USP

SCHOOL OF ECONOMICS
THE UNIVERSITY OF THE SOUTH PACIFIC

WORKING PAPER

Can the Fijian Economy Gain from Ethanol Production?

Peter J. Stauvermann
Faculty of Business and Economics
University of the South Pacific
Fiji Islands

Sunil Kumar
Faculty of Business and Economics
University of the South Pacific
Fiji Islands

Can the Fijian Economy Gain from Ethanol Production?

Peter J. Stauvermann

and

Sunil Kumar

University of the South Pacific

School of Economics

Suva, Fiji

Abstract

Fiji is totally dependent on imported fossil fuel for its transport sector and options for alternative motor fuels are limited. Currently, any prospect for local refinery or exploration for fossil fuel is non-existent. In the past, as fuel prices soared, there have been discussions at various levels to explore alternative sources of transport fuel. These attempts at alternatives fuels in Fiji may have been sporadic but the seriousness of these issues should not be understated. The economic viability of options such as production of ethanol from sugar or cassava including other bio-fuels needs detailed economic analysis that could give direction to future discussions. A cost-benefit analysis is necessary to assess the viability of these options. This paper evaluates the feasibility and sustainability of bio-ethanol production from sugarcane and cassava. The analyses in this paper are influenced by the experiences of Brazil, Thailand and the United States in ethanol fuel where it is used as transport fuel at a commercial scale. The foreign exchange savings potential of this fuel option in Fiji is also explored and the economic analysis is based on the 2005 study of the Dutch Sustainable Development Group commissioned by the Dutch government.

JEL: D61, Q1, Q42, Q54

1.0   Introduction

There is a risk that Fiji will become a lost state like Haiti in the next few years if political instability continues and the current weak economic performance persists (Chand 2007). Of course at the moment, the Fijian economy is also suffering because of the worldwide economic crises, especially from decline in tourism demand, which is very important for the Fijian economy. In April 2009, the Reserve Bank of Fiji devaluated the Fijian currency by 20% in response to worsening foreign reserves and balance of payments (RBF 2009a). The two main reasons for the decline in foreign reserves have been declining tourism and commodity exports and ever burgeoning imports.

Fiji has been realizing a relatively huge balance of trade deficit for the last many years which reached an unsustainable situation recently due to the prolonged decline in tourism and exports. The ratio between trade balance deficit and GDP in 2007 was just around 32%, which showed slight improvement in 2008 but worsened recently (RBF 2009b). The trend in Figure 1 shows a steady increase in BOP deficit since 2003 to 2006. The increasing trend however, eased off in 2007 fiscal.

Figure 1 Fiji's Balance of Payment (BOP) as a Ratio of GDP
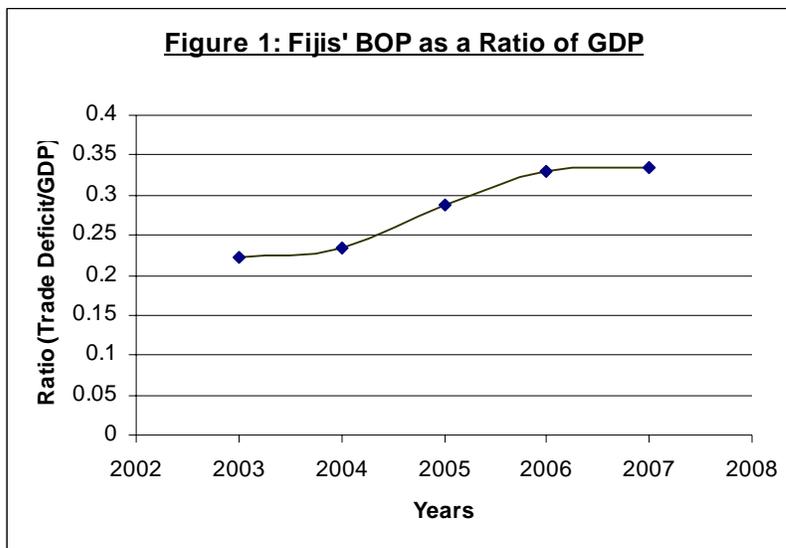
Source: FIBOS (2009) -Fiji Islands Bureau of Statistics figures on Trade and BOP.[1]

---

[1] The ratios are calculated using figures in actual prices in current Fiji dollars as published by the Fiji Islands Bureau of Statistics (FIBOS) in March, 2009.

The main cause of decline in exports has been arising due to falling earnings from sugar as a result of falling prices and decline in production. Additionally, a large transaction of foreign aid from the European Union for the sugar industry and other agricultural sectors was frozen in response to the military government's failure to hold elections in 2009 as agreed earlier. The prospect of any settlement on this issue has been further dashed due to the abrogation of the Constitution of Fiji on April 10th 2009.[2] Fiji has lost any opportunity for dialogue with its larger economic partners such as Australia and New Zealand due to this unfortunate event.

To ascertain the losses to Fiji, a brief analysis is shown in Table 1. The differences between world market prices and the prices Fiji sugar receives in the European markets is mainly due to preferential prices received by Fiji from the European Union.[3] There are reasonable grounds to believe that the world market prices for sugar will continue to decrease further in future. Figure 2, for instance, shows the trend of sugar prices over the last three decades (the trends shown here are from OECD 2004).

Table 1 Value of Sugar in Fiji Dollars in Comparison to World Market Prices

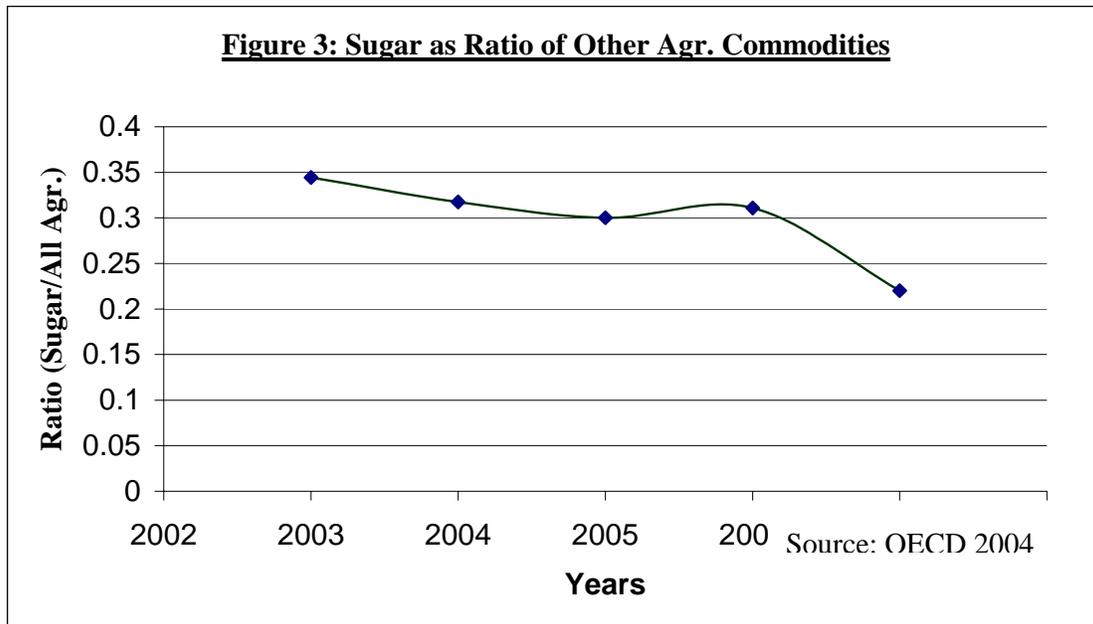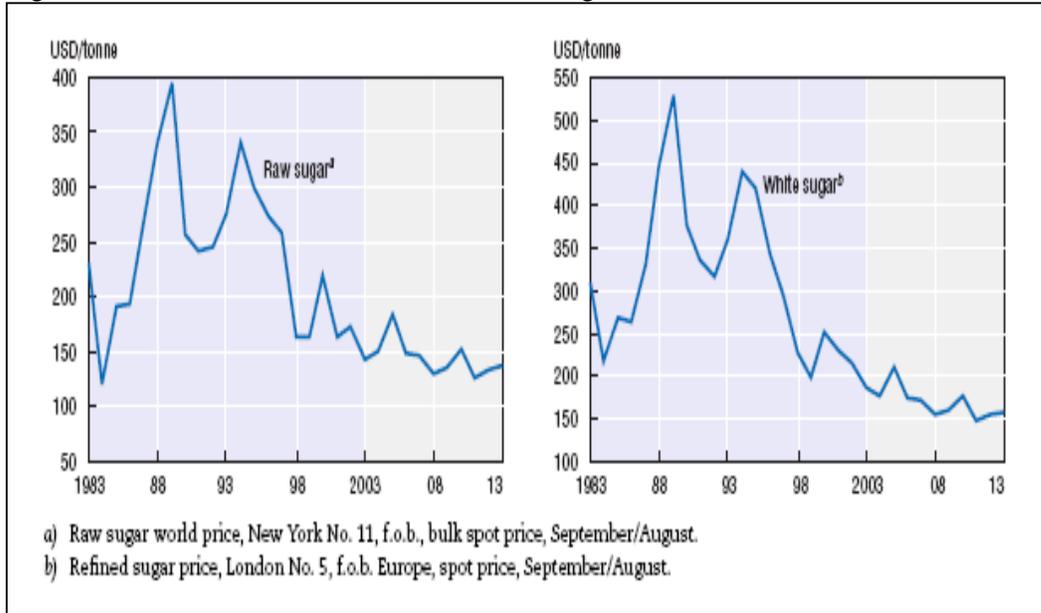| Year	2003	2004	2005	2006	2007	2008
Value of Sugar in FJD per ton	836.2	799.4	739.3	860.4	840.9	954.2
World Market Price in FJD per ton	188.24	247.06	436.73	590.51	414.46	481.06

Source: FIBOS (2008; 2009)

In comparison to other agricultural commodities, sugar output has declined from 34% by value in 2003 to 22% in 2008 (see Figure 3). Despite this decline, sugar production continues to be valued as an important export good for Fiji. It remains the largest single commodity export and second largest foreign exchange earner after tourism. As we can observe from Figure 4, the ratio of sugar exports to all other exports has been declining since 2003.

---

[2] The European Union made a commitment to Fiji for an aid of approximately $FJ350 million over a period of 5 years to compensate for losses due to withdrawal of preferential prices that Fiji enjoyed in the past under ACP-EU agreement.

[3] The institutional prices of the European Union were reduced by 20% in 2006 and 2007 and by 33% in 2008. Therefore, a compensation of 135 million Euros was offered as a subsidy for Fijian sugarcane farmers, which has been held back due to the coups of 2006 and constitutional abrogation in 2009.

Figure 2: World Prices for White and Brown Sugar in US dollars

a) Raw sugar world price, New York No. 11, f.o.b., bulk spot price, September/August.
b) Refined sugar price, London No. 5, f.o.b. Europe, spot price, September/August.

Figure 3: Sugar as Ratio of Other Agr. Commodities

Source: OECD 2004

Source: FIBOS (2008)

Figure 4 shows that the share of sugar exports remained between 15-20%, with a slight downward trend. On the other hand one of the main imports good for Fiji is fossil fuel, which has continued to rise in the last 5 years. The trend is shown in Figure 5, which shows that the ratio has increased by about 13% points. It increased from around 22% in 2003 to

35% in 2008. It is possible that this increasing trend could continue if the world prices of fuel oil continue to rise in future.

Figure 4: Sugar Exports/Exports

Source: FIBOS (2008)

Figure 5: Fuel Imports as a Ratio of all Imports
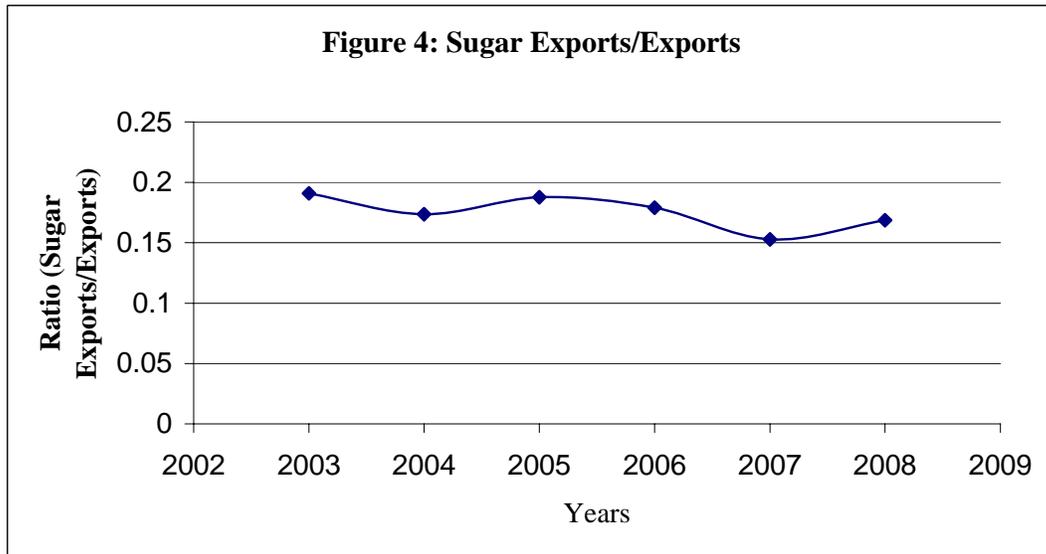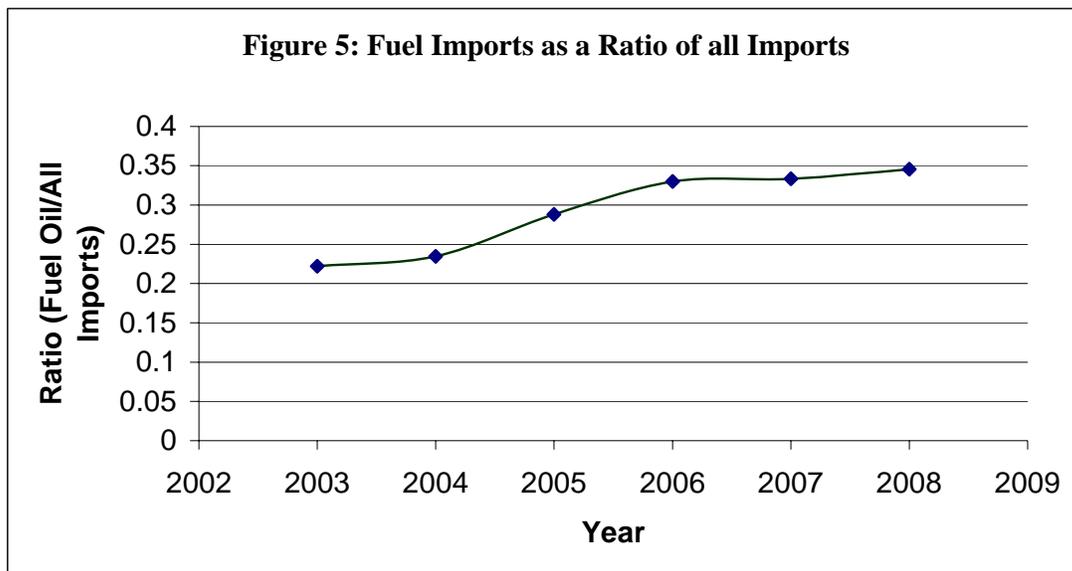
Source: FIBOS (2008)

With the current declining trend for sugar and increasing fuel import bill, Fiji needs to take decisive action to break away from this unsustainable economic path. It needs to embark upon ventures that replace sugar commodity export as a major foreign exchange earner by commodities such as bio-fuels. While initially it may be export oriented, in the long run fuel

imports may be substituted by these domestically produced bio-fuels if appropriate vehicular technologies become viable (see DSDG 2005 and International Energy Agency 2004). The conclusion drawn by DSDG (2005) clearly points out that production of ethanol from sugar for developing countries is a lucrative option, which is particularly the case since demand for ethanol will continue to increase as price for fossil fuel increase as stated by International Energy Agency (2004). Production of ethanol is possible if investments are made in ethanol plants, which can be situated close to existing sugar producing unit (DSDG 2005). In this way, developing countries like Fiji would be able to export ethanol instead of rough sugar. Fiji then would have an option of exporting ethanol and also partially substitute for imported mineral oil such as diesel and gasoline. This transformation however, requires some change in existing technologies which may be cheaply available in the global market in future.

If production of ethanol becomes economical and exports are realised, opportunities for the production and use of other crops such as cassava and corn for ethanol production could also be possible. Thus, investments in these areas could lead to a long term sustainable development path for Fiji. This is particularly the case since Fiji has surplus land resources for agricultural production (Prasad and Tisdell 1996; Narayan and Prasad 2003).

In this paper, the economics of ethanol production from sugarcane and cassava in Fiji are established using production ratios from previous studies in Thailand, China and other countries such as Brazil and the United States. If the economics of ethanol production is found to be prospective, this paper could become the basis of positive arguments supporting ethanol production as a substitute for sugar exports in the near future and open up prospects for other environmentally friendly developments in the Pacific region (see conclusion and recommendation statements in DSDG 2005).

The viability and advantages of ethanol as transport fuel is explained in the following sections and subsections of this paper. The next section of the paper explore cost-benefit analysis of commercial production of ethanol and its use as transport fuel to prove economic viability of this industry in Fiji. The cost-benefit analysis is based on a study of the DSDG (2005), which was done for the Dutch government. The Dutch study is not a one-to-one replication for Fiji but its findings are generalised for developing countries and can be applied in the case of Fiji without much difficulty if the economics of feed crop production proves to be viable. The sugar production costs for this study are extracted from Fiji Sugar Corporation reports and Lal (2008). The costs of production of cassava are extracted from agriculture manuals published by Fiji's Ministry of Agriculture.

2.0   The Economics of Ethanol Production in Fiji

In principle, ethanol is usable in all kind of combustion motors with some technical modifications (see for instance, Martinez-Frias et al. 2007 and Bastian-Pinto et al 2009). However, it is also possible to use it as fuel in gasoline and diesel cars with a few restrictions, especially in older model cars. However, it can be said that all cars can run on a mixture of ethanol and mineral gasoline, where the ethanol share is not higher than 10%. This fuel is widely known as E10 in most Ethanol using countries in Europe, USA, Brazil and Asia. A large percentage of cars designed after 1999 can run on ethanol mixed fuel with between 0-100% combinations with mineral oil. These cars are named flexible-fuel vehicles (FFV), which allow use of pure ethanol fuel E100.

Ethanol has lower energy content than mineral oil and typically, the energy content of Ethanol E85 is lower than that of mineral gasoline, which requires approximately 20-26% higher consumption by volume if E85 is used in place of pure gasoline fuel. This energy characteristic of ethanol has to be taken into account when computing and comparing consumption.

The kinds of ethanol that are used and will be offered in different countries are likely to differ and will continue to evolve in future (International Energy Agency 2004). For example, in the United States, Australia and Thailand E10 is used widely now, while in Brazil E25 and in Sweden E100 is specified for busses. In the European Union, generally, E5 is commonly prescribed at the moment and many other countries are considering ethanol to meet environmental requirements in the future (Blackman and Harrington 2000). By 2020, E20 composite fuel is likely to be enforced all over the EU region and similar developments are expected in other countries like Brazil and Thailand and China and some Asian countries. This trend is likely to give rise to increased demand of ethanol. Such steps are already taken in these countries as a response to environmental concerns and economic sustainability. It is argued that the ecological balance of ethanol is much higher than that of mineral fuels (Rask 1998; Blackman and Harrington 2000; Kurosawa 2004; International Energy Agency 2004). The efforts at reducing Green House Gases (GHG) are now on global agenda and adjustments are already underway in most countries (Islam 1995; Streck 2004).

The crucial factor in the use of ethanol as fuel lies in the economics of production, use and the availability of technology. For Fiji, production of ethanol could become a niche market export if investments in sugar based ethanol can be realised in the short run. The prospect of production of ethanol from cassava is also quite high if such methods prove economical for Fiji. In addition to the use of brown sugar, use of molasses for ethanol

production may prove more profitable. It would help add volume to the market from the existing infrastructure available for the sugar industry. However, the economics of ethanol production and energy depends largely on the production processes of both primary sources and the process of converting the primary sources into ethanol. For example, the source of primary inputs such as sugar, sugar syrup, molasses, corn or cassava would incur different cost per litre of ethanol.

Tables 2, 3, 4 and 5 give some details of the costs of production of ethanol. This data clearly indicates whether ethanol production will be viable in Fiji at a commercial rate or not. According to Table 2, using molasses or sugar syrup for the production of ethanol are cheaper than using brown sugar. The production cost of ethanol using sugar is higher due to the higher market price of processed sugar. Molasses is cheaper since it is a bi-product of sugar production and sugar syrup is impure sugar, which incurs further cost when converted into refined sugar.

Table 2: Material Cost of Ethanol (Sugarcane Feedstock)

Raw Materials	Price per Ton in EUROS	Material Cost per Litre of Ethanol	Material Cost per Litre (in FJD)
Molasses (3.4kg/liter)	37.62	0.1279	0.3756
Cane Sugar B-syrup (2.7 kg/litre)	47.19	0.1274	0.3738
Cane sugar (1.65 kg/litre)	324.4	0.5353	1.571

Source: Authors' Calculations based on DSDG (2005)

When the processing costs are factored in and the total cost per litre of ethanol is calculated, the option of using sugar as the primary input is uneconomical.[4] The price of ethanol from rough sugar is about seventy two Euro cents per litre, which is quite high (see Table 3 for details). The current price is about 49-60 Euro cents per litre is the global market. It is around 56-58 Euro cents in the European region. However, the cost of ethanol production from molasses and sugar syrup is much less due to their low world market prices. It costs between FJD$0.90 and FJD$1.00, which is between 30 and 35 Euro cents. This price range is significantly lower than the cost when sugar is used. From this data alone the option of producing ethanol using sugar does not seem viable. However, production of ethanol does not require sugarcane to be converted to sugar. It can be produced from thick liquid syrup, which is unrefined sugar and costs much less (DSDG 2005). This sugar syrup can be extracted directly and used as source commodity. This direct conversion can bring the cost of

---

[4] The calculations are based on currency rates of $FJD2.934 to €1. This is rate used for all the calculations hereafter.

production of ethanol much lower but the opportunity cost of this will be calculated in terms of the foregone revenues from sugar production. Table 3 shows the total cost of ethanol production using world market prices of primary inputs. The calculations have been done for three different interest rate scenarios to include the cost of capital and constant wage rate component using agricultural sector wages in Fiji. These prices would change due to changing prices of sugar in the EU markets. The European Union announced reduction in the protocol sugar price by 5.1% for mid 2006, 9.2 % for 2008 and 21.7% for 2009, bringing the reduction in price to a total of 36%. The prices used here for the cost calculation of ethanol production incorporates reduction in prices for 2006, 2008 and 2009, which is approximately 36% lower than 2005 prices (see FSC 2007; Lal 2008). Therefore, the cost of producing ethanol from cane sugar reflects the opportunity cost of producing ethanol against the current use of resources for the production of edible sugar. Table 3 shows the weighed average price of ethanol production at around $€0.57, which is the same as the prices in European Union region. On this basis alone production of ethanol fuel is expected to be competitive and economical. However, the overall economics of ethanol production and use is not as simple.

International Energy Agency (2004) points out that the economics of ethanol fuel is quite complicated. The prices fluctuate from region to region due to a number of reasons. Price distortions exist due to government subsidies and support in the United States and Europe (see Ferreira et al. 2009; Hettinga et al 2009). The calculation of indirect benefits from the use of ethanol as a substitute of fossil fuel is also difficult. The use of food grain for ethanol production impacts negatively in at least two ways. It puts pressure on food prices due to demand side pressure and impacts the environment on bio-diversity and deforestation as a result of demand for land and soil erosion. Therefore, while the costs of production of ethanol can be calculated easily, the benefits arising from the use of ethanol as a substitute for fossil fuel is much harder to determine.

Table 3 Total Cost/litre of Ethanol from Sugarcane (at various rate of investment costs)

| | Three Capital Investment Costs (Interest Rates) | | | | | |
	Euros (5%)	FJD (5%)	Euros (10%)	FJD (10%)	Euros (12%)	FJD (12%)
Molasses	0.3157	0.9263	0.3336	0.9788	0.3407	0.9996
Cane Sugar B-syrup	0.3153	0.9251	0.3331	0.9773	0.3403	0.9984
Cane Sugar	0.7231	2.1216	0.7410	2.1741	0.7481	2.1949
Average Cost	0.5527	1.6217	0.5706	1.6741	0.5777	1.6950

Source:

A similar cost analysis is done for the use of cassava as the primary feed. The calculations are done using ratios provided by a number of studies in Thailand. The details of these calculations are shown in Tables 4 and 5. The prices shown in this study are assumed to be competitive and thus applied to Fiji with some adjustments to factor prices.

Table 4 Total Cost per Litre of Ethanol from Cassava (in Thailand)

Types of Costs	Input Ratios and Costs (Thailand)	Thailand prices of Ethanol (in Euros per litre)	Prices in FJD
Material Cost	333 Litres/ton (of Cassava chips)	0.2566	0.7529
Processing Cost	29% of gate price is the processing cost with 17% before tax profit.	0.2138	0.6273
Total	With 15% trade margin	0.5410	1.5872

Source: Nguyen et al. (2008) – Calculations are based on 2006 prices.

Table 5 shows the cost of production of ethanol on farm gate price of cassava. The current data with the Ministry of Agriculture shows that approximately twenty tons of cassava can be produced from one hectare of average land type in Fiji. At the current market priced of $0.40 per kg, farmers fetch a huge margin on this crop but most farmers are small operators. With a marketable yield (at approximate recovery rate of 80%) of approximately sixteen tons per hectare, the total revenue per hectare is calculated to be $FJD6400. The current profit margin received by cassava farmers is approximately $FJD4500 per hectare.

This profit margin is extremely high and may be uneconomical. This market price in Fiji is artificially high due to non-commercial production of cassava in Fiji. This price structure therefore, can be brought down if more competitive production mode is used and better market conditions are induced in the market. Thus, incomes of cassava farmers can be compensated if farm size increase and more efficient techniques of production are established due to expanded markets.

If the current cost of production for cassava in Fiji is taken to be $1830 per hectare and a 30% profit margin is added, the cassava input cost is then calculated to be 17.5 Euro cents per litre of ethanol (see Table 5). With this raw material cost structure, the price of ethanol would be expected to be competitive in the world market. The ethanol price would then be €0.37 (thirty seven Euro cents) per litre. However, if the price of cassava remains high due to higher profit margins and small scale production (with high cost structure), then ethanol production in Fiji would be uncompetitive and not viable. Table 6 for instance, shows the cost of production of cassava with 50% profit margin. At this rate of profit the material

cost rises to 24.6 Euro cents per litre of ethanol and the total price increases to approximately 52 Euro cents per litre if cost ratios are maintained. Further cost analysis shows that the price of ethanol will be at 86 Euro cents per litre, if the price of cassava is at the current level. This calculation is based on constant cost ratios, which may not be the case since the processing cost is not based on cost of raw materials. Appropriate adjustments in the costs of production are likely to bring the actual cost of production significantly down.

Table 5: Total Cost per Litre of Ethanol production from Cassava (in Fiji)

Types of Costs	Fiji Prices (in Euros) with Thailand Production ratios for Ethanol processing	Fiji Prices (in FJD) with Thailand Production ratios for Ethanol processing
Material Cost	17.5	51.5
Processing Cost	14.6	42.9
Retailing Costs	4.8	14.2
Total	37.0	108.5

Source: Ministry of Agriculture (2008) -Database 2009, Statistic Division.

Table 6: Total Cost per Litre of Ethanol production from Cassava (in Fiji)

Types of Costs	Fiji Prices (in Euros) with Thailand Production ratios for Ethanol processing	Fiji Prices (in FJD) with Thailand Production ratios for Ethanol processing
Material Cost	24.6	72.1
Processing Cost	20.5	60.1
Retailing Costs	6.8	19.8
Total	51.8	151.9

Source: Ministry of Agriculture (2008) -Database 2009, Statistic Division.

The current world market price of ethanol is $€0.57. Therefore, if the farm gate price of cassava is maintained at about $FJD0.24 (24 Fijian cents) per kilogram of cassava, production of ethanol would become economically viable and possible to export at the wolrd market price. However, the world economic market place is far more complicated then this. The pricing mechanism is much more complicated due to the subsidies received by corn and grain farmers in the US (Vedenov and Wetzstein 2008; Hettinga, et al. 2009).[5] These subsidies distort prices and farm level efficiency. In this scenario, government support for this sector may be necessary for it to be a success, at least initially.

Ethanol industry competes with fossil fuel, which is a far more mature sector than ethanol industry. The price of fossil fuel fluctuates significantly and can be produced quite

---

[5] Also see Ferreira, et al. (2009) for price interaction mechanism between gasoline and ethanol prices and the choice of car that uses different technology and use of fuel types.

cheaply due to the existing infrastructure and available technology. It will, therefore, be the real challenge for ethanol produces to compete with the conventional fuel in the market place.

Such industry support, however, is not likely in Fiji. However, in comparison to the US or even the European conditions, Fiji is better placed in terms of stock feed production for ethanol. Tropical climate in Fiji is quite suitable for sugarcane and cassava production since these two crops require lot of sunshine, heat and soil moisture, which is naturally present in Fiji's climatic condition. This condition provides the possibility of producing ethanol at globally competitive prices due to lower cost of production of the feedstock.

3.0 Macroeconomic Aggregates for Ethanol Production

The total output of sugarcane is expected to be between 2.5 and 3.5 million tons from the available output trend. From this level of sugarcane production, 300,000 tons of rough sugar is expected to be realised. Table 7 shows the trend from 2002 to 2006, which gives an average output level of approximately 307,000 tons and 128,822 tons of molasses, which can also be used in ethanol production (see last column).

Table 7 Sugar Production Statistics (in Tons)

	2002	2003	2004	2005	2006	Average
Cane (Tons)	3,422,896	2,610,011	3,001,235	2,788,720	3,225,551	3,009,683
Sugar (Tons)	330,405	293,645	314,139	288,911	310,140	307,448
Molasses (Tons)	148,597	107,476	113,147	117,770	157,121	128,822
TCTC Ratio	10.4	8.9	9.5	9.7	10.4	9.78

Source: FSC (2007)

According to FSC (2007), the total turnover for 2006 was at $235 million, which accounts for total sales of sugar and molasses. If this sales figure is adjusted for price changes in 2007 and 2008, the total turnover would be approximately $260 million. This value is now adjusted for difference in output level (2006 output = 310,140; Average output = 307,448), which gives a total value of approximately $257 million. If this earning is now adjusted for price decline of 36%, the value of sugar is then expected to be $176 million in 2008 prices. An arithmetic comparison of values is now done from the foregoing value analysis.

Approximately, $FJD140 million more would be earned from ethanol production in comparison to sugar commodity earnings. This calculation is based on the ethanol price of 48 Euro cents per litre. However, it needs to be noted that ethanol production requires additional investments and processing cost of approximately €0.21 per litre. This additional cost amounts to approximately €48 million for this level of production. Thus, after factoring this

cost, a surplus of only about €5 million over the return from sugar is realised. This margin of gain over sugar exports is quite small but if ethanol price rises to as high as €0.57 and costs of production of ethanol are reduced through efficiency gains, the margin would increase substantially and would be sufficient to provide incentives for investments in this sector. This however, would also depend on government support and appropriate investment policies, particularly in provision of logistics and infrastructure (see Hettinga et al. 2009).

Table 8 Ethanol Production from Sugar (in Tons)

	Average Output in Tons	Kg of Inputs per Litre	Total Expected Output of Ethanol	Price (in €)	Earnings (in €)	Earnings (FJD)
Sugar Output	307,448	1.65	186,332,121	0.48	$89,439,418	$262,427,662
Molasses	128,822	3.4	37,888,824	0.48	$18,186,635	$53,362,111
Total	NA	NA	224,220,945	NA	$107,626,053	$315,789,773

Source: FSC (2007) for Sugar data and rations from the Dutch study.

While the data on costs of production using sugar for ethanol production looks reasonably economical, use of cassava for ethanol production remains an option since the climatic conditions in Fiji are suitable for this crop. According to cost of production shown in Table 5, ethanol can be economically extracted from cassava but there are a number of difficult issues to resolve before this sector could become functional. First and foremost production of ethanol from cassava would require entirely new setup. To get this underway, government would be required to attract investors who are willing to invest in Fiji. This would only be feasible if the government commits politically in this sector and makes available the necessary resources to invest in infrastructure. International level negotiations would also be necessary if Fiji decides to export ethanol.

In addition to this, a number of basic issues such land tenure need to be addressed so that farmer are motivated to invest in their farms. The process of change would be required to initiate investments domestically both on the production and demand sides for consumption. That is, vehicular investments would also be necessary for local consumption. Appropriate policies such as tax incentives for people to switch to ethanol cars and buses would be necessary if cost implications are not attractive.

The start-up process of ethanol production and consumption could prove quite tricky for small countries like Fiji. It may involve costly and well-planned processes for the government to start-up a model. As pointed out by DSDG (2005) ethanol producing plants from sugar will have to be established close to the existing sugar factories in the form of

distilleries, where the existing sugar mills provide the feedstock for ethanol production. A more costly strategy may necessary for ethanol production from cassava.

A low-technology ethanol plant would cost approximately $FJD1.0 million. Such a plant produces about 3000 litres of 96% alcohol. This plant would be able to operate if about 9 tons of cassava is fed into it on daily basis. If such a plant operates at full capacity, it would feed approximately 3000 tons of cassava flour per year. Such a plant would require commitment of more than 200 hectares of arable land for cassava crop. On the other hand, a large scale ethanol plant would be based on investment capital of over $FJD40 million and would be fed from more than 8000 hectares of arable land. Such a plant requires a constant feed of over 100,000 tons of cassava flour or chips per year and would produce about 30 million litres of ethanol annually.

If ethanol from this plant is exported, it would fetch €15 million, which is equivalent to approximately $FJD45 million. This profit margin is quite lucrative and would still be so with reasonable tax rate. The profit rate in Thailand is at an average of 15-18% of factory gate price (Nguyen et al. 2008).

Use of cassava as feedstock may raise other domestic problems if prices start rising instead of declining. Cassava is a staple food in Fiji and the current production is about 50,000 tons. This amount and possibly more will also be demanded as food in the domestic market.

The current production of cassava will be increased two folds if a single such mill has to be fed with cassava for ethanol production. Under current circumstances, a project like this may be hard to realise if resources are not pooled together and government support not stated explicitly, which seems to be the case at the moment. The availability of land resources in plentiful is not enough to spin-off this industry. The government and policymakers need to make sure that land tenure problems are resolved immediately so that investors feel secure and farmers are able to lease land at market rates without fear of harassment.

At the moment the land issue is a great disincentive for all parties. Under the current lease conditions the farmers are unwilling to invest their savings to build farm capacities (see for instance Lal (2008); Chand 2007 and Prasad and Tisdell 1996).

4.0   Balance of Payments and other benefits

The balance of payments issue for Fiji is a serious problem. The current account deficit remains around 30% of GDP. This order of deficit is extremely large, but it is clear from the analysis above that production of ethanol can contribute significantly towards

reducing it if export of ethanol is realised. In the long run, if appropriate vehicular technologies are available then ethanol production would help reduce Fiji's oil import bill. This issue has been stated and emphasised clearly by DSDG (2005). However, the level of this reduction in import bill depends on how far Fiji is willing to go in utilising ethanol as an alternative fuel. This depends largely on how far Fiji is will to exploit its land resources for the production of ethanol and what forms of technology are available around the global that is affordable for the people of Fiji. With this two-way gain, the prospects for ethanol production and consumption are extremely bright, particularly when all prediction indicates that fossil fuel prices would continue to rise in the future (see Goldemberg and Guardabassi 2009).

Apart from economic gains, Fiji will also gain from environmental and health costs. There are enough evidences to suggest that returns on health would be large and such a contribution will also be global. Assuming that the ethanol production in Fiji would be similar to the production in Brazil, the GHG emissions in comparison to mineral fuel would be 80-85% if such combination of fuel is used. That is, even if Fijian cars are only able to use E10 in the immediate future, the reduction in GHG emissions from cars would immediately dropped by more than 8.5%, which would be a remarkable achievement because the combustion of ethanol produces no other harming substances (see Rask 1998). The data in Table 9 shows that ethanol contributed significantly towards cleaner environment.

Table 9 Greenhouse Gas reduction from Use of Ethanol (by %)

Ethanol	Grain (EU, USA)	Sugar beet (EU)	Sugarcane (Brazil)	Cellulosic Feedstock (USA)	Rapeseed (EU)
Minimum Reduction of GHG in %	-20	-35	-80	-60	-45
Maximum reduction of GHG in %	-43	-55	-85	-100	-60

Source: Greenpeace (2007)

In the case of production of ethanol from sugarcane, there are existing production infrastructure and farm level output. However, ethanol plant construction would require significant investments and since the sugar mills are public sector entities, the ethanol plant would necessarily have to be public investment. If such decisions are possible, particularly with new sugar price structure, then those decisions should be made as soon as possible since adjustments in this sector often takes time while global condition can change quite drastically. For instance, oil prices can change significantly in the short run and the existing incentive may even diminish. So decisions at the national level need to be taken on long term

footing and not on short term scenarios. There are several global and domestic dynamics in oil market that are often hard to understand or manipulate (Malla 2009). Any undue delay would further erode the confidence of the existing farmers and possibly result in wastage of current production capacities at all levels. As pointed out by Lal (2008), farm husbandry and current practices at the farm level have to be reformed significantly so that cost of production can be reduced with some gains in profitability.

5.0   Conclusion

The authors are convinced that production and use of ethanol in Fiji is one of the rare examples where a win-win situation exists and numerous possibilities exist for this to be exploited. The gains here are the based on the following considerations:

1) The production of ethanol is profitable especially in the long-run because of the dramatically increasing demand worldwide.

2) Even that the domestic use should be enhanced through policy implementation, the domestic demand will always be lower than the supply and consequently Fiji would retain the potential to export part of the ethanol it produces. In this way aggregate exports would increase bringing the BOP deficit down and additionally contribute to the global quest for reduction in carbon emission.

3) With expanding ethanol industry the much needed employment for low-skilled workers would be created. It will also lead to high skill workers as the industry matures and leads to expanded services sector. The positive externality would be far reaching and have a transformational effect on the society. With a thriving ethanol industry Fiji would easily be able to step onto international partnership and join forces for **CDM** (clean development mechanism) projects. The clean development mechanism is one of the four mechanisms of the Kyoto-protocol. The current state of emissions, such as PM10 emissions from buses and other heavy vehicles would easily become a thing of the past.

4) The production and use of ethanol in Fiji would have enormous ecologically benefits. With the existing sugar industry no additional land would be required to be cleared for farming. This venture therefore, would not have any additional negative implication from the use of land.

As is the case for every other industry, any investment in this industry is not risk free, but success in this sector has multiple gains at all levels. A lot however, depends on government support. If the government support and policy approach is positive (including land use legislation), then the risk will become minimal even if fossil fuel prices remain erratic in the future. Additionally, the government would be required to subsidize new vehicular technologies particularly for flexible-fuel vehicles, which would accelerate development for the use of ethanol for transport.

References:

Bastian-Pinto, C., Brandao, L. and Hahn, W. J (2009) "Flexibility as a Source of Value in the Production of Alternative Fuels: The Ethanol Case", *Energy Economics*, Vol. 31, No.3, pp. 411-422.

Blackman, A. and Harrington, W. (2000) "The use of Economic Incentives in Developing Countries: Lessons from International Experience with Industrial Air Pollution", *The Journal of Environment Development*, Vol. 9, No. 1, pp. 5-44.

Chand, S. (2007) "Swim or sink: the predicament of the Fiji economy", pacific Economic Bulletin, Vol. 22, No. 2, pp. 1-21.

DSDG (2005) "Feasibility Study on Effective and Sustainable Bio-ethanol Production Program for LDCs – an alternative to Sugar Export", Ministry of Agriculture, Nature and Food Quality, (June, 2005), Netherlands.

FIBOS (2008) *Key Economic Statistics* (December), Fiji Islands Bureau of Statistics, Government Building, Suva.

FIBOS (2009) *Key Economic Statistics* (March), Fiji Islands Bureau of Statistics, Government Building, Suva.

FSC (2007) Fiji Sugar Corporation - Annual Report 2007, Fiji Sugar Corporation Limited and Subsidiary Companies, Government Building, Suva.

Goldemberg, J. and Guardabassi, P. (2009) "Are Bio-fuels a Feasible Option?" *Energy Policy*, (Viewpoint), Vol. 37, No. 1, pp. 10–14.

Greenpeace UK (2007) "Bio-fuels: Green Dream or Climate Change Nightmare". http://www.greenpeace.org.uk/blog/climate/biofuels-green-dream-or-climate-change-nightmare-20070509 (Retrieved on 2008-04-28).

Hettinga, W.G., Junginger, H.M., Dekker, S.D., Hoogwijk, M., McAloon, A.J. and Hicks, K.B. (2009) "Understanding the Reductions in US Corn Ethanol Production Costs: An Experience Curve Approach", *Energy Policy*, Vol. 37, No. 1, pp.190-203.

International Energy Agency (2004) *Bio-fuels for Transport – an International Perspective*, OECD, CHIRAT, Paris.

Islam, S.M.N. (1995) "The Role of Renewable Energy in the Energy System: An Issue in the Philosophy of Renewal of Natural Resources", *Energy Economics,* Vol. 17, No. 2, pp. 117-124.

Kurosawa, A. (2004) "Carbon Concentration Target and Technological Choice", *Energy Economics,* Vol. 26, No. 4, pp. 675-684.

Lal, P. (2008) *Ganna – Portrait of the Fiji Sugar Industry*, Sugar Commission of Fiji, Lautoka, Fiji Islands.

Malla, S. (2009) "Viewpoint CO2 Emissions from Electricity Generation in Seven Asia-Pacific and North American Countries: A decomposition Analysis", *Energy Policy*, Vol. 37, No. 1, pp. 1-9.

Martinez-Frias, J., Salvador M. Aceves, S.M. and Flowers, D.L. (2007) "Improving Ethanol Life Cycle Energy Efficiency by Direct Utilization of Wet Ethanol in HCCI Engines", *Journal of Energy Resources Technology*, Vol. 129, No. 4, pp. 332-337.

Ministry of Agriculture (2008) Crop Statistics, Database, Statistic Division Ministry of Agriculture, Government Building Suva.

Narayan, P. K. and Prasad, B. (2003) 'Fiji's Sugar, Tourism and Garment Industries: A Survey of Performance, Problems and Potentials', *Fijian Studies*, Vol. 1, No.1, pp. 3-27.

Nguyen, T.L.T, Gheewala, S.H. and Garivait, S. (2008) "Life Cycle Cost Analysis of Fuel Ethanol Produced from Cassava in Thailand", *International Journal of Life Cycle Assessment*, Vol. 13, No. 7, pp. 564-573.

OECD (2004) *Agricultural Outlook 2004-2013*, Organization of Economic Cooperation and Development, OECD Publishing, Geneva.

Prasad, B.C. (1998) "Property Rights, Economic Performance and the Environment in Fiji: A Study on Sugar, Tourism and Forestry", PhD thesis, University of Queensland.

Prasad, B.C. and Tisdell, C. (1996) "Getting Property Rights 'Right': Land Tenure in Fiji", *Pacific Economic Bulletin*, Vol. 11, No. 1, pp. 31-46.

Rask, K.N. (1998) "Clean air and Renewable Fuels: the Market for Fuel Ethanol in the US from 1984 to 1993", *Energy Economics*, Vol. 20, No. 3, pp.325-345.

RBF (2009a) "Reserve Bank Announces the Following Monetary Policy Changes", *Press Release*, No. 16, Reserve Bank of Fiji, RBF Building, Suva.

RBF (2009b) *Economic Review*, Vol. 26, No. 3, Reserve bank of Fiji, RBF Building, Suva.

Streck, C. (2004) "New Partnerships in Global Environmental Policy: The Clean Development Mechanism", *The Journal of Environment and Development*, Volume. 13; No. 3, pp. 295-322.

Vedenov, D. and Wetzstein, M. (2008) "Toward an Optimal U.S. Ethanol Fuel Subsidy", *Energy Economics*, Vol. 30, No. 5, pp. 2073–2090.

Ferreira, A.L., Prado, F.P. de Almeida and Silveira, J.J. (2009) "Flex Cars and the Alcohol Price", *Energy Economics*, Vol. 31, No. 3, pp.382-394.

Recent Working Papers

2009/WP:

4   T.K.Jayaraman and Chee-Keong Choong *Monetary Policy Transmission Mechanism in Vanuatu*

3   T.K.Jayaraman and Chee-Keong Choong *How does Monetary Policy Work in Solomon Islands?*

2   T.K.Jayaraman and Chee-Keong Choong, *Monetary Policy Transmission Mechanism in Vanuatu*

1   T.K.Jayaraman and Chee-Keong Choong, I*s Money Endogenous In The Pacific Island Countries?*

2008/WP:

20   T.K.Jayaraman and Evan Lau*, Rise in Oil price and Economic growth in Pacific Island: An Empirical Study.*

19   T.K.Jayaraman and Chee-Keong Choong, *External current account and domestic imbalances in Vanuatu: A Study on Causality Relationships*.

18   T.K.Jayaraman and Chee-Keong Choong, *Channels of Monetary policy Transmission mechanism in pacific island countries: A Case Study of Fiji: 1970-2006.*

17   T.K.Jayaraman and Chee-Keong Choong, *Impact of high oil price on Economic Growth in small Pacific island countries.*

16   T.K. Jayaraman and Evan Lau, *Causal Relationships between current account Imbalances and budget deficits in Pacific island countries: A panel Cointegration Study.*

15   T.K. Jayaraman, *Do Macroeconomic Fundamentals Influence External Current Account Balances?*

14   T.K. Jayaraman and Chee-Keong Choong*, Is Fiji's Real Exchange Rate Misaligned.*

13   T.K.Jayaraman, Chee-Keong and Siong-Hook Law, *Is Twin Deficit Hypothesis in Pacific Island Countries valid? An Empirical Investigation.*

12   Tauisi Taupo, *Estimating the production function for Fiji.*

11   Tauisi Taupo, *Estimating demand for money in Philippines.*

10   Filipo Tokalau, *The Road that is; for whom and why: Impacts of tourism Infrastructural development on Korotogo Village, Fiji islands.*

9   Mahendra Reddy*, Sequential Probit modeling of the determinants of child Labour: Is it a case of luxury, distributional or Substitution Axiom?*

8   Neelesh Gounder, Mahendra Reddy and Biman C. Prasad, *Support for Democracy in the Fiji Islands: Does Schooling Matter?*

7   Sunil Kumar, *Fiji's declining formal sector economy: Is the informal sector an answer to the declining economy and social security?*

6   T K Jayaraman and Evan Lau, *Does External Debt Lead to Economic Growth in the Pacific Island Countries: An Empirical Study*

5   Gyaneshwar Rao, *The Relationship between Crude and Refined Product Market: The Case of Singapore Gasoline Market using MOPS Data*

4   Bill B Rao and Saten Kumar, *A Panel Data Approach to the Demand for Money and the Effects of Financial Reforms in the Asian Countries.*

3   Bill B Rao and Rup Singh, *Contribution of Trade Openness to Growth in East Asia: A Panel Data Approach.*

2   Bill B Rao, Rup Singh and Saten Kumar, *Do We Need Time Series Econometrics?*

1   Rup Singh and Biman C Prasad, *Small States Big Problems Small Solutions from Big Countries.*

2007/WP:

24   Biman C Prasad, *Changing Trade Regimes and Fiji's Sugar Industry: Has the Time Run-out for Reform or is there a Plan and Political Will to Sustain it?*

23   B Bhaskara Rao and Rup Singh, *Effects of Trade Openness on the Steady State Growth Rates of Selected Asian Countries with an Extended Exogenous Growth Model.*

22   T K Jayaraman and Jauhari Dahalan, *How Does Monetary Policy Transmission Mechanism Work in Samoa?*

21   T K Jayaraman and Chee-Keong Choong, *More on "Shocking Aspects" of A Single Currency For Pacific Island Countries: A Revisit*

20   Biman C Prasad, *Economic Integration and Labour Mobility: Are Australia and New Zealand Short-Changing Pacific Forum Island Countries?*

19   T K Jayaraman and C K Choong, *Monetary Policy Transmission Mechanism In The Pacific Islands: Evidence From Fiji.*

18   K L Sharma, *High-Value Agricultural Products of The Fiji Islands: Performance, Constraints And Opportunities*

17   Saten Kumar, *Income and Price Elasticities of Exports in Philippines.*

16   Saten Kumar Determinants of Real Private Consumption in Bangladesh

15   K.L Sharma, *Public Sector Downsizing in the Cook Islands: Some Experience and Lessons*

14   Rup Singh and B C Prasad, *Do Small States Require Special Attention or Trade Openness Pays-off.*

13   Rup Singh, *Growth Trends and Development Issues in the Republic of Marshall Islands.*

12   B. Bhaskara Rao and G Rao, *Structural Breaks and Energy Efficiency in Fiji.*

11   Rup Singh, *Testing for Multiple Endogenous Breaks in the Long Run Money Demand Relation in India*

10   B.B Rao, Rukimini Gounder and Josef Leoning, *The Level And Growth Effects in the Empirics of Economic Growth: Some Results With Data From Guatemala*

9   B. Bhaskara Rao and K.L Sharma, *Testing the Permanent Income Hypothesis in the Developing and Developed Countries: A Comparison Between Fiji and Australia.*

8   T. K Jayaraman and Chee K Choong, *Do Fiscal Deficits Cause Current Account Deficits In The Pacific Island Countries? A Case Study of Fiji*

7   Neelesh Gounder and Mahendra Reddy, *Determining the Quality of Life of Temporary Migrants using Ordered Probit Model.*

6   T K Jayaraman, *Fiscal Performance and Adjustment in the Pacific Island Countries: A Review.*

5   Yenteshwar Ram and Biman C Prasad Assessing, *Fiji' Global Trade Potential Using the Gravity Model Approach.*

4   Sanjesh Kumar and Biman C Prasad, *Contributions of Exports of Services Towards Fiji's Output*

3   Paresh Kumar Narayan, Seema Narayan, Biman Chand Prasad and Arti Prasad, *Tourism and Economic Growth: a Panel Data Analysis for Pacific Island Countries*

2   T.K. Jayaraman and Chee-Keong Choong, *Will External Borrowing Help Fiji's Growth.*

1   Arti Prasad Paresh Kumar Narayan and Biman Chand Prasad, *A Proposal for Personal Income Tax Reform For The Fiji Islands*

2006/WP:

34   Paresh K Narayan and Arti Prasad, *Modelling Fiji-US Exchange Rate Volatility.*

33   T.K. Jayaraman and Chee-Keong Choong, *Why is the Fiji Dollar Under Pressure?*

32   T.K. Jayaraman and Baljeet Singh, *Impact of Foreign Direct Investment on Employment in Pacific Island Countries: An Empirical Study of Fiji*

31   B. Bhaskara Rao and Toani B Takirua, *The Effects of Exports, Aid and Remittances on Output: The Case of Kiribati*

30   B. Bhaskara Rao and Saten Kumar*, Cointegration, Structural Breaks and the Demand for Money in Bangladesh*

29   Mahendra Reddy*, Productivity and Efficiency Analysis of Fiji's Sugar Industry.*

28   Mahendra Reddy*, Preferential Price and Trade Tied Aid: Implications on Price Stability, Certainty and Output Supply of Fiji's Sugarcane.*

27   Maheshwar Rao*, Challenges and Issues in Pro-Poor Tourism in South Pacific Island Countries: The Case of Fiji Islands*

26   TK Jayaraman and Chee-Keong Choong*, Structural Breaks and the Demand for Money in Fiji*

25   B. Bhaskara Rao and Saten Kumar, *Structural Breaks and the Demand for Money in Fiji*

24   Mahendra Reddy*, Determinants of Public Support for Water Supply Reforms in a Small Developing Economy.*

23   Mahendra Reddy*, Internal Migration in Fiji: Causes, Issues and Challenges.*

22   Mahendra Reddy and Bhuaneshwari Reddy*, Analyzing Wage Differential by Gender Using an Earnings Function Approach: Further Evidence from a Small Developing Economy.*

21   Biman C. Prasad Trade*: "WTO DOHA Round: An Opportunity or a Mirage for Fiji.*

20   Benedict Y. Imbun*, Review of Labour Laws in Papua New Guinea*

19   Benedict Y. Imbun*, Review of Labour Laws in Solomon Islands*

18   Rup Singh Cointegration, *Tests on Trade Equation: Is Devaluation an Option for Fiji?*

17   Ganesh Chand*, Employment Relations Bill: An Analysis.*

16   TK Jayaraman and Chee-Keong Choong, *Public Debt and Economic Growth in the South Pacific Islands: A Case Study of Fiji*

15   TK Jayaraman and Chee-Keong Choong, *Aid and Economic Growth in Pacific Islands: An Empirical Study of Aid Effectiveness in Fiji.*

14   Rup Singh, *A Macroeconometric Model for Fiji.*

13   Rup Singh and Saten Kumar*, Private Investment in Selected Asian Countries.*

12   Ganesh Chand, *The Labour Market and Labour Market Laws in Fiji*

11   Carmen V-Graf*, Analysis of Skilled Employment Demand and Opportunities in the Pacific Labour Market*

10   Philip Szmedra, Kanhaiya L Sharma and Cathy L Rozmus*, Health Status, Health Perceptions and Health Risks Among Outpatients with Non-communicable Diseases in Three Developing Pacific Island Nations*

9   Heather Booth, Guangyu Zhang, Maheshwar Rao, Fakavae Taomia and Ron Duncan, *Population Pressures in Papua New Guinea, the Pacific Island Economies, and Timor Leste*

8   Mahendra Reddy*, Technical efficiency in Artisanal Fisheries: Evidence from a Developing Country.*

7   Paresh K Narayan and Biman C Prasad*, Macroeconomic Impact of the Informal Sector in Fiji*

6   Biman C Prasad*, Resolving The Agricultural Land Lease Problem in The Fiji Islands; Current Discussions and The Way Forward.*

5   Rup Singh & Saten Kumar*, Demand For Money in Developing Countries: Alternative Estimates and Policy Implications.*

4   B. Bhaskara Rao, Rup Singh & Fozia Nisha, *An Extension to the Neoclassical Growth Model to Estimate Growth and Level effects*.

3   Rup Singh & Saten Kumar, *Cointegration and Demand for Money in the Selected Pacific Island Countries.*

2   B. Bhaskara Rao & Rup Singh, *Estimating Export Equations.*

1   Rup Singh, *An Investment Equation for Fiji*

2005/WP:

27   Neelesh Gounder & Biman C. Prasad, *What Does Affirmative Action Affirm: An Analysis of the Affirmative Action Programmes for Development in the Fiji Islands*

26   B.Bhaskara Rao, Fozia Nisha & Biman C. Prasad *The Effects of Life Expectancy on Growth*

25   B. Bhaskara Rao, Rup Singh, & Neelesh Gounder, *Investment Ratio in Growth Equations*

24   T.K. Jayaraman, *Regional Economic Integration in the Pacific: An Empirical Study*

23   B. Bhaskara Rao & Maheshwar Rao, *Determinants of Growth Rate: Some Methodological Issues with Time Series Data from Fiji*

22   Sukhdev Shah, *Exchange Rate Targeting of Monetary Policy*

21   Paresh Narayan and Baljeet Singh, *Modeling the Relationship between Defense Spending and Economic Growth for the Fiji Islands*

20   TK Jayaraman*, Macroeconomics Aspects of Resilence Building in Small States*

19   TK Jayaraman, *Some "Shocking Aspects" of a Regional Currency for the Pacific Islands.*

18   Bimal B. Singh and Biman C. Prasad, *Employment-Economic Growth Nexus and Poverty Reduction: An Empirical Study Based on the East Asia and the Pacific Region*

17 Biman C. Prasad and Azmat Gani, *Savings and Investment Links in Selected Pacific Island Countries*

16 T.K. Jayaraman, *Regional Integration in the Pacific.*

15 B. Bhaskara Rao, *Estimating Short and Long Run Relationships: A Guide to the Applied Economist.*

14 Philip Szmedra, KL Sharma, and Cathy L. Rozmus, *Managing Lifestyle Illnesses in Pacific Island States: The Case of Fiji, Nauru and Kiribati.*

13 Philip Szmedra and KL Sharma, *Lifestyle Diseases and Economic Development: The Case of Nauru and Kiribati*

12 Neelesh Gounder, *Rural Urban Migration in Fiji: Causes and Consequences.*

11 B. Bhaskara & Gyaneshwar Rao, *Further Evidence on Asymmetric US Gasoline Price Responses*

10 B. Bhaskara Rao & Rup Singh, *Demand for Money for Fiji with PC GETS*

9 B. Bhaskara Rao & Gyaneshwar Rao, *Crude Oil and Gasoline Prices in Fiji: Is the Relationship Asymmetric?*

8 Azmat Gani & Biman C. Prasad, *Fiji's Export and Comparative Advantage.*

7 Biman C. Prasad & Paresh K Narayan, *Contribution of the Rice Industry to Fiji's Economy: Implication of a Plan to Increase Rice Production*

6 Azmat Gani, *Foreign Direct Investment and Privatization.*

5 G. Rao, *Fuel Pricing In Fiji.*

4 K. Bunyaratavej & Tk Jayaraman, *A Common Currency For The Pacific Region: A Feasibility Study.*

3 Sukhdev Shah, *Kiribati's Development: Review And Outlook.*

2 T.K. Jayaraman, B.D. Ward, Z.L. Xu, *Are the Pacific Islands Ready for a Currency Union? An Empirical Study of Degree of Economic Convergence*

1 T.K. Jayaraman, *Dollarisation of The South Pacific Island Countries: Results Of A Preliminary Study*

2004/WP:

15 Vincent D. Nomae, Andrew Manepora'a, Sunil Kumar & Biman C. Prasad, *Poverty Amongst Minority Melanesians In Fiji: A Case Study Of Six Settlement*

14 Elena Tapuaiga & Umesh Chand, *Trade Liberalization: Prospects and Problems for Small Developing South Pacific Island Economies*

13   Paresh K. Narayan, Seema Narayan & Biman C. Prasad, *Forecasting Fiji's Exports and Imports, 2003-2020*

12   Paresh K. Narayan & Biman C. Prasad*, Economic Importance of the Sugar Industry in Fiji: Simulating the Impact of a 30 Percent Decline in Sugar Production.*

11   B. Bhaskara Rao & Rup Singh, *A Cointegration and Error Correction Approach to Demand for Money in Fiji: 1971-2002.*

10   Kanhaiya L. Sharma, *Growth, Inequality and Poverty in Fiji Islands: Institutional Constraints and Issues.*

9   B. Bhaskara Rao, *Testing Hall's Permanent Income Hypothesis for a Developing Country: The Case of Fiji.*

8   Azmat Gani, *Financial Factors and Investment: The Case of Emerging Market Economies.*

7   B. Bhaskara Rao, *The Relationship Between Growth and Investment.*

6   Wadan Narsey, PICTA, PACER and EPAs: *Where are we going? Tales of FAGS, BOOZE and RUGBY*

5   Paresh K. Narayan & Biman C. Prasad, *Forecasting Fiji's Gross Domestic Product, 2002-2010.*

4   Michael Luzius, *Fiji's Furniture and Joinery Industry: A Case Study.*

3   B. Bhaskara Rao & Rup Singh, *A Consumption Function for Fiji.*

2   Ashok Parikh & B. Bhaskara Rao, *Do Fiscal Deficits Influence Current Accounts? A Case Study of India.*

1   Paresh K. Narayan & Biman C. Prasad, *The Casual Nexus Between GDP, Democracy and Labour Force in Fiji: A Bootstrap Approach.*

2003/WP:

11   B. Bhaskara Rao & Rup Singh, *Demand For Money in India: 1953-2002.*

10   Biman C. Prasad & Paresh K. Narayan, *Fiji Sugar Corporation's Profitability and Sugar Cane Production: An Econometric Investigation, 1972-2000.*

9   B. Bhaskara Rao, *The Nature of The ADAS Model Based on the ISLM Model.*

8   Azmat Gani, *High Technology Exports and Growth – Evidence from Technological Leader and Potential Leader Category of Countries.*

7   TK Jayaraman & BD Ward, *Efficiency of Investment in Fiji: Results of an Empirical Study.*

6   Ravinder Batta*, Measuring Economic Impacts of Nature Tourism.*

5   Ravinder Batta, *Ecotourism and Sustainability.*

4   TK Jayaraman & Rajesh Sharma, *Determinants of Interest Rate Spread in the Pacific Island Countries: Some Evidence From Fiji.*

3   T.K. Jayaraman & B.D. Ward, *Is Money Multiplier Relevant in a Small, Open Economy? Empirical Evidence from Fiji.*

2   Jon Fraenkel, *The Coming Anarchy in Oceania? A Critique of the `Africanisation' of the South Pacific Thesis.*

1   T.K. Jayaraman, *A Single Currency for the South Pacific Island Islands: A Dream or A Distant Possibility?*