

## **Mandatory blending in Zimbabwe: Examining implementation challenges and contemporary issues**

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### **Abstract**

Zimbabwe introduced mandatory petrol blending in 2011. By 2014, the blended petrol grade E15 was available on the market. The introduction of mandatory blending comes against the backdrop of fuel crises, and the need to promote local investments. Mandatory blending is not a new a phenomena. It has been imposed globally as a regulatory measure to upscale biofuel production and use by consumers. Subsequently, policies have been crafted and in some instances, incentives have been introduced to improve the uptake of biofuels. However, with each introduction of regulatory instruments, there are growing complexities and resistance from the public globally and Zimbabwe is no exception. The paper interrogates some of the complexities and the challenges in public acceptance in Zimbabwe using literature review and document analysis. This paper examines these constraints and assesses the likely impact of new policies designed to address them. Increase in biofuel mandate pose huge challenges to the infrastructure needed across all stages of the supply chain from the crop production, feedstock harvesting, and storage transport and processing to biofuel production and use. The lessons from Zimbabwe are relevant to other (African) countries that are considering implementing mandatory blending policies.

*Key words:* mandatory blending, policy implementation, challenges, opportunities, Zimbabwe

## 1. Introduction

Policies have been crafted globally to move away from depending on fossil fuels and to find alternative fuels which are cheaper and cleaner. These policies aim to achieve multiple objectives, such as reduce energy imports, lower energy price, reduce greenhouse-gas (GHG) emissions, support infant domestic industries, amongst others (CBO, 2007; Sobrino & Monroy, 2009; CARB, 2009b, Rajagopal, Hochmany & Zilberman,2012). Most of these policies focus on bio-derived feedstock. Mandatory Policies have been introduced to encourage uptake of biofuels production and use, it specifies either a target quantity of biofuel (as in the United States (US) with the Renewable Fuel Standard (RFS)) or a target market share for biofuel (as is the case in several countries in Europe (Rajagopal, Hochmany & Zilberman,2012) .

In addition to implementing Biofuel mandates a country can impose emission intensity standard as a regulation to upscale biofuel production and use. For instance California's Low Carbon Fuel Standard (LCFS), which is also under consideration in the European Union (EU) and China (Rajagopal, Hochmany & Zilberman, 2012). The major difference between the two types of regulation is that biofuel mandate may explicitly or implicitly specify the type and quantity of biofuel to be consumed, an emission-standard simply specifies an upper limit on the average GHG intensity of gasoline (and/or diesel) for a region. The two types of regulations can be considered equivalent when there is only one type of fossil fuel and one alternative fuel and both have fixed GHG intensity. If regulations do not cover the entire market, they may lead to a different trade-off between the various policy objectives. Goel et al. (2015) contends that blends of biofuel can be used as automobile fuel and the existing methods to detect the blending ratio have heavy one-time test cost, need controlled environment and require experienced operators. Anderson and Elzinga (2014) posits that mandating a minimum market share for a more costly alternative fuel either directly, or implicitly through a ban on the preferred conventional fuel will inevitably increase fuel prices in a competitive market .

The intention of the paper is to critically evaluate and analyse the challenges posed by the mandatory blending policy in Zimbabwe, using Critical Discourse Analysis (hereafter referred to as CDA). Scholars of public administration would have preferred to use the 5-C Protocol analyses by Brynard (2007), which is known for outlining key explanatory variables that might allow a better understanding of implementation policies. The five interlinked

variables known as the 5Cs are (content, commitment, capacity, clients and coalitions (Cloete et al., 2012). The aim is not to suggest which specific political and economic decisions need to be made with regard to mandatory blending use in Zimbabwe. Rather the objective is to understand and examine the general public' reflections and issues arising as a result of the introduction of a new technology to solve (or at least reduce) GHG emissions, and the fuel import bill. The paper does not use simulations models as is (used by Lapan, 2012: Castiblanco and Morenc, 2014: Tan et al 2014) it is not possible to analyse functional distribution of the chain's income into wages, interests, income and profits, essential variables to determine distributive impact. The paper therefore contributes to literature through documenting the events taking place as Zimbabwe implements mandatory blending, highlighting shortcomings of the policies and providing lessons for other countries.

The paper is structured as follows; the next section deals with the implementation of biofuels globally, followed by their implementation in some African countries. It then cascades to the implementation of mandatory blending in Zimbabwe which is the thrust of this paper. The third section deals with the methodology used, followed by some of the emerging discourses found in the newspaper articles and on the internet as mandatory blending discourse unfolds in Zimbabwe. A discussion on some of the issues arising will be done and lastly conclusions are proffered.

## **2. Methodology**

Complicating the mandatory blending debate is that implementations are at nascent stage and very few studies have been done on public acceptance and attitudes, in Africa, more so in Zimbabwe. Since the paper sought to examine the implementation challenges and some of the issues arising, the authors settled on CDA whereby discourses were interrogated. CDA relates the analysed text to other, connected discourses (inter-textuality) and to historical and synchronic contexts. Wodak (2008) defined critical discourse analysis as fundamentally interested in analysing opaque as well as transparent structural relationships of dominance, discrimination, power and control as manifested in the language.

Discourse Analysis focused on the narratives or storylines of the different actors in the value chain. It is a useful tool to identify clusters of norms and concerns among public, private and grassroots sectors that can influence policy and practise (Diego Vazquez et al., 2012). Archival research through the use of newspaper articles, internet surfing, blogs was used to aid in finding opinions, narratives and discourse's emerging. Drawing from the

narratives, the language and the experiences and that have been taking place in Zimbabwe; the paper complements and contributes to other studies that have been carried out in this discourse. The paper gives rigorous examination to the language, what was said and how it was said. The main findings of the paper are glaring concerns around the impact of the fuel on the consumers, technological risk, and sour relations of distrust between the consumers and the manufactures.

### **3 Situating Biofuel Mandates Internationally**

The lens in which biofuels production and distribution is taking place differ from place to place. United States and Brazil specialises on ethanol production and the European Union (Biodiesel) are currently the major suppliers and they do drive demand for biofuels. Policies have been crafted in the countries and they have contributed greatly to this rapid rise in demand. Not to mention that the policies have aided in persuading producers into finding ways to increase production.

For instance in the United States, the 2005 Energy Policy Act imposed an obligation on gasoline/petroleum fuel suppliers to blend ethanol with gasoline. The Renewable Fuel Standard (known as RFS I) required 7.5 billion gallons of renewable fuel to be blended with gasoline annually by 2012 (Environmental Protection Agency, 2010). Corn ethanol is the main renewable fuel in the United States which has enabled the United States to achieve its target alongside government support. This has seen production levels increasing five-fold: from approximately 5,000 million litres in 1991 to 25,000 million litres in 2007 (Mol, 2010: 63). In 2007 United States raised its mandatory fuel target through the Energy Independence and Security Act (EISA), which was signed into law in December 2007. EISA set the new Renewable Fuel Standard (RFS II) to reach 36 billion gallons by 2022. It divided this amount among different renewable fuels: conventional biofuels from corn; advanced biofuels from sources other than corn starch, including biodiesel from vegetable oils; and cellulosic biofuels, from crop residues like straw, wood waste and chips, and fast growing algae. RFS II commands that, by 2022, corn starch-based biofuels are to make up a maximum of 15 billion gallons; advanced biofuels, 21 billion gallons, of which 16 billion gallons are to come specifically from cellulosic biofuels (Mol, 2010: 63).

Brazil has been called the world's first sustainable biofuels economy due to its government supported production of ethanol from sugarcane and its embrace by the country population. Its regular petrol has an ethanol concentration of between 18-25(E18—E25). It

also sells E100 hydrated ethanol for flex-fuel vehicles which can run on any concentration of petrol and ethanol (Biofuels International, July/August 2014:42). European Union in 2014 through its renewable energy Directive (RED) has revised its mandate from 10% to 7% of which first generation biofuels should not exceed 6% and 2.5% of the figure should be second generation biofuels.

Hong Kong's Climate Change Strategy and Action Agenda Consultation Document (September 2010) recommends the adoption of a B10 blend and highlights the potential for using waste cooking oils in producing biodiesel locally.<sup>1</sup> Lux Research report 2014 titled "planning for the long term in Asia Pacific alternative fuel markets" highlights that China and India are set to dominate Asia's alternative fuel markets, driven by challenging mandates. Indonesia is targeting 20% adoption by 2025; while Malaysia positions itself to be a dominant exporter with 143 million gallons a year in 2015. Biofuels International (July/August 2014) asserts that Ethanol demand is on the rise in China, as a result of the nation's 10% blend mandate, equivalent to 3.3 billion gallons as of 2020.

Khanna et al. (2010), state that the French government combines two instruments to develop biofuels. The first instrument is a tax reduction of the exercise tax fuels (tax cuts are granted for limited quantities after a tender from the European Union level. In addition wholesalers selling petroleum products are subject to another tax gap (TGAP) which they can avoid paying by incorporating biofuels. Tax rates increase over time in line with the increase in the incorporation non-target up to 7%. This measure results in a high penalty for fuel distributors who do not respect the share of biofuels to be incorporated and thus should be considered similar to biofuel mandates. Another advanced country Thailand also use biofuels for their motorists, where a 10% ethanol blend motor fuel has been standard for years. The country adopted E20 in 2008 due to strong demand and sells flex fuel vehicles capable of using E85, though infrastructure for such a high volume is a limiting factor (Biofuels International, July/August, 2014).

The South African Department of Energy (DoE) has published its draft position paper on the South African Biofuels Regulatory Framework, which included the mandatory blending regulations and a pricing framework, in the Government Gazette for public to comment (DoE, 2014). According to the document, the South African government has

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<sup>1</sup> Please consult the OEM Statement Summary Chart of the National Biodiesel Board for a non-exhaustive list of selected supporting engine manufacturers <http://www.asb-biodiesel.com/biodiesel2.php>

identified the biofuels industry as a potential major source of employment and economic development; however, despite the approval of the Biofuels Industrial Strategy in 2007 no single large-scale biofuels industry player has emerged, as was targeted. Mandatory blending regulations in South Africa will be effected as from October 1, 2015. It is expected that mandatory blending targets would increase uptake of all biofuels supplied by licensed biofuels manufacturers, by compelling licensed manufacturers of petroleum products and their wholesaling arms to buy and blend all the biofuels made available by licensed biofuels manufacturers. Similar to trends around the world, with the introduction of mandatory blending, a number of misconceptions, misperceptions and unanswered questions about the biofuels industry arise. Mainly these contestations arise as a result of information asymmetries, lack of informed understanding about the strategic benefits and opportunities of biofuels to South Africa's energy and economic future (Nyamwena –Mukonza et al., 2014).

In Africa, Malawi is the only country that consistently implemented mandatory blending for transport since 1982 (UNDP, 2007). Car users in Malawi use a blend of the conventional fossil fuel and ethanol produced from molasses, the by-product of producing sugar from sugarcane. From 2002 to 2005 ethanol was also used to manufacture gel fuel for domestic cooking applications, but this became later uneconomical for the producers to continue. In Malawi ethanol is also exported to East African Countries and smaller amount to Mozambique, Zambia and Botswana (UNDP, 2007).

Aside to the general successes of Mandatory blending there are also negative challenges that have been experienced by implementing countries. Even though Brazil has been a biofuels goldmine for the best part of half a decade, in 2013 it was mixed as the region goes into transition. Several events happened across the industry in 2013, such as international policy changes, biofuel mandates cuts and economic uncertainty. Subsequently there have been fluctuations in production and consumption. The huge discovery of huge pre-salt oil reserves off Brazilian shores have presented the industry with a different situation in 2014 than could have been predicted when the market was flourishing a decade ago (Biofuels International, March/April 2014). Exacerbating the challenges are significant weather problems global financial crisis and a recent focus on cheap shale gas in North America along with a proposed slash in the country's 2014 Renewable fuel standard mandates. Slashing mandatory targets in Brazil will result in a possible decrease in exports. Though there are challenges with ethanol blending, the topic has attracted a lot of researchers and some studies have elucidated some critical economic effects.

De Gorter and Just (2009a) analysed the impact of a biofuel blend mandate on the fuel market. They find that when tax credits are implemented along with the blend mandate, tax credits subsidize fuel consumption instead of biofuels. De Gorter and Just (2009b) also developed a framework to analyse the interaction effects of a biofuel tax credit and a price-contingent farm subsidy. The annual rectangular deadweight costs which arise because they conclude that ethanol would not be commercially viable without government intervention dwarf in value the traditional triangular deadweight costs of farm subsidies.

Rajagopal et al.(2012) developed a two-region partial equilibrium model of the global market for liquid fuels to analyse different fuel policies based on multiple criteria, including greenhouse gas (GHG) emissions, expenditure of fuel imports, and the impact on fuel consumers and producers. The study found that while ethanol policies may lower gasoline price in the home region, they increase the price of other oil products. A carbon tax increases prices of all fuels. For current sources of ethanol, reduction in GHG emissions due to the substitution of gasoline with ethanol in domestic markets may be dominated by the increase the global emissions because of price effects.

Ferris and Jones (2010) examined the effects of biofuel mandates for food prices in the future sensitivity of these impacts to crude oil prices. The study showed that the effect of the renewable fuels standard (RFS) on food and fuel prices depends on the crude oil prices. Their study found out that high crude oil prices over the period 2010-2017 result in higher ethanol and biodiesel prices and also higher feedstock prices (corn and soya beans) and higher land values. The impact of biofuel mandates on fuel consumption and fuel prices is shown to depend on the supply elasticities of gasoline and biofuels the elasticity of substitution between gasoline and ethanol and the cost of biofuel production. Ando, Khan & Taheripour (2010) showed that the impact of biofuel mandate on GHG emission is ambiguous and decreases as gasoline supply curve becomes more inelastic. While mandates result in higher biofuel production levels particularly cellulosic biofuels than a carbon tax, they can result in significantly lower welfare levels and higher GHG emissions.

Ando et al. (2012) argues that mandates have a danger of leading to land use changes across the world. Tan et al .(2014) applied the inoperability input-output model (IIM) proposed by Haines and Jiang (2001) and later enhanced by Santos and Haines (2004) to assess the economic effects of implementing mandatory biodiesel blending programs in the Philippines. Results show that IIM can provide insight on which economic sectors will be

most affected by a particular disaster in terms of economic loss or inoperability. These two measures of system vulnerability can be integrated to yield an over-all ranking of the economic sectors using weights. Furthermore, the total economic loss and total inoperability are greater with the implementation of a biofuel policy. Hertel and Beckman (2010) argue that promoting biofuels increases price volatility of agricultural products, which creates problems for macroeconomic management and significant challenges in food security issues of poor countries.

#### **4 Mandatory blending in Zimbabwe**

The University of Zimbabwe in August 2012 through the Mechanical Engineering Department carried out a research which indicated that “for more than a decade during the 1980s, all petrol sold in Zimbabwe was ethanol petrol blend, with the ethanol percentage sometimes reaching 20 percent. From the 1970s to the late 90s, ethanol blends in fuel were between 10-15 percent with Zimbabwe’s vehicles using blends of up to 25 percent without compatibility issues. Zimbabwe has a draft Biofuels policy crafted in 2007 which states that ethanol production commenced at Triangle limited. Blending with petrol ran from 1980 to 1992 and it was stopped during the severe drought of 1992 that reduced sugarcane production. Production recommenced in 1994, at a lower level which could only support 5% blending levels which were deemed too low for economic viability. In the year 2005 the government revamped the programme and an Ad hoc cabinet committee on import substitution was set up which decided to embark on a National Biofuels Programme. The initial target was to substitute at least 10% of daily consumption of fossil liquid fuels by 2010.

The Zimbabwe Energy Regulatory Authority (ZERA) is a body corporate established in terms of the Energy Regulatory Authority Act [Chapter 13:23] of 2011. ZERA is mandated to regulate the energy sector in Zimbabwe in a fair, transparent, efficient and cost effective manner for the benefit of the consumers and energy suppliers. ZERA derives its mandate from the Energy Regulatory Authority Act [Chapter 13:23] of 2011 as read together with the Electricity Act [Chapter 13:19] of 2002, Petroleum Act [Chapter 13:22] of 2006 and subsequent amendments.

Following the licensing of ethanol producer Green Fuel (Pvt) Ltd, ZERA said the blended fuel complied with quality standards as set by the Standards Association of



Zimbabwe and would not have negative effect on vehicles, amid public fears<sup>2</sup>. As of April 2014 there are 13 centres that are selling E85, with plans to open up new centres throughout the country underway. The price of E85 in Zimbabwe ( which has adopted the US dollar) is costing between \$1.08 and \$1.10 a litre compared to unleaded at \$1.45. The Ministry of Energy and Power Development has announced that it plans to proceed with E20 and is only being held back by limited ethanol supplies<sup>3</sup>.

The regulations laid down by the Government state that diesel or petrol which is sold in all filling stations of Zimbabwe should have specifications set down by the State. This is regarding all the fuels and specifications have to be followed by all suppliers of fuel. As for petrol, the rules and regulations say there should be 15 % of ethanol which is the minimum range which is supposed to be mixed with 85% petrol<sup>4</sup>. ZERA is responsible for inspecting all the service stations, garages and all in the fuel industries or those dealing with jet A1 used in aeroplanes. These are supervised by ZERA to ensure that the suppliers are following the set down regulations. ZERA has a committee which goes round the filling stations inspecting the fuel to see if it is according to the specifications.

The introduction and implementation of mandatory blending in Zimbabwe has also spurred debates in parliament, as members of parliament seek clarification from the Minister and the deputy minister responsible. One of the major questions which were asked in parliament was, *“Can you clarify the policy on ethanol blending. We hear so many conflicting reports whether it is now E15, E20 etc. Where are we going? What is the exact position regarding this? The deputy minister in response said”*,

*THE DEPUTY MINISTER OF ENERGY AND POWER DEVELOPMENT (ENG: MUTEZO):*

*“As we are all aware, the legislation to do with ethanol blending passed through both Houses of Parliament. It is indeed law that we are required to do mandatory blending. All vehicles that use petrol in Zimbabwe are required to use mandatory blended fuel which currently is at 15% and as already been indicated will go to 20%. Our expectation as Government and the Ministry in particular, is that vehicle importers and manufactures will work within the law, which means they should start bringing in vehicles that are able to use the legally available blended fuel. Of course, we are in discussion with the vehicle*

<sup>2</sup> [www.zera.co.zw/index\\_htm.../10.%20ZERA%20TD%20presentation](http://www.zera.co.zw/index_htm.../10.%20ZERA%20TD%20presentation)

<sup>3</sup> Zimbabwe: Ethanol Blending Cuts Fuel Import Bill By U.S.\$20 Million , <http://allafrica.com/stories/201401020317.html>

<sup>4</sup> Zimbabwe: Mandatory Blending the Way to Go <http://allafrica.com/stories/201310160364.html>,

*manufactures as well as the dealers to ensure that they understand the position and that they will be able to comply. Madam President, ...”<sup>5</sup>.*

In another development as the implementation of mandatory blending evolves in Zimbabwe, it was challenged in the constitutional court. Below is an insert from the New Zimbabwe, 26, December 2013 highlighting the story as it was reported<sup>6</sup>.

*“The mandatory blending of petrol with ethanol to levels beyond E10 has been challenged at the Constitutional Court, it has emerged. A Zimbabwean citizen, Tabani Mpfu, has taken the Zimbabwe Energy Regulatory Authority (Zera), Energy and Power Development minister Dzikamai Mavhaire and Green Fuels to court over the issue. Green Fuel is the company which pressed for mandatory blending after establishing a \$600 million ethanol plant and supporting cane production plantations in the eastern Manicaland province..”*

One of the Ministers responsible for information in response to this challenge launched a scathing attack on the policy alluding to the fact that the government had erred in effecting it<sup>7</sup>.

*“Sometimes when policies are made, it’s because certain powerful interests are influencing that policy and the powerful interests are not always political, sometimes they are the business ones which will be seeking an advantage over others through their connections with policy makers and so forth,” “Sometimes it’s because at the material time, when the policy is made, people might be pre-occupied with other things... and allow a funny policy to be made and hope to come back to rule again and then take care of the policy, Sometimes there are genuine circumstances where the information is incomplete, and the information becomes complete as the policy is being implemented. Policy implementation is policy making, because you can refine now that you see what is happening. “On the basis of what you say, and using the reasonable person standard, it (mandatory blending) doesn’t sound right. It can only happen in a country where people don’t even make cars”.*

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<sup>5</sup> See parliamentary debates on the

<sup>6</sup> See Petrol blending challenged in court, December 27 2013 <https://www.newsday.co.zw/2013/12/27/petrol-blending-challenged-court/>, Also Zim: Politics fuels blending case, (7 February 2014) <http://mg.co.za/article/2014-02-07-00-politics-fuels-blending-case>

<sup>7</sup> Moyo said there is need for a relook at the mandatory blending policy, see Moyo urges second look at mandatory blending, 28 November 2013. <http://www.newzimbabwe.com/news-13282-Moyo+urges+review+of+mandatory+blending/news.aspx>

The benefits of mandatory blending therefore are not clearly defined to the consumer. In other words people need solid proof of the real benefits of switching choices. The corporate model is superb but a few markers were overlooked in the zeal to give the market cheaper fuel that saves the environment by a lower carbon footprint. The Employers' Confederation of Zimbabwe has also contributed to the debate on implementation challenges, citing the need for government to engage stakeholders and enabling the right to choose.

Green fuel the country's sole ethanol producing company has been on record, explaining that all vehicle models are compatible with a 10 per cent mix of anhydrous ethanol and unleaded petrol, provided that they have installed a flexi-fuel upgrade kit. However, Manufacturers say that the percentage should not be above 10 percent. Nissan owners are reporting that the mandatory E15 blend could damage their cars. The car manufacturers and assemblers have allegedly warned that they would not honour warranties for vehicles because they could be affected by the fuel, which they deemed harmful to certain models.

*“Nissan vehicles are designed to take a maximum 10 per cent ethanol blended gasoline only. If this percentage is exceeded, Nissan products will have to have most fuel injection components changed and various rubber components installed into the fuel systems redesigned to cater for a higher ethanol blend.”<sup>8</sup>*

In response the Green fuel Pvt Ltd Public Relations Officer said, “Vehicles could either be already flexi fuel from the manufacturer or needed to be fitted with a fuel upgrade kit to enable them to run on the blend”. In addition Green Fuel alleges that more than 3,500 vehicles in Harare were currently using 85 per cent anhydrous ethanol (E85) blended with unleaded petrol. According to Green fuel public relations officer (2013) these vehicles are running without problems, therefore there is need for motorists to approach service stations with E85 to get detailed information on flexi-fuel kits as mandatory blending is here to stay and there are indications that percentage mix is going to increase.

Willowvale Mazda Motor Industries managing director Engineer Dawson Mareya said “E15 was not compatible with Mazda cars and might result in engine malfunction”. Croco Motors which supplied legislators with all-terrain vehicles have gone further and even suggested which garages the representatives are supposed to fuel their cars.

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<sup>8</sup> See for more on the fears of Nissan <http://www.thezimbabwean.co/life/environment/70032/green-fuel-explains-ethanol-blend.html>

Nevertheless as the government continues to increase the percentage, there has been no attempt to offer an alternative to the technical submissions made by Nissan or to shed light on what technical advice the Government is relying on. The government refuses to engage all the stakeholders on the way forward regarding mandatory blending. Interestingly an analogy has been provided by government officials referring to those who are opposing as young and childish, as they cannot remember that the country once used up to E25. The Minister of Energy further said “country’s thrust and economy was not determined by a few people who own Mercedes-Benz cars, it is determined by how we benefit as a country. Firstly, there is employment creation, saving money lost through importation of fuel, reducing price of fuel and generating power.”

Thus numerous issues have arisen with the commencement of mandatory blending in Zimbabwe. The next section therefore examines the cross cutting issues from the implementation of mandatory blending in Zimbabwe.

## **5 Issues arising with the introduction of mandatory blending**

### **5.1. Efficiency or monopoly**

Green fuel Pty Ltd in Zimbabwe is the sole supplier of ethanol blended fuel, therefore allowing it to monopolise the industry. However, while Green fuel at the moment enjoy monopoly, it is important that for it to achieve efficiency and sustainability, lack of support for continued ethanol innovation and use could destroy the installed capacity that has been established having both negative impacts on the industry and on the economy as a whole.

A simple scenario which could be derived from the monopoly Green fuel is enjoying is as follows, for instance if the government introduces 20 percent mandatory blending and Green Fuel similarly runs out of the devices in question. Will all vehicles have to be parked until Green Fuel comes up with a plan? In addition, Green Fuel has not actually proven its claims by successfully modifying a broad range of vehicles. This scenario poses serious challenges to the industry and to the economy as a whole.

Besides the Green fuel exercising monopoly, the country risk having the effects of monoculture, as the company continues to expand its hectareage and growing the same crop year after year. To reduce the risk, it is a prerequisite to look beyond large scale mono-culture oriented production models for growing certain biofuel feedstock. Empirical evidence

suggests that small scale farmers will stand to benefit from crop based fuel if production, marketing and distribution networks are designed appropriately and if they are able to adopt an out-grower type (Andt et al., 2008).

## **5.2 Violation of consumer rights to choose/ stakeholder engagement**

Car user deserves the right to choose. According to section (4) Chapter (4) of the COPAC draft constitution covers the Declaration of Rights which spells out the fundamental rights and liberties that every Zimbabwean is entitled to. Under political rights, Zimbabweans have the right to make their choices freely. Property rights are enshrined in this chapter as well as the right to agricultural land and freedom from arbitrary eviction. Every Zimbabwean has the right to an environment that is not harmful to their health. So the implementation of mandatory blending in Zimbabwe violates this right, and there is need to relook at the policy and address these concerns.

## **5.3 Infrastructure**

Increase in biofuel mandate pose huge challenges to the infrastructure needed across all stages of the supply chain from the crop production, feedstock harvesting, and storage transport and processing to biofuel production and use (Kang et al., 2007). It is now incumbent upon the Government to ensure that more blending facilities are set up countrywide to ensure that the product is readily available at different centres besides Feruka in Mutare and at the National Oil Infrastructure Company of Zimbabwe in Msasa. An immediate challenge that needs to be addressed is how to get the supplies to the southern parts of the country and such a facility should ideally be set up in Bulawayo (which is the second capital city of Zimbabwe).

## **5.4 Logistics**

According to Khanna et al. (2010) expansion of biofuels imposes logistical challenges for the design, capacity and location of bio-refineries. Decisions about the location and bio-refineries are expected to depend on the trade-offs between large facilities that take advantages of economies of scale and decentralized between networked production nodes closer to producers of feedstock, consumers of the biofuels and consumers of the co-products from bio refineries..

It is integral that institutions in Zimbabwe carry out a spatial and temporary analysis of the factors that influence the location of refineries and their development over time to cost effectively meet the goals of mandatory blending. Such a study is fundamental and imminent

for the success of biofuel mandates in Zimbabwe, and research shows that with the introduction of mandatory blending in Zimbabwe, no serious study had been taken to identify these compounding factors affecting the smooth run of mandatory blending.

Nyamwena-Mukonza (2014) contends that in Zimbabwe, biofuels are a noble project, however they have been met with scepticism in some quarters and also politics has meddled within the projects rendering them as inefficient and unfruitful. Nonetheless, with the right socio-political environment there are advantageous. Change within the consumers and the fuel supply industries can be difficult but it is important that all stakeholders work together to ensure that alternative fuels are fully compatible with existing technologies and infrastructure, handling or engine use. What this means is that the Standards Association of Zimbabwe and other stakeholders must carefully adapt fuels standards to allow for, higher blending ratios within the existing infrastructure and end--use vehicle. Collaborative work is essential for the success of the biofuels in Zimbabwe.

### **5.5 Welfare and equity implications of mandatory blending**

Introduction of mandatory blending for the right reasons is laudable and commendable, but it needs a working economy. The economics of supply and demand are at work. Continuous supply of feedstock is fundamental and cannot be underestimated in the long run .The right attitude by consumers and aggregate demand is desirable. Confederation of Zimbabwe Industries -CZI (2013) reports that a number of factors affect business in Zimbabwe among them policy instability , corruption , power cuts , electricity charges , access to financing , domestic demand , public sector bureaucracy ,Environmental Management Agency (EMA) requirements, interest rates, exchange rate, insufficient capacity to innovate, ageing equipment, competition from imports, cash shortages, bank system instability. The factors identified have a great contribution in the success/failure of the implementation of mandatory blending, as well as the welfare economics of biofuels.

Given these ambitious targets and government policy geared to implement them, it is important to have a clear understanding of the welfare implications of policies that impact biofuels production (Cui, Lapan& Cooper, 2010). They found out that, if policy is constrained, for example by international obligations, they find that a fuel tax and an ethanol subsidy can be welfare enhancing. They also find that an ethanol mandate is likely to welfare-dominate an ethanol subsidy. The results were also confirmed by a study by Lapan et al. (2012) when they find out that biofuels mandates are equivalent to a combination of fuel

taxes and biofuels subsidies that are revenue neutral. From a welfare perspective, they showed that biofuels mandates dominate biofuels subsidies, and that combining fuel taxes with mandates would be welfare enhancing.

Biofuels in Africa are smallholder-centred with the main aim to encourage diversification and consequently improve livelihood. However, current macro-economic assessments of the impacts of biofuel expansion in increasing welfare especially to the small scale farmers are not well represented in literature (INCRISAT, 2007). This makes it difficult to predict net welfare benefit that biofuel production may have on job creation and decreasing fuel import bills. Further research is needed in this regard which examine linkages between production, consumption and trade-offs between food and energy (Andt et al., 2008).

Uncertainty of market demand reduces the incentives for producers of cellulosic and other advanced fuels to invest in production processes that would scale-up these fuels' production and presumably lower their costs. Raising capital for these investments would be significantly easier if commercialization efforts benefited from purchase agreements that would ensure market uptake, but no organization is willing to commit at the current market cost.

It is therefore important to understand when a mandate is binding or when the consumption subsidy determines the market price for ethanol. Keeping with standard economic theory, consumers of fuel (a blend of ethanol and gasoline) obtain utility from the number of kilometres travelled. The maximum price that consumers are willing to pay for ethanol is *l times the consumer price of gasoline,  $l(PG/p_t)$ , where  $PG$  is the market price of gasoline*. If the ethanol price is above this, consumers could purchase the same distance travelled by using gasoline exclusively. In the absence of other policies, market forces will render the price of a mile using ethanol and the price of a mile using gasoline to be equal. However, when the mandate is binding, the wholesale price of ethanol will be determined by the point on the ethanol supply curve that corresponds to the required level of production.

The implementation of mandatory blending in Zimbabwe has been marred with the emergence of distributional consequences that are mainly power-related, which are not accepted by the majority of population, also resource access problems (land). In addition, skewed incomes distributions emerge which have raised concern with regard to their importance.

## 5. 6 Policy reassessment

Between the years 2005 and 2011 the global market value for biofuels increased from US\$15.7 billion to US\$83 billion a five times increment and Biofuels policies have been the catalyst for this increment. These policies have been formulated such that they support the production and utilisation of the biofuels (Pires & Schechtman, 2009). Fontes (2010) further emphasises on the need to have such biofuel policies and also states that energy industry leaders and policy makers must understand that supporting such policies would help to develop a marketplace on a regional basis.

The role of policy support to domestic biofuels sectors in the form of tax credits, subsidies, and tariffs against imported ethanol (for the United States and the European Union) remains a concern for key stakeholders. Countries display different social preferences in handling the delicate issue of food–fuel links depending on the local dynamics of agricultural demand and supply. In Brazil, the flexibility of sugar-ethanol mills allows producers to shift easily between ethanol and sugar production based on prevailing market conditions for food (sugar) and fuel (ethanol/gasoline) and provides them with constant, year-round outputs in their supply chain.

Green Fuel Pvt Ltd in Zimbabwe has said it will freely install devices that will allow all vehicles to run on E20. All this is admirable but questions remain when. In February the country suffered ethanol shortages after Green Fuel ran into trouble raising supply challenges in the future.

In light of the challenges and problems biofuels mandates have posed, it is expected that producers are waiting for legislative clarity and policy clarity. If the Zimbabwean government can resolve its internal disputes and return to a consistent and stable policy framework that will support the economic and environment conducive for production and use of liquid fuels , then growth becomes inevitable. If not properly implemented and with no stakeholder engagement, and market demand then biofuels will continue to develop in other countries.

Biofuels International (July/ August 2014) reckons that the unfortunate part of the biofuel debate is that those who are opposing biofuels are not grasping the latest science regarding biofuel production and capacity, they are inexplicitly locked into a do nothing position that politically favours the status quo reliance on fossil fuels.



From the successes coming from US, Brazil (ethanol and Biodiesel) biofuels have a promising future. The Zimbabwean community will benefit greatly from an open and transparent review of the mandatory blending policy and biofuel policy before jumping to a panicked conclusion that leads then in the exact opposite direction and sound policy.

Lessons learnt from other implementing countries affirm the need to combine mandatory blending with other instruments, like tax reduction for biofuels and if possible mandatory blending can be done on voluntary basis. It has become imperative that the policy should also address the subject of second generation biofuels and its implementation. Biofuels International (July/August 2014) states that second generation biofuels offer great advantages over first generation biofuels. Instead of competing with the food supply, it consumes agricultural wastes or crops specifically grown for energy .Oikonomou et al.(2010) posits that policy instruments are designed and implemented in an already policy crowded environment, interactions between them are taking place. These interactions can take different forms and shapes and are considered as complementary, if they carry over positive impacts on the policy mix, or overlapping if they reduce the overall effects that each instrument stand-alone could generate in the market in achieving their objectives.

When looking at the issue of policy reassessment it is important for the government to include some of the environmental concerns that have been raised by pressure groups in Zimbabwe. Environmental standards have become a necessity when mandatory blending targets are imposed and therefore should be considered. Mandatory blending in US and European Union is environmentally driven by environmental standards. Clause 14 states that the `main purpose` of mandatory national targets is `to provide certainty for investors and to encourage continuous development of technologies which generate energy from all types of renewable sources.

## **6 Conclusion**

A bio-based economy is multifaceted, and more often than not, there is need for navigational guide to understand it .After all it's a transitional period, it is bound to have its ups and downs and the Biofuels industry in Zimbabwe is no exception. It has already witnessed hype, doubt and partial paralysis, political twist and turns and broken promises and shining horizons. Fortunately or unfortunately the forefront of this are the twist and turns by the government and doubt by the consumers and the manufactures of cars. Ethanol

production because it is relatively easy to produce and inexpensive, it has proven itself to be mainstream fuel with established success in the US where a 10% blend currently is the standard and in Brazil where ethanol provides more than 40% of the country transportation fuel. Biofuel mandates are raising concern about cost competitiveness against fossil fuels. A biofuel blend mandate may increase or decrease consumer fuel prices with endogenous oil prices, depending on relative supply elasticity's.

Scholarly literature concludes that Biofuels should be considered as an option in a portfolio of renewable energy technologies to address climate change and reduce dependence on fossil fuels. Ultimately it is the political driver of security of supply, ability to embrace other new technologies, especially second generation and the operational driver of synergies that are going to see the successful implementation of mandatory blending in Zimbabwe. Three concepts figure indispensably in all CDA: the concept of power, the concept of history, and the concept of ideology. All these concepts have featured prominently in this research paper, as they have provided a general insight of the events of mandatory blending of biofuels. History plays a crucial role in the implementation of mandatory blending, and for years prior to independence and after independence ethanol blending had been used in the country. Power relations and ideologies are intertwined with the government or authority of the day.

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