

Green Fuel an Ultimate Need for Pakistan

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Abstract: This paper aims to identify the potential and mechanism to capitalize domestic resources for the production of low-cost energy. Paper briefly touches some of the core problems related to energy and their effects over the economy. It also explains the current problems, the future prospects of demand and supply and proposes the possible ways to knob this problem in a best possible ways. Bio-fuel, renewable source of energy is introduced in detail, inclusive of suitable feed crops options for the production of Bio-fuel in Pakistan. The concept is strengthening through different analytical factors and fiscal benefits. To apprehend the concept, strong agricultural background of Pakistan, multi crop supportive agro ecological zones are discussed, the paper also includes agricultural and environmental prospect of bio-fuel and for successful development and regional benefits, policy guidelines are suggested.

Key words: Pakistan • Bio-Fuel • Regional benefit • Fiscal benefits • Demand and supply

INTRODUCTION

Energy a commonly used word and very well known problem of this age, which is knocking the doors of every economy today. Energy resources are among the most significant inputs of a industry as the modern production units spend almost 33% manufacture expenditure in terms of energy cost, so a slight rise in the price of energy can give rapid shocks to all the industries of an economy, which undoubtedly would be affecting the whole economy in shape of recession or uncontrollable inflation. Today the world is facing a huge shortage of energy in the form of oil (rising price), natural gas and electricity. The exhaustible characteristic of oil resources is a biggest threat in this regard.

The shortages in electricity and rising prices of oil are said to be energy crisis. The phenomena of economy as a whole is that all the Macroeconomic variables (inflation, unemployment, income etc.) are linked together like a chain.

(Kojima and Johnson [1] indicates that, Thailand, as a low-cost sugar producer, plans to replace 20% of its vehicle fuel consumption with bio-fuels and natural gas within the next five years. Tax breaks for 10% ethanol blended gasoline have been used to maintain a consistent

price advantage, which has increased consumption 23-fold in 2004 and 11- fold in 2005. After consumption increases stalled, the government took steps to increase the price difference.

An increase in the price of electricity increases the cost of production (Specially manufactured goods) that directly affects the price level, increased prices reduces the purchasing power of general public hence a reduction in the welfare of the society as whole. According to Ankumu, G [2] the production of Bio-fuel may be capital intensive, if bio-fuel production is dominated by large producers, the farmers and workers may suffer from increased inequality and income disparity and unsafe or worsened working conditions.

(Regmi [3] argued that, for every 1% increase in primary staple food prices, poor people are estimated to reduce consumption by 0.75 Percentage points.

Same kind of effects are imposed by the rising prices of oil, rising oil prices makes the mode of transportation expensive and it is quite obvious that expensive mode of transportation increases the price of each and every product, transported via any mode of transportation to the customer which means an increase in the general price level. The demand for energy is raising day by day fro the entire world which also includes Pakistan.

According to energy security action plan (planning commission), "to increase the GDP growth up to 6%, the demand for energy will rise in double digits. In 2015 the demand for electricity will cross 120 Million Tons of Oil Equivalent (MTOE) and in 2030 the demand would be 7 times more than the current demand (55MTOE), yet around 80 percent of Pakistan's energy requirements are full filled through imports. As petroleum and petroleum products are the major imports of Pakistan, in the year 2008-9 the import bill of petroleum product for Pakistan was 5513838 US dollar. Keeping in view such a huge share of oil imports we can't even predict the effects of record breaking international prices of oil on our economy. Hundreds of industrial units are forced to shut down because of increased energy prices; they're unable to compete at lower prices as desired to survive in the market.

A situational analysis conducted by SEMEDA concludes that the most feasible way to cope with the energy problem is to turn our attention toward other resources, like Bio-fuel. Bio-fuel is referred to a fuel obtained from natural oils like soybean, which meet the specifications of American Society of Testing and Materials (ASTM) D 6751. It can be utilized with petroleum-fuel in diesel engines with minute or no alteration. Bio-fuel is obtained by a chemical procedure called transesterification. It can be produced by many ways i.e. producing it from wild plants such as *Jatropha*, *Pongamia* or *Algae* which is found on waste water streams could yield a large quantity of feed stock or from oil crops like canola, mustard and tallow, the fat derived from livestock and meat processing.

In the 21st century the increasing demand for energy requirements through more sustainable energy sources has become one of the most important challenges for mankind. For various reasons, the current supply of energy from, in particular, fossil fuels (mineral oil, natural gas and coal) is exhaustible as well as unsustainable.

The aim of this paper is to find a sustainable solution for the energy crisis our economy is facing today; a lot of studies have been undertaken by different researchers of the world about the rising energy demand, exhausting oil reserves and environmental issues. Bio-energy (Bio-fuel) is considered to be the best solution for this great and escalating problem decided unanimously by different scholars around the globe.

Bio-Fuel Production: A substitute of petroleum fuel is Bio-fuel which derived from 100 percent renewable resources. Bio-fuel is considered as the fuel of the future. Bio-fuel or bio-fuel is prepared by a chemical process

called transesterification. The process results in two products, "methyl esters" (the chemical name for bio-fuel) and "glycerin" (a valuable by-product usually sold for use in the production of soap). Bio-fuel is among the few alternatives of petroleum-fuel for motor vehicles up till now to have successfully fulfilled the testing requirement of Clean Air Act Amendments (The 1990 Clean Air Act is a piece of United States environmental policy relating to the reduction of smog and air pollution).

Pure Bio-fuel is biodegradable and non-toxic. It requires little or no modification in the existing diesel engines. It can also be mixed together with the petrol-based diesel fuel designated BXX, where XX represents the volume percentage of Bio-fuel in the blend e.g. B10 shows 10 percent Bio-fuel 90 percent petrol and B100 means 100 percent bio diesel. A study conducted by U.S. Department of Energy showed that "the production and use of Bio-fuel, in contrast to petroleum-diesel, reduced the carbon dioxide emissions to 78.5%; because of its environmental friendly nature it successfully passed the environmental protection agency (EPA) test".

Products Details: Bio-fuel is made through a chemical process called transesterification, the process results in two products, methyl esters (bio-fuel) and glycerin

Glycerin: Glycerin, also known as glycerol, is the secondary product of bio-fuel production. In the separation process, crude glycerin is obtained, which is basically combination of the catalyst, alcohol and glycerin. Glycerin is used in an array of products and industries, including soaps, pharmaceuticals, medicines and industrial applications.

Bio-Fuel: Bio-fuel is an ester which is capable of being substituted and/or mixed with diesel in any proportion with no noticeable effects on the performance of the motor it is used in. There are some minor variations in the final properties of bio-fuel that are related to the original feed stock used for processing.

There are many resources available that document in detail the properties and benefits of bio-fuel and its use. The following is a summary of some aspects of the fuel:

- Compatible with conventional diesel
- Biodegradable
- Negligible sulphur emissions
- High Lubricity (ability of fuel to lubricate fuel system, a feature of diesel reduced by the low sulphur fuel requirements)
- Reduction in net carbon emissions

The energy content of bio-fuel varies slightly depending upon the feed stock used to produce it. (Blottnitz and Curran [4] suggest that sugar based bio-fuels are superior to starch based ones (e.g. from corn) in terms of avoided GHG emissions. Bio-fuel can be extracted from many sources, but the most suitable option for Pakistan is to extract it from agricultural sources (will be discussed later in the paper), as Pakistan has a strong agricultural base.

Environmental Perspective: Most of the developing countries have agricultural based economy and most of the people lives in rural areas and attached with agriculture sector the development of bi-fuels immense impact on there income and employment opportunities. Global warming is considered as one of the most important issues in the continuously growing world economy. But it is considered more dangerous than bio-diversity in the least developed countries. Using bio-fuel as an alternative to conventional fuel brings many benefits, as it is renewable, its is cheap, its ensure long-term supply of energy and also because of its environmental friendly nature Its effect on environment is significant because it contribute to greenhouse effect much lesser then oil or natural gas. According to a study by (UNCTAD) if developed courtiers adopt bio-fuel as an alternative to petroleum-fuel their economic may prosper in term of environment benefits, rural and agricultural sector development, batter employment opportunities and financial benefits for labor force. Bergsma [5] indicates that, Bio-fuels may effect biodiversity, air and water quality. These effects have not been studied as extensively by LCA analysis as the energy balance and GHG emissions. Biodiversity will be threatened by large scale production of monoculture bio-fuel crops, especially if it involves extensive destruction of rainforests.

In Pakistan Bio-fuel can be used as a tool to stop or slowing down the rapid migration form rural to urban areas because bio-fuel production contributes in developing the rural economy. As it increase the employment opportunities for rural people in their own areas they are less likely to migrate toward urban cities in search of jobs.

Bio-fuels can also be used for controlling the soil erosion in the fertile plans of Pakistan. Biomass influences the humus content of the soil and reduces erosion, thus the soil and agricultural land quality can be improved by increasing biomass production.

Currently Pakistan is suffering from Energy crisis and by developing bio-fuel industry; Pakistan can over come this problem in efficient and effective way. According to

a study by World Bank in 2005 which is also applicable in Pakistan, bio-gas produced by Transforming agricultural waste and fertilizer will not only solve the energy problem it also positively effects the living standard of people in rural areas by increasing jobs and substitute the amount of time they are used to spend is collecting woods and other thing for fulfilling their requirements of energy, with economic activities. Bio-gas will also decrease the green house effect, in rural areas.

Agricultural Prospective: According to a UN report, "As bio-fuels absorb crop surpluses in developing countries, commodity prices will rise, increasing income for farmers in poor countries". And that will endue the economy by encouraging local producer and increase the efficiency of farmers by sustainable agriculture in most developing countries. According to the Europe Bio-Fact Sheet (2008), "Non food crops for bio-fuels can contribute to diversifying farmers' production with 'cash-crops' and provide them with an income, even on a very small scale, in a similar way that crops grown for fibers have done in the past".

(Bensten *et al*, [6] indicates that, it would be best if bio-fuels could be produced from municipal and agricultural waste rather than specifically designated crops.

Another advantage that Pakistan can have while developing the Bio-fuels industry is that it will create lot of jobs and unemployment which is a major problem for Pakistan can be controlled to some Extent. According to Europe Bio-Fact Sheet (2008), "the development of bio-fuels will bring direct opportunities to developing countries because their production will create many local jobs in the value chain - from growing raw materials to their manufacture. Furthermore, the local production of bio-fuels in developing countries will help to decrease the dependency on costly fossil fuel imports. According to Europe Bio-Fact Sheet (2008), "As production surpluses are reduced in OECD countries there will be less 'dumping' of cheap agricultural commodities in developing countries". According to a report of UN report in year 2008, "As bio-fuels absorb crop surpluses in developing countries, commodity prices will rise, increasing income for farmers in poor countries. This will lead to more economically sustainable agriculture and prices in most developing countries, encouraging local production and allowing farmers to live from production". According to (Bhardwaj, 2007) under a drastic bio-fuel expansion scenario, prices of corn and oilseeds could rise as much as 72% and 44%, respectively. A similar increase in global palm oil prices has been forecasted, (Braun [7]

forecast a further increase in prices of corn by 26% and oilseeds by 18% due to the planned global expansion of bio-fuels, [8].

Pakistan is an agrarian country and having one of the largest irrigation systems of the world to irrigate the area under cultivation. Pakistan has a diverse economy including not only agriculture, but a well established manufacturing and services sector. In terms of Purchasing Power Parity (PPP) the economy of Pakistan is the 26th largest economy in the world.

According to agricultural statistics of Pakistan 2008-9 "the geographical area of Pakistan is 79.61 million hectares (Mha) and only 25 % of the total area is currently used for cultivation purpose. The total land area of Punjab is 20.6 mha (about 50.90 million acres), out of which 54 % or 11.04 mha (or 27.28 million acres) are cultivated. The total land area of Sindh is 14.1 mha (or 34.84 million acres), out of which nearly 39 % or 5.45 mha (or 13.45 million acres) are cultivated. The total land area of Balochistan is 34.7 mha (or 85.74 million acres), out of which only 5 % or 1.99 mha (or 4.91 million acres) are cultivated and the total land area of NWFP comprises of 10.2 mha (25.20 million acres), out of which nearly 10% or 1.93 mha (or 4.77 million acres) are cultivated". The statistics clearly indicates that there is a huge potential of variety of plants cultivation required for Bio-fuel production. Pakistan is not even utilizing half of its cultivable agricultural land. According to economic survey of Pakistan, agriculture still contributes around 25% to the GDP, generates 40 percent employment directly and earns large sum of foreign exchange (around 60% of total exports earnings); Employment and foreign exchange can very easily be increased if we bring more of our land under cultivation. Increased cultivation of land can be used for the production of any kind of desired crops no matter for edible oil or for feed stock.

Economic Overview and Regional Benefits: Fiscal year 2008-09 was a crucial year for Pakistan's development. So many misfortunes disrupted the smoothly growing economic variables like supply shocks, energy crisis (discussed earlier), instable law and order situation weakening of business confidence etc. Many of the economic problems, especially those directly related with energy shortfall, can be resolved through the development of Bio-fuel producing projects. Around 44 percent of Pakistan's work force is indulged in agriculture and the Production of Bio-fuel will help the agriculture sector to get maximum gains in shape of increased prices of the crops used for the production of Bio-fuel. The economy as a whole will benefit from the reduction in capital outflows which goes for oil importations and

amounts around \$11 billion according to trade policy 2009-2010 statistics. A reduction in out going reserves will help stabilize the economy of the country to major extent.

Industrial sector would be getting clean burning extremely cheaper fuel (if produced from Molasses, Jatropha, Algae etc.) for their machinery and equipments which will help reduce the emissions of green house gasses. Reduced energy cost will reduce the cost of production (electricity cost, machinery fuel) of all the manufacturing industries that will lead to a cheaper range of manufactured products. Apart from this different employment opportunities would be provided to the local people of the region.

Through studies in America reveals that if USA production of bio diesel reaches 650 million gallons per annum the bio diesel industry will add \$24billion between 2010 and 2015 and the projected jobs are 39,102 in all the sectors of the economy. Same potential can be enjoyed in Pakistan if serious attention is given to the production Bio-fuel without further loss of time. In order to initiate the process government should immediately formulate the policy guidelines for the same and issue directives to the concerned government department to adopt and implement the same. Even a separate autonomous or semi autonomous organization/company may be established to facilitate and promote the cultivation of feed crops and production Bio-fuel through private sector involvement.

Regional Benefits: Balochistan is the least developed region (province) of Pakistan, but it has got a largest area of land and supportive agro ecological zones for the production of feed crops like Jatropha, Soya bean, canola, sun flower etc. if opportunities are created in Balochistan in exploiting these agricultural advantageous a large number of employment and revenues can be generated in addition to use of Bio-fuel as import substitute, specially in the rural side of the economy and the farmers will get more income for the production of feed crops.

If Jatropha is used as a feed stock there would be unlimited benefits Balochistan will reap, in shape of reduction in soil erosion, desertification and it will provide the most economical source of energy at large. Inexpensive source of energy may further stimulate the business practices in Balochistan.

CONCLUSION AND RECOMMENDATIONS

Bio-fuel can become an emerging part of energy sector needing paradigm shift in the mind set of authorities and serious attention and promotion by the

Government through involvement of public and private sector's stake holders. In order to regulate and facilitate exploitation of this potential intervention at national level for policy formulation and its implementation through concerned Ministry/Organization is need of the hour. To achieve these goals a proper policy intended to make bio diesel an attractive option as compare to the conventional diesel, properly and appropriately incentives the sector may be adopted.

Recommendations for Promotion of Bio-fuel Production

- Formation of Provincial Board/ Steering Committee: Pakistan is blessed with multi crop supportive agro ecological zones and large availability of idle land. To exploit the natural potential of the country for the production of feed stock. A board/Steering Committee should formed including experts, members from regulatory body, R and D cell, SMEs and other stake holders, to monitor the activities and suggest initiatives to keep pace on aggressive lines by submitting report on quarterly basis to the concern ministry/ Government.
- Regulatory Body: The price instability increases the risk of doing business and affects the consumers as well as producers badly. A regulatory body should be developed to regulate the prices of Bio-fuel and assure the best quality oil production through out the country. The regulatory body should also be authorized to maintain a balance between demand and supply of Bio-fuel.
- Land Provision: To protect the already grown pattern of the edible crops, specified land should be allocated for the cultivation of feed stock In order to increase the production of feed stock farmers should be provided an opportunity to acquire land through land lease policy for the cultivation of feed stock. The land distribution should be done through competent authority to insure the optimal utilization of barren land for the purpose.
- Incentives to Farmers: Provision of seed to the farmers may be made available at door step. Tax exemptions and subsidies should be given to the farmers and stake holders on all kinds of farm inputs, required for the cultivation of feed stock for Bio-fuel, at least for five years. Such incentives will encourage the farmers and the stakeholder for the cultivation of feed stock and the production will boost up the growing pattern. Easy availability of all kinds of input required for modern farming practices should be ensured.
- Collection Points and Processing Facilities: The distance from market plays an important role in the cost of making a crop available in the market. As the distance from market increases it becomes difficult for farmers to supply his crop to the market due to high transportation cost and time requirement. This inability forces a farmer to rely over the intermediary. To facilitate the farmers the Bio-fuel marketing companies should be instructed to form collection points and processing facilities at regions near to the farmers growing feed crops.
- Technical Assistance: the concept of Bio-fuel is totally new for the local investors, especially farmers. The farmers and producers need technical training for growing the feed crops and extracting the Bio-fuel out of it. It will be obligation on oil marketing companies involved in this venture should be obligatory to provide technical assistance to farmers and other stake holders for the production of Bio-fuel.
- Support Price: the agriculture sector is among the most vulnerable sector of the economy. The prices of agricultural product can shoot up or go down in an instant. *Jatropha* is totally new to the farmers; hence it may carry a lot of risk. To protect the farmers from such like risks and make their investment secure a concept of reserve price is to be enforced for the produce of feed stock for Bio-fuel.
- R and D Centers: Research and development is a corner stone for the growth of any economy. High yielding variety of local *Jatropha* seeds or any other suitable feed crop is required in order to produce best quality Bio-fuel efficiently. This goal can only be achieved if Research and Development centers are established. Incentives should be given to the private companies for the establishment of world class Research and Development centers.
- Duty Free Imports: import duties like tariffs and quotas hamper the importers, in order to attract more investors towards the production of Bio-fuel, the required machinery and equipment should be free from all kinds of custom duties. The duty free imports may increase the profits in this sector hence fixed investment will grow.
- By Products: The process of transesterification results in two products -- methyl esters (the chemical name for Bio-fuel) and glycerin (a valuable by-product usually sold for use in the production of soap). A Parallel industry should be developed for the efficient utilization of the by products of Bio-fuel as well.

- Sales Tax Exemptions: The general sales tax makes the commodity expensive which normally means a decline in the demand for that commodity. To stimulate the demand for Bio-fuel and make it an efficient alternative for conventional oil its sale should be exempted from the GST. Such exemptions will not only attract the consumers but the oil marketing companies as well towards the Bio-fuel.

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