal is indicative, indications are that this target will not be attained. Consequently, in January 2007 CION proposed to introduce a binding 10% target for biofuels in transport fuel by 2020. This was confirmed by the Council of Prime Ministers in March of the same year laying the basis for future discussions.

On the 23rd of January 2008, CION put forth a proposal for *Climate Action*. This included a proposal for a Directive on ‘the promotion of the use of energy from renewable sources’ setting an overall binding target for the European Union of 20-percent renewable energy use by 2020 and a 10-percent minimum target for the market share of biofuels by 2020, to be observed by all EU Member States. The 10 percent target is to be achieved by each Member State whereas the 20 percent target is an overall EU target. Parallel to the renewable directive another directive currently being amended is the Fuels Quality Directive EC/98/70. In this Directive the Commission suggested a 10% decrease of the lifecycle greenhouse gas emission per unit energy of the transport fuels over the 2010 level. Work on both of these Directives was still not concluded at the time of preparing this report however Council Working Group members have agreed to present the following regulations for discussion with the European Parliament;

Renewables Directive Art 3(3) “Each Member State shall ensure that the share of energy from renewable sources in all forms of transport in 2020 is at least 10% of final consumption of energy in transport in that Member State”

Fuels Quality Directive Art. 7a (2) “Member states shall require suppliers to reduce life cycle greenhouse gas emissions per unit of energy supplied for use in any type of road non–road mobile machinery up to 10 % , compared with the fuel baseline standar .”

Some of the new EU Member States said they could not afford to develop alternatives and preferred to stay with cheaper but more polluting options such as coal and oil (1). Hence this paper refers to the position being seen in Malta in setting a biofuel strategy with hindsight the aim of fulfilling of its upcoming obligations set by new Directives.

1. Current Situation in Malta

1.1 Targets

Biofuels in Malta have been relatively very successful ever since their introduction in 2003. Successive years have shown increasing trends and the amount of Biofuel retailed in Malta in 2007 was a very encouraging in this regard. In fact in 2007, 1.08% of all the total transport fuel sales by energy content were biofuels. Figure 1, below shows what consumption percentages have been achieved ever since the first introduction of biofuel in the Maltese Islands. Also shown on the chart are the indicative targets set by Malta for 2006 and 2010 (Reference target years set by the EU).

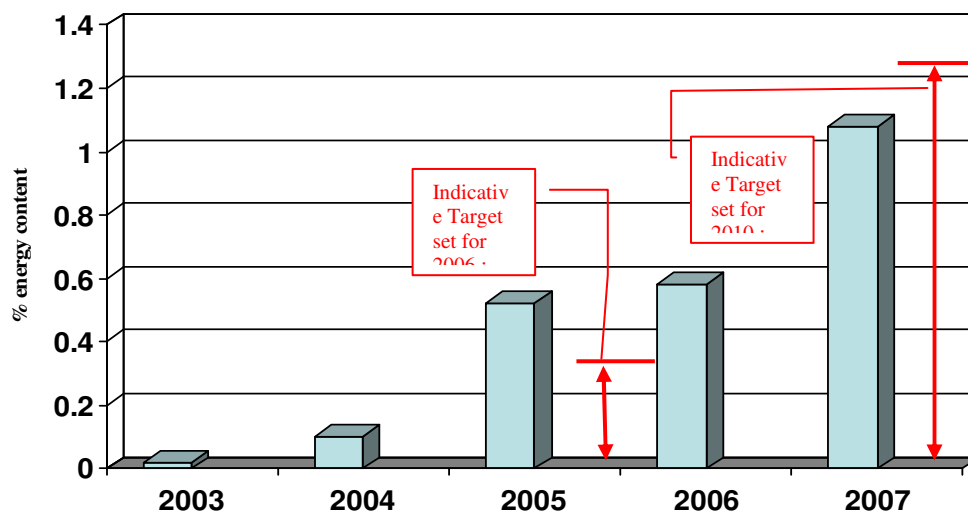


Figure 1 - Percentage of biofuel of total petrol & diesel fuel sales (Transport)

In 2006 Malta set the National Indicative target for 2010 as 1.25%. This was based on expected trends following the experience gained in the preceding years and the assumption that the market would remain the same, that is, that no other government intervention such as substitution obligation would take place to further promote biofuels.

Biofuels in Malta are produced by three companies. Two produce biodiesel which is then retailed to the transport and industry sectors and a third produces pure vegetable oil which is then used for heating in boilers.

1.2 Retail of Biofuel in Petrol Stations

Currently, biodiesel produced from either locally sourced recycled waste cooking oil or imported vegetable oil, is the only type of biofuel available on the Maltese market. Till now no interest has been shown by the local fuel importers to import pre-blended biofuels or neat biofuels to blend in its storage sites, basically because of price considerations and the lack of availability on the international market.

Currently, biofuels in Malta are produced by three companies. Two produce biodiesel which is then retailed to the transport and industry sectors and a third produces pure vegetable oil which is then used for heating in boilers. One of these companies distributes biodiesel to around 30 petroleum filling stations, equivalent to about 40% of the total. Presently petroleum filling stations are permitted to store and dispense 100% biodiesel only, and are not allowed to mix or blend inside their tanks. The customer has however the right to choose which ever blends he prefers.

1.3 Limitations to reach higher targets

The problem for Malta in reaching the high Biofuel targets set by the EU can be mainly attributed to a number of factors. In fact to reach *higher feasible market penetrations* without altering the market structure is very difficult, since this requires a country to possess certain characteristics, features and resources, which are hardly modifiable in small states. Issues such as:

- Availability of raw material;
- Infrastructure limitations;
- Quality Issues;
- Economies of Scale Issues;
- Negative Publicity; and
- Competing Sectors

are all considered as obstacles which might hinder a larger market penetration. All these issues and their relative influence are analysed in a more in-depth manner below.

1.3.1 Raw material

All studies related to the use of biodiesel and to its probable increase in use in the future, given the ambitious targets being set by the European Union, clearly state that one of the problems which may be encountered in reaching such targets will be related to the sourcing of the raw material. A number of raw materials are being used in this regard, with rape seed oil, palm oil and soy-bean oil being the front runners in this sense. However, in order to grow these plants, a number of decisions as to land space allocation and good water reserves must necessarily be made. In this regard small states are already at a disadvantage given that the arable land available is scarce and water is also a highly valued and highly priced commodity.

In this regard, Malta's potential for growing crops for producing biofuels is negligible due to both limited availability of arable land and water resources as was amply described in the Malta Environmental and Planning Authority's Structure Plan (2), wherein it was stated that "*Cultivated land has however decreased from 15,200 ha in 1971 to 12,000 ha in 1986 and the trend is continuing.*" Malta's 2006 report on biofuels, submitted to the European Commission as part of the obligations set down by the directive, in this regard underlines these two limitations and specifies that the only current indigenous source available for the production of biodiesel is waste cooking oil.

However, even waste cooking oil as a source of raw material for the production of biodiesel is a finite source. In addition to this, the fact that not all of this source material for biodiesel is collected makes it even more difficult for the reference target to be met. A report (3) has shown that only 2,850 tons of waste cooking oil equivalent to 50% of the current 5,700 tons of waste cooking oil produced is collected. Should all the 2,850 tons of waste cooking oils collected in Malta be diverted for the production of Biodiesel, at the current rates of production it is estimated that 2.85 million liters of biodiesel would be produced, resulting in only 1.56% by energy content of the total fuel sales to the transport

sector. As can be seen this figure is still short of the reference value set by the EU Directive.

1.3.2 Infrastructure limitations

As far as infrastructure is concerned, oil storage in Malta is paid at a high premium given its strategic location in the middle of the Mediterranean, the not so high oil storage capacity and the competing local and bunkering markets for this capacity. Additionally, building new storage capacity is not an immediately feasible option and would require further investment commitment for many producers and lengthy planning permissions and discussions for land allocation. As regards biodiesel, this is still not an acute problem since quantities are still relatively small; however should the amount of biodiesel consumption increases considerably, then biodiesel would find itself competing for storage space.

Given that the production of biodiesel is currently not cost effective without financial incentives, this added cost would further hinder biodiesel uptake.

A real problem on the other hand currently exists at petroleum filling stations. At least a third of existing petroleum filling stations in Malta are kerb-side pumps with limited space available to dedicate tanks and dispensers exclusively to biodiesel or specific blends of biodiesel. This limits the amount of the product that can be retailed.

In order to partially overcome this problem a number of petroleum-filling stations have modified their petroleum fuel storage facilities and re-directed their use for the sale of 100% biodiesel.

1.3.3 Quality issues

As for all other fuels, ensuring fuel quality is of extreme importance in developing trust and building confidence in a particular product.

The issue of quality control is thus a matter of utmost importance in the development of a thriving biofuel market. In ensuring that only biofuels and particularly biodiesel products of the right quality are allowed into the market, the following minimum objectives should be made to be met:

- (i) the consumer must be protected from being given a product which is different from what he is being sold;
- (ii) the product sold must be suitable for the engine for which it is being marketed. In particular it must not cause damage to the engine;
- (iii) the product must comply to any existing standard or legislation.

In particular in the case of Malta, where again economies of scale (or the lack of them) play an important role, the absence of appropriate laboratory facilities to ensure that the biodiesel offered on sale in the market is up to the applicable standard is a big drawback in the efforts to reduce costs.

1.3.4 Economy of scale issues

Although these issues have been raised within this study already for a number of times, in relation to other services connected with the provision of biodiesel, one should also underline that this fact in itself and the fact that Malta is an island creates problems in regards to the CIF (Cargo, Insurance & Freight) price at which biodiesel might be bought from the international market. In the international carriage of goods business, prices per liter tend to increase with a decrease in the size of the cargo; hence smaller volumes of biodiesel tend to become more expensive per liter of product purchased, than when imported in larger quantities. Therefore unless a way is found to increase cargo sizes, importing pure biodiesel will very rarely be cost-effective on its own merits.

1.3.5 Negative publicity

Publicity is a key issue in developing a market for a particular product, however, negative publicity can create an opposite a devastating ripple effect on the market. For this reason, it is of the utmost importance that confidence in biodiesel is ensured through proper education on the pros and cons of using biodiesel, throughout all the fuel market chain from the producer/importer level, down to the retailer and consumer level.

1.3.6 Competing sectors

Indeed competing sectors further reduce the potential for biodiesel use for transport purposes. Although in itself this is also a good thing, diverting biodiesel use from transport to other uses, such as electricity and heat generation would further diminish Malta's chances of reaching the EU set targets for biofuel use in the transport sector.

2. Current Situation in Europe

The European Union has been and continues to be a leader on biofuels. However, based on their production costs biofuels are currently not competitive with diesel or gasoline in the EU. Even the recent increases in the crude oil price did not change this as increased demand for vegetable oil drove up biofuel feedstock prices at the same time. Consequently, the EU biofuels market largely depends on obligatory mandates and incentives. The way these incentives are passed into the biofuel market is at the discretion of each individual member state.

2.1 *Biofuels in transport*

While biofuels as a share of all transport fuels is trending upwards, based on current conditions it is not expected that the European Union as a whole to achieve its targets by 2010.

Biodiesel is the main biofuel for transport used in the EU and is estimated to account for 75 % of this market in 2008. Bioethanol is the runner-up with a 20 % market share. Pure vegetable oil accounts for the remainder. However, while the use of biodiesel and bioethanol is expected to further increase in the future, pure vegetable oil is expected to decline and form a niche market. Many expectations rest on Biomass-to-liquid (BtL). However, this second generation biofuel is still in its infancy and will take some years before it reaches market commercialization.

	2006 r	2007 e	2008 e	2009 f	2010 f
Biodiesel	4,170	5,460	6,000	7,610	8,960
Pure Vegetable Oil	915	620	415	190	200
Bioethanol	945	1,350	1,700	2,055	2,570
BtL	0	0	5	10	10
Total biofuels	6,030	7,430	8,120	9,865	11,740
Diesel & replacements (incl. biofuels)	180,570	184,360	188,230	192,190	196,220
Gasoline & replacements (incl. biofuels)	112,515	113,530	114,550	115,580	116,620
Total Fuel	293,085	297,890	302,780	307,770	312,840
Biofuels as a share of total transport fuel used	2.06%	2.49%	2.68%	3.21%	3.75%
Current non-binding EU goal ¹	2.75%	3.50%	4.25%	5.00%	5.75%

Source: EU FAS posts (1)

Note: Since the various fuels and biofuel differ in their energy content, the data in the table is stated in ktoe rather than volume in order to provide a better comparability.

Table 1 - Estimated EU-27 Biofuel and Conventional Fuel Consumption (in ktoe)

¹ As set in EU directive 2003/30.

2.2 Biodiesel in Europe

The biodiesel market in Europe grew to represent 75% of the total biofuels market in the transport sector, mainly driven by the oil price, set aside schemes and generous tax incentives. As a result of the good profits in the EU biodiesel sector in 2005 and in 2006, there was a large expansion of biodiesel capacity in the EU. However, capacity increased faster than consumption and the utilisation rate was higher at the beginning of the year and lower towards the end in 2007.

	2006 r	2007 e	2008 e	2009 f	2010 f
Production	5,138	6,080	6,477	8,295	9,773
Imports	155	852	1,136	1,364	1,591
Exports	0	0	0	0	0
Consumption	5,293	6,932	7,614	9,659	11,364

r = revised / e = estimate / f = forecast

Source: EU FAS posts (1)

Table 2- Estimated EU-27 Biodiesel Production, Imports, and Consumption (in Million Liters)

This low utilization rate was due to higher vegetable oil prices and competitively priced biodiesel, B99, imports from the world market and some companies had to close down operations. However blending of biodiesel is an ordinary procedure of refining companies who provide diesel where biofuel content is mandatory, for example for 2008 in the UK, Bulgaria and Sweden all diesel contains 5% biofuel, and in Italy, Czech Republic and Finland 2%. Other Member States have their own mandatory targets

2.3 Bioethanol in Europe

In the European Union bioethanol production is much less than that of biodiesel. In 2006 and 2007 is estimated at respectively 1.25 MMT and 1.35 MMT. The availability of competitive bioethanol imports from Brazil restrict the increase in production

	2006	2007 e	2008 e	2009 f	2010 f
Production	1,584	1,711	2,155	2,535	3,346
Imports	317	995	1,267	1,584	1,774
Exports	38	44	63	63	51
Consumption	1,863	2,662	3,359	4,056	5,070

r = revised / e = estimate / f = forecast

Source: EU FAS posts (1)

Table 3 - EU-27 Bioethanol Production, Import and Consumption (in 1 Million Liters)

Bioethanol production capacity is forecast to increase from 1.75 MMT in 2006 to over 7.0 MMT in 2010. This growth in capacity is based on sector intentions to expand. It is anticipated that only a part of these investment plans will be put in practice. In 2007, only about 45 % of the available capacity was utilised due to high grain prices, in particular wheat. The lowest utilization rates were reported in Central Europe and in Spain. Due to these bleak market conditions many investment projects for building new plants were delayed or canceled.

For refining companies blending of bioethanol is done at the distribution terminal rather than the refinery. The refinery will produce a special grade of petrol which then when blended with bioethanol at the distribution terminal will give an on-specification petrol. This is done to avoid water related problems in the distribution system. Non refining companies include the bioethanol when they are blending batches of petrol.

3. Substitution obligation in Malta

Currently there is no substitution obligation in Malta however compliance to EU Directives will in all probability drive the Maltese Authorities to introduce an obligation. For the purpose of this exercise the obligation is set to try and reach the maximum possible, that is, the 10 % by energy content.

Since the binding target set by the EU is based on the energy content of petrol and diesel placed on the market, and not by volume and given that the energy content of bioethanol is lower than that of petrol, one possible approach on how the target could be reached is shown below.

Biodiesel has physical characteristics similar to those of diesel. Its energy content is assumed **33 MJ/liter** which is slightly lower than that of petroleum diesel, **36 MJ/liter**. At low concentrations of biodiesel, engine performance is not affected. Bioethanol, on the other hand, has energy content much lower than conventional petrol, here is taken as **21 MJ/liter** whilst that of petrol is taken as, **32 MJ/liter**. In practice therefore higher flow rates are required of the same engine performance.²

This issue of energy content is very important when assessing the share of biofuels in the transport sector. Existing EU *Directive 2003/30/EC on the promotion of biofuels and other renewable fuels for transport obligations* and the proposed *Proposal for a Directive of the European Parliament and of the council on the promotion of the use of energy from renewable sources* state that the share of biofuel as a percentage of the total petrol and diesel placed on the market is to be based on the energy content and not on volume basis. In practice this means that if an amount of liters of diesel is substituted by the same amount of liters of biodiesel, the total energy content would be almost equal to the energy content of having 100% diesel, since the energy content of the two fuels are practically the same. Therefore if the total energy required by the diesel market is a certain amount

² Annex III – Energy Content of Transport Fuel – Proposal for a Directive of the European Parliament and of the council on the promotion of the use of energy from renewable sources

per year, substituting a portion of diesel with biodiesel would not have such a drastic effect on the total energy supplied.

The opposite is true for bioethanol, since the energy content of bioethanol is lower than that of petrol. Substituting an amount of liters of petrol with the same amount of liters of bioethanol would not yield the same energy such as if it was pure petrol, therefore a higher amount of liters of bioethanol would be required to complement the energy required by the petrol market.

All this means that by simply substituting an amount of liters of petrol with the same amount of bioethanol and an amount of liters of diesel with the same amount of biodiesel, that is, doing a by volume substitution, **does not** mean that the same percentage amount as requested by the Directives has been effected.

Table 4 shows projections of the petrol and diesel future consumption in Malta between 2010 and 2020, using figures and methodology used by the Malta Transport Authority but further improved by the MRA according with trends observed between 2003 and 2006.

Year	Liters of Petrol	Liters of Diesel
2010	76,773,150	117,565,035
2011	74,652,300	119,812,980
2012	72,790,650	121,078,560
2013	71,014,050	122,132,025
2014	69,105,150	123,242,370
2015	67,126,050	124,560,090
2016	65,546,550	126,534,300
2017	63,575,550	128,501,400
2018	61,591,050	130,380,810
2019	59,620,050	132,176,085
2020	57,669,300	133,890,780

Table 4 – Projections of Petrol and Diesel consumption up to 2020

If part of the share of the market of petrol is taken up by the introduction of Autogas, than a corrected figure for petrol would be that shown in Table 5. Obviously, the diesel requirement as projected in Table 4 remains unchanged.

Year	Liters of Autogas	Adjusted liters of petrol required after considering Autogas component
2010	1,800,000	75,552,477
2011	2,400,000	73,024,735
2012	3,000,000	70,756,194
2013	3,600,000	68,572,703
2014	4,200,000	66,256,912
2015	4,800,000	63,872,121
2016	5,400,000	61,885,730
2017	6,000,000	59,507,839
2018	6,000,000	57,523,339
2019	6,000,000	55,552,339
2020	6,000,000	53,601,589

Table 5 – Liters of Autogas projected up to 2020 and adjusted liters of petrol required

Table 6 indicates what would be the requirements of biofuels with a substitution obligation of 5% by volume for bioethanol and a rate increasing from 2010 to 2020 of 5% to 11% by volume of biodiesel.

When calculating the final biofuel content in the total Petroleum transport fuel only 2020 figures give an **8%** by energy content in 2020, meaning that either a fuel with a higher ethanol content would have to be introduced in the latter stage of the next ten year period or this shortfall is balanced through the use of other renewable fuel.

Year	Percentage Bioethanol (Substitution by volume of 5%- Substitution by energy of 3%)		Percentage Biodiesel (Substitution by volume of 5%- Substitution by energy of 5%)	
	Petrol liters	Bioethanol Liters	Diesel Liters	Biodiesel Liters
2010	73,285,903	3,453,828	111,686,783	6,412,638
2011	70,833,993	3,338,274	113,822,331	6,535,253
2012	68,633,508	3,234,569	115,024,632	6,604,285
2013	66,515,522	3,134,752	116,025,424	6,661,747
			Percentage Biodiesel (Substitution by volume of 7 %- Substitution by energy of 6 %)	
2014	64,269,205	3,028,887	115,847,828	8,066,773
2015	61,955,957	2,919,868	117,086,485	8,153,024
			Percentage Biodiesel (Substitution by volume of 8%- Substitution by energy of 7 %)	
2016	60,029,158	2,829,062	117,676,899	9,662,619
2017	57,722,604	2,720,358	119,506,302	9,812,834
			Percentage Biodiesel (Substitution by volume of 9/10 %- Substitution by energy of 9 %)	
2018	55,797,639	2,629,638	118,646,537	12,801,025
2019	53,885,769	2,539,535	120,280,237	12,977,288
			Percentage Biodiesel (Substitution by volume of 10/11 %- Substitution by energy of 10 %)	
2020	51,993,541	2,450,358	120,501,702	14,606,267

Table 6 – Bio fuel projections

4. Local Blending against Pre Blending and Transport of Biofuel

4.1 Local Blending against Pre-Blending

The figures for biofuel and bioethanol required to reach desired target shown in Table 6 indicate that a large amount of biofuel would have to be imported. The maximum that can be expected to be supplied from local waste oils is around 2 Million liters. Hence the issue arises between importation of pre-blended fuel or importation of raw material with local production of the biofuel and later blending. In discussions with Maltese fuel suppliers the opinion is different. This would all depend on the intentions of the Maltese Authorities, as the market would be driven by financial considerations. As indicated in the document issued by the Commission in January 2007, 'Biofuels Progress Report' prices for biofuels are always expected to be higher than those of fossil fuels. What happened to fuel prices in the first months of this year might have changed this issue however biofuel prices also rose in line with fossil fuel prices possibly due to the scarcity of the raw materials not only due to the increase in use of biofuels but also because of natural occurrences of floods and droughts. However the recent drop in prices of fossil fuel makes the data given in the 'Biofuels Progress Report' more credit and substantiating the need for the Authorities to make choices in favor of biofuel use because this would be detrimental in choice of the local suppliers to keep prices low for the consumers.

The Authorities can affect the market with the rate of taxes or support programs biofuels are subjected to. Local biofuel from waste vegetable oil should always have preferential treatment. This happens in a large number of Member States, for example Spain, Portugal, Sweden, Greece and the Netherlands all have programs to incentivize the local production. Excise duties play a large role also. The rate of taxes should be in such a way as to promote use that is most to advantage for the Nation, be it to give preference to local production and blending or to assign specific excise duties to incentivize suppliers to opt or not opting for the pre-blended product.

As stated in 2.3 pre-blending of bioethanol with petrol can be problematic. The leading supplier of fuel to the Islands said that this left two ways for them to operate, one is to purchase and store ethanol separately and then blend it through the line filling the fuel distribution vehicles or another option was to buy small ‘parcels’ of either pre-blended petrol or blending the petrol whilst being supplied from the tanker. The safest was the first however the supplier still has to erect the equipment for them to operate in such manner. Biodiesel pre-blended is available, hence again it is just a question of finance feasibility for the importers of fuel. The Authorities should give direction to the supplier by providing fiscal incentives. In discussion with the Maltese suppliers the opinion on the way forward is different. One company stated they would prefer to have a ready blended product with quality assurance from the refinery whilst another company stated that local producers should be given the opportunity to enter into or extend their the biofuel production as long as the quality of the product is up to international standards. The main biofuel producer in Malta, Edible Oils, claimed that it has got equipment to deliver 65,000 liters of biodiesel a day, meaning approximately 16 Million liters annually. Referring to Table 4 this figure should serve well for the near future.

4.2 Transport of Biofuel

This issue was discussed with the three largest fuel distributors in Malta. They were receptive to the idea of the CO₂ Star label, however they said that there is still much to be addressed with this logo. Following the finalisation of the Renewables Directive much more information could assigned to emission figures as Maltese suppliers have to use default figures in the absence of figures derived directly from their products.

Two fuel transport vehicles have already been designated to carry biofuel only and the figure could grow if the market grows. Both owners of the vehicles have designed and made signs or logos, of their own design, on the vehicle to indicate that this vehicle transports biofuel as consumers then to be more positive to buying ‘green’ product if the price is right. The attaching of the CO₂ star would make their incentive, rubber stamped by an international mark. Hence they are in agreement to discuss this possibility.

5. Conclusions

The biofuels market offers many challenges. Although in Malta, biodiesel has been in use for a number of years, this market has still really to take off and challenge the dominant position of the conventional fossil fuels. In this regard, actions by private entrepreneurs have to be accompanied by governmental incentives. Actions need to be taken not only when Directives are imposed on the Islands, as opportunities might be lost. However, the Maltese suppliers have to gauge their decisions adequately as these could be detrimental to the consumers. The Maltese suppliers have to wait for direction from the Authorities and also for the biofuels market to establish itself in the Mediterranean Region.

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