

The plan to increase Fiji's rice production—is it worthwhile?

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In a recent initiative, the Fiji government has established a revitalisation program for the rice industry, with assistance expected from the Republic of China, India and Indonesia. Using the computable general equilibrium model of the Fijian economy, the economy-wide impact of a 40 per cent increase in rice production is simulated. This analysis finds that even such a large increase in production would have an insignificant impact on Fiji's economic growth.

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The contribution of the agriculture sector to Fiji's gross domestic product (GDP) has declined over the past 15 years from 25 per cent to 16 per cent. The major agricultural activity has been the production of sugarcane. The export of sugar to the European Union under preferential arrangements had made the sugar industry a leading industry in terms of employment and its contribution to GDP. However, over the past ten years its contribution has declined to 7 per cent of GDP, although it still accounts for 22 per cent of merchandise exports and 8.5 per cent of foreign exchange earnings, as well as employing approx-

imately 51,000 persons. In its 2003–05 strategic development plan, the government emphasised rejuvenating the agricultural sector, especially the non-sugar crop and livestock sectors, in anticipation of the decline of the sugar industry. Besides sugar, the crop sector consists of traditional food crops (taro, cassava, ginger, *yaqona* and rice), tropical fruits (pineapple, pawpaw and mango), vegetables, spices, cocoa and coconut products. Beef, dairy, pork, poultry, sheep, goats and honey make up the livestock sub-sector.

Recently, the government announced a revitalisation program for the rice industry.



The main objective is to enhance domestic capacity for the production of rice for domestic consumption. The project involves capital improvement works for the Northern Division irrigation scheme, the Navua East irrigation scheme, and the rain-fed rice growing areas. To achieve its objective, the government is expecting assistance from the Republic of China, India and Indonesia.

With prospects for sugar production declining due to the expiry of the preferential price agreement with the European Union, revitalisation of other crop sectors has taken on particular importance. The government recognises that rice is important in the diet of all ethnic groups in Fiji: per capita consumption per annum currently stands at 64 kilograms. Fiji imported 29,176 tonnes of rice in 2003, valued at F\$18.8 million. The government plans to spend about F\$2.3 million and increase rice production by 7,500 tonnes over the period 2005–07. With this increase in production, it aims to increase farm employment, provide greater opportunities for rural people to participate in agro-business, and improve living standards, including health and education. It also anticipates that revitalising the non-sugar crop sectors will slow the movement of people from rural to urban areas.

This paper provides an economy-wide analysis of the contribution of the rice industry and poses the question: is it prudent for government to inject funds into the rice industry to increase production? A 40 per cent expansion in rice production is simulated to analyse the economic implications (as proposed by the government for the period 2005 to 2007).

Overview of the rice industry

Rice is a major staple food crop consumed by all communities in Fiji. It is an import-substitution industry, providing income to an estimated 1,500 households. There are

three rice-farming systems, determined by the availability of water resources and, to some extent, topography. The three systems are

- irrigation (four irrigation schemes exist— Lakena, Navua, Dreketi and Bua— but only the latter three are operational). This system accounts for 20 per cent of total local supply
- rain-fed wetland, the dominant system of rice farming (accounting for 54 per cent of production), and
- rain-fed dryland, where rice is grown only in the rainy season in association with other dryland crops such as sugar cane. This system accounts for 36 per cent of production.

Rice was assigned a high priority by government in the period between 1970 and 1985 in an attempt to attain self-sufficiency in this commodity. Import substitution was a policy of government during this period, as can be seen in Development Plan 6 (1970–75) and Development Plan 7 (1976–80). To achieve self-sufficiency, farmers were provided assistance in the form of subsidies as well as restrictions on imports through high duties, ensuring price support for farmers. Other incentives were provided in the form of fertiliser, credit facilities, extension services and irrigated water. The government also promoted ‘rice week’ celebrations to raise awareness of the value of a rice diet.

During the 1970s, an estimated F\$30 million was invested by government to increase rice production (Prasad 1997). Development Plan 8 (1981–85) emphasised the maintenance and consolidation of irrigated systems to utilise the capacity of the capital investment made during the 1970s. The government undertook rationalisation of the capital-intensive, irrigated rice schemes with a view to employing more appropriate technology.

**Table 1 Rice industry targets during Fiji's Ninth Development Plan, 1986–90**

	1986	1987	1988	1989	1990
Production (tonnes)	33,552	36,193	38,396	42,530	5,162
Imports (tonnes)	13,169	11,500	10,269	7,172	5,162
Consumption (tonnes)	46,721	47,693	48,665	49,702	50,738
Self-sufficient (percentage)	72	76	79	86	90
Employment	25,550	25,950	26,150	27,500	27,700

Source: Fiji, 2003. *Rebuilding Confidence for Stability and Growth for a Peaceful, Prosperous Fiji: strategic development plan 2003–2005*, National Planning Office, Government of Fiji, Suva.

Efforts were made to introduce gravity-fed irrigation systems in place of the more expensive pump systems. Despite these efforts, Development Plan 9 (1986–90) drew the following conclusions

- a low number of extension/research linkages existed in delivering research results to farmers
- emphasis was on increasing production rather than optimising farm returns
- insufficient harvesting and threshing equipment was available
- insufficient collection services were available to cater for present and projected production
- there was a need to extend appropriate cultural practices for high-yield varieties (Fiji 1980:62).

During the implementation of Development Plan 9, the government continued to pursue the objective of self-sufficiency and attempted to overcome the constraints identified. The government's target was 90 per cent rice self-sufficiency by 1990 (Table 1).

However, these plans were disrupted in 1987 by two military coups. Furthermore, the economic policy agenda changed significantly, with a shift from the import-substitution based growth strategy to an export-oriented strategy. The policies

relating to the rice industry also changed, with government withdrawing support and deregulating the industry by lowering import tariffs. The production level declined in 1987 but increased in 1988 and 1989, achieving 66 per cent self-sufficiency. However, since 1989 production has continued to decline and self-sufficiency over the past five years has averaged only 33 per cent (Table 2).

Fiji CGE model specification

The computable general equilibrium (CGE) model of the Fiji economy, developed by Levantis (1999) and extended by Narayan (2004), consists of 35 industries (13 agricultural industries, 10 manufacturing industries and 12 services industries), 34 commodities and 2 occupational types. Gold production is separated into two industries given their different cost structures. A list of the 35 industries and 34 commodities is given in Appendix 1. The Fiji model is a 'comparative static' model, meaning that a simulation provides projections for a future point in time, after the economy adjusts to the imposed shock(s). Schematically, the model takes the following form

$$F[Z_1(t), Z_2(t), Z(0)] = 0$$

Here, $Z_1(t)$ and $Z_2(t)$ are vectors of values of



Table 2 Rice production and self-sufficiency between 1971 and 2003

	Production	Self-sufficiency ^a (per cent)
1971	17,272	54
1972	17,272	52
1973	15,697	43
1974	17,272	48
1975	22,948	56
1976	20,586	52
1977	17,966	43
1978	16,105	41
1979	18,717	43
1980	17,846	46
1981	16,972	44
1982	20,302	47
1983	16,160	37
1984	22,246	52
1985	27,574	57
1986	24,219	52
1987	23,477	51
1988	32,147	59
1989	31,827	66
1990	26,477	58
1991	29,038	55
1992	22,479	48
1993	22,284	42
1994	18,019	22
1995	19,906	45
1996	18,850	42
1997	17,385	38
1998	5,092	11
1999	17,301	37
2000	13,170	28
2001	14,612	31
2002	12,852	27
2003	15,396	25

Note: ^a Production as a percentage of total consumption.

Source: Fiji, 2003. *Rebuilding Confidence for Stability and Growth for a Peaceful, Prosperous Fiji: strategic development plan 2003–2005*, National Planning Office, Government of Fiji, Suva.



endogenous and exogenous variables at time t , and $Z(0)$ is a vector of initial conditions. The equations of a typical Johansen model such as the Fiji CGE model can be classified into five groups

- equations explaining household and other final demand for commodities
- equations explaining industry demand for primary factors and intermediate inputs
- equations explaining prices
- market-clearing equations for primary factors and commodities
- other equations, for example, those defining GDP, aggregate employment, the consumer price index and the investment price index.

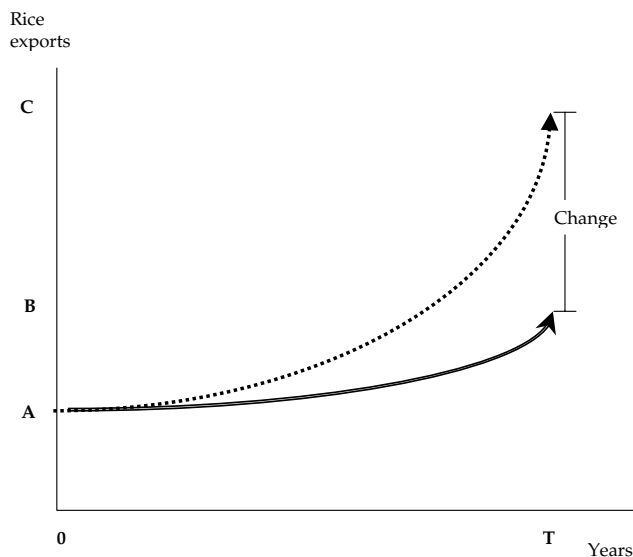
The equations are derived from neoclassical microeconomic assumptions about the behaviour of price-taking economic agents.

Put differently, consumers maximise utility subject to their budget constraints and producers choose their inputs so as to minimise costs of production. The model is solved using the GEMPACK software package, developed by the Centre for Policy Studies and the Impact Project, Monash University.¹

Model closure and solution

To simulate the long-run impact, capital is allowed to move between industries in response to changes in rates of return. This assumption is consistent with the fact that Fiji is a 'small' country in economic terms and therefore faces a perfectly elastic supply of capital from the world market, that is, the domestic rate of return is determined by the world market rate. The exogeneity of the rate of return on capital implies two things: a rise in investment levels is needed to build and maintain industry capital; and

Figure 1 Comparative static interpretation of results



Source: Authors' calculations.



if changes in economic conditions lead to growth in some industries, they will attract investment and, *de facto*, attract capital from other industries. This behaviour ensures that when all inter-industry adjustments have taken their course, capital in all industries earns a uniform rate of return.

In the labour market, real wages are endogenous, so employment or unemployment must be fixed. For the purposes of this analysis, we hold employment fixed, implying that shifts in the demand for labour will be equilibrated with appropriate adjustments in the wage rate.

This comparative static model is illustrated at Figure 1, which plots the values of some variable, say exports of rice, against time. In this setting, A is the level of rice exports in the base period (period 0). Suppose that in period 0 a shock is applied, for example, a 10 per cent fall in costs of rice production. As a result of this shock, C is the level of exports that will be attained in T years' time, all other things being equal. In the event of no shock, B will be the level of rice exports.

The movement from A to B is the underlying growth path of rice exports. In essence, comparative static analysis is only concerned about the size of the gap between B and C, and not the economic path taken to reach either B or C. In a comparative static simulation, the model might generate the change in rice exports (C–B), the percentage change $(100(C-B)/B)$ or both, showing how rice exports in period T would be affected by a reduction in costs. It is important to note that comparative static models are not dynamic in that they do not describe the adjustment paths, shown as dotted and bold lines in Figure 1.

Results

This section reports on the results of simulating a 40 per cent expansion in rice production, the target set by the government for the period 2005 to 2007, to analyse its macroeconomic impact. Only selected macroeconomic indicators are discussed, as the impact on all other sectors is insignificant. To this end, it should be noted that rice

Table 3 Macroeconomic effects of a 40 per cent increase in rice production

Variables	Percentage change
Government savings	0.240
Imports	0.009
Exports	0.070
Consumer price index	-0.037
Investment price index	-0.010
Private disposable income	-0.028
Income tax revenue	0.019
Real GDP	0.030
GDP deflator	-0.001
Real private consumption	-
Real investment	0.380
Real national welfare	0.0002

Source: Authors' calculations.



is a small, rural-based industry and its contributions to GDP and national welfare are minimal. The impacts of changes in this industry on other aggregate variables are also small (Table 3). For example, the impact of a 40 per cent increase in rice production on the level of imports is insignificant. In the 1980s, when the rice industry was being promoted heavily, it was perceived as an important industry because of the impact of increased production on the import bill. This was in line with the import substitution policies being pursued by the government at that time.

The impact on real investment is 0.38 per cent. Over the past 15 years the government has received assistance from foreign donors with about F\$30 million invested in infrastructure. The results indicate that if the government were to achieve a 40 per cent increase in rice production, it would have to raise the level of investment in the industry. Since 1989 the government has withdrawn support from the industry in line with its policy of deregulation, and two major irrigation schemes in Nausori and Navua on the island of Viti Levu have ceased operations. Recently, government has concentrated its efforts on boosting rice production in the northern division of the country but, as the results indicate, this would require an increase in the level of investment, especially in irrigation infrastructure.

Another result of note is the impact of the expansion in rice production on government savings. Expansion of rice production would boost government's revenue from VAT collections and income taxes. However, its overall impact on GDP, while positive, is still negligible. It is appropriate, therefore, to conclude that government savings may be better invested in the overall development of rural infrastructure so that it helps the agricultural sector as a whole. It may also help farmers move away from the current

inefficient production of rice and exploit other crops for export.

Conclusions and policy implications

The results presented here show that even if rice production is restored to levels of the late 1980s, the impact on national welfare and GDP would be insignificant. The rice industry received government support in the form of tariff protection and subsidies in the 1970s and 1980s when government's major economic policy was an import-substitution strategy for growth. Despite significant capital investment in the industry to increase production and improve the welfare of rice farmers, all rice projects failed and irrigation schemes in the main rice production towns, such as Navua and Nausori located in the central division, have been abandoned.

The withdrawal of support became significant in the late 1980s when government decisively moved towards an export-oriented strategy for development. It did so, however, in a radical manner and withdrew support to the agricultural sector as a whole. This withdrawal anticipated significant growth in the urban manufacturing sector to compensate for the loss of production in the rural sector. The investment in the garment sector was seen as a major boost to the manufacturing sector and it was expected that those released from the rural agricultural sector would be absorbed by the growing manufacturing sector. While the manufacturing sector did expand, led by garment manufacturing, it did not grow sufficiently to absorb the labour and other resources released from the rural sector.

By 2000, there was an increasing realisation that the agricultural sector needed attention from government. Between 1991 and 2001, the urban population had



increased by about 10 per cent, and the contribution of agriculture to GDP had declined from 22 per cent to 16 per cent. The government's response has been to inject more funding into the agricultural sector and the rice industry was chosen as one of the key non-sugar crop sectors.

However, our results indicate that it is not economical for government to invest in infrastructure for the rice industry. Support for the rice industry goes against the thrust of government policy to move towards trade liberalisation and to promote crop sectors that will contribute to export earnings. Support for the rice industry is not consistent with the export-oriented strategy to promote growth; it is a return to the import substitution policies pursued in the 1970s and 1980s. Government should invest in rural infrastructure generally and provide extension support to crop sectors that can contribute to exports and those that can complement the tourism industry.

To support the rice industry and other agricultural industries in rural areas, the government should consider investing in rural infrastructure such as roads, water supply, electricity, marketing institutions and extension services, that is, infrastructure and services that will generally assist agricultural and other rural production. Such facilities reduce the cost of production and give producers an opportunity to tap into the export market. This would be a more effective approach to rejuvenating the agricultural sector in Fiji. To the extent that it is possible to do so, rice farmers, like other farmers, could use the opportunities provided by improved rural infrastructure to increase efficiency and production and be better able to compete with imports. Efficient local production of rice can add to Fiji's food security and, combined with other economic activities, rice farmers' income levels would rise and their livelihood could be expected to improve on present standards.

Notes

- ¹ For applications of the Fiji CGE model see Narayan (2003a, 2003b), Narayan (2004), and Narayan and Prasad (2005a, forthcoming).

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Appendix 1 List of industries and commodities in the Fiji model

Industry	Commodity
Sugarcane	Raw sugar
Coconuts	Coconuts
Rice	Rice
Ginger	Ginger
Taro (dalo)	Taro (dalo)
Root crops	Root crops
Kava	Kava
Fruit and vegetables	Fruit and vegetables
Other crops	Other crops
Dairy	Dairy
Livestock	Livestock products
Forestry	Forest products
Fishing	Marine products
Emperor gold mine	Gold
Mt Kasi gold mine	Gold
Quarrying	Quarrying
Sugar manufacturing	Sugar products
Beverages and tobacco	Beverage and tobacco
Food processing	Processed foods
Clothing, footwear and textiles	Clothing, footwear and textiles
Other manufactures	Other manufactures
Electricity and water	Electricity and water
Construction	Construction services
Commerce	Retail/wholesale services
Hotels, cafes, restaurants	Hotels, cafes, restaurants
Transport and communication services	Transport and communication services
Finance	Financial services
Insurance	Insurance services
Property services	Property services
Business services	Business services
Other private services	Other private services
Health	Health services
Education	Education services
Other government services	Other government services
Non-farm informal sector	Informal services

Source: Levantis, T., 1999. *The CGE Model of the Fiji Economy: a working manual*, National Centre for Development Studies, The Australian National University, Canberra.
