Land, Lomé and the Fiji sugar industry

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The Fiji Sugar industry faces an uncertain future. With the ongoing negotiation over the renewal of the preferential access under the Sugar Protocol of the Lomé Convention, the renewal of native land leases, declining productivity and high costs, the industry is facing major challenges. The viability of the industry will depend on the reforms the industry and government make in the short to medium term. These reforms would need to be underpinned by significant research on crucial aspects of the industry.

The Sugar Commission of Fiji (SCOF) has identified in its Sugar Industry Strategic Plan a number of reforms needed to increase efficiency in the transportation and milling subsectors. Reforms to the cane payment system to increase farmer incentives to produce sugar cane with high sugar content and the establishment of an independent Sugar Cane Research and Extension Centre are also planned. While these strategies will help increase crop and sugar yield, they are not likely to be sufficient to encourage improvements in farm efficiency.

This chapter discusses the types of policy issues the Sugar Commission of Fiji is likely to face in the light of expected changes in land tenure, the international sugar trade reforms, declining farm productivity and high production costs. It outlines gaps in the industry's proposed reforms. More specifically, the chapter outlines the reforms needed in the Sugar Cane Research Centre and its research portfolio to cope with medium term challenges.

The Fiji Sugar Corporation (FSC) must move beyond concentrating on just increasing yield through farm husbandary, breeding, crop agronomy and pest control. The proposed Sugar Cane Research Institute must adopt a systems approach to research and development to include in its portfolio economic and other social science research. Moreover, the Institute should also embrace a more participatory approach to research and involve all

relevant stakeholders, including growers and policymakers, in the identification of research needs, prioritisation of research and design and implementation of research. Such an approach will help the Commission develop appropriate economic policies and farm level strategies aimed at increasing farm productivity and economic profitability and efficiency. It will encourage farmers to consider the technical and economic feasibility of sustainable farming systems, including crop diversification.

The Fiji sugar industry

The value of the sugar industry's production is about F\$230 million, equivalent to about 43 per cent of the value of Fiji's agricultural production. Although its contribution to the nation's GDP has fallen slightly in recent years, sugar remains the single most significant source of primary production, contributing about 23 per cent of GDP. Other major contributors are the 'service' sectors, such as transport and communication (12.6 per cent), finance, insurance, real estate and business services (14.1 per cent), hotels and restaurants, wholesale and retail sectors (16.5 per cent), and community, social and personal services (17.5 per cent).

Sugar is Fiji's largest export earner, accounting for around 40 per cent of the country's total export earnings. Much of this depends on two sets of preferential arrangements that Fiji has enjoyed since 1975. Under the Sugar Protocol of the Lomé Convention and the Special Preferential Sugar (SPS) Agreement, exports to the European Union (EU) have accounted for some 59 per cent of Fiji's total sugar exports and Fiji has enjoyed prices well above free world sugar prices and a guaranteed quota of about 197,000 tonnes of sugar. In 1997 this was equivalent to 56 per cent of Fiji's total sugar production. Apart from relying on the EU markets, Fiji also has preferential arrangements for sugar exports to the United States, supplying an annual quota of about 18,900 tonnes in 1997, equivalent to a little less than 1 per cent of US total sugar imports. Fiji has in the past also supplied sugar to Malaysia, China, Korea, Canada, New Zealand and Japan. In 1997, only Malaysia and Japan took Fiji's sugar under bilateral agreements. Domestic consumption of sugar is about 1 per cent of total production.

In 1998, there were 22,130 sugar cane farmers with the average farm holding of about 4.6 hectares. Farm numbers have risen by about 30 per cent from a low of about 17,000 in 1975. The area under sugar cane has also increased since the implementation of the preferential access agreement in 1975, from about 45,000 ha to about 74,000 ha of sugar cane in 1997 (see Table 7.1). The average area harvested has increased from about 2.5 ha to 3.4 ha per grower. The status of farmers—whether they are full-time or part-time, relying on other sources of income—is unknown. Average sugar cane production is about 52 tonnes/ha, with farmers receiving on average about F\$50/tonne.

Table 7.1 Sugar cane production and payments received by growers and millers, 1995–97

	1997	1996	1995
Number of growers	22,100	22,304	22,449
Area under sugar cane (ha)	73,378	73,981	73,977
Tonnage per grower	148	196	183
Yield per ha	44.7	59.2	55.6
Cane crushed ('000 t)	3,280	4,380	4,110
Sugar output ('000 t)	347	545	454
Price per tonne cane F(\$)	50	45	54
Income to growers (F\$million)	164.2	196.3	221.0
Income to millers (F\$million)	69.3	79.1	89
Employment direct (no.)	36,991	37,422	36,754
Cane cutters (no.)	14,891	15,118	14,305

Source: FSC Annual Report 1998 and Current Economic Statistics (Jan–Oct 1997).

Cane is transported by rail or truck to the four Fiji Sugar Corporation-operated mills at Lautoka, Rarawai and Penang in VitiLevu and Labasa on Vanua Levu. Altogether these mills employ about 4,500 workers. In addition, there are about 14,300–15,000 cane cutters and about 2,000 lorry operators whose livelihood depends on a viable sugar cane production sector. Thus the sugar sector is a major employer in the rural areas, employing about 25 per cent of the country's active workforce.

Challenges facing the industry and research needs

The sugar industry faces many challenges. The renewal of native land leases and the renewal of the Lomé Convention are two urgent problems that need immediate action. In the short to medium term, the industry will also need to address the problem of low and declining farm productivity and inefficient transport and milling sectors. These challenges will have to be met through reforms underpinned by rigorous research, and some hard decisions.

Agricultural land lease renewal

The most pressing challenge facing the industry is the renewal of expiring native leases. Seventy three per cent of farmers in Fiji are cultivating land under native leases from indigenous Fijian landowners. These leases were offered for a period of 30 years, under the 1969 Agricultural Landlord and Tenant Act (ALTA). Native leases began expiring in 1997 and over 70 per cent of leases will expire by 2001 (see Table 7.2).

Renewal of ALTA leases is currently being negotiated between the growers, landowners and the government. Before the May 1999 elections, of the 134 expiring leases, 90 per cent had been renewed. The challenge

Table 7.2 Expiry of agricultural farm and cane leases in Fiji, 1997–2005

Year	Agricultural leases	Sugar cane leases
1997	45	26
1998	189	129
1999	231	168
2000	1,828	1,215
2001	1,808	2,536
2002	479	325
2003	645	466
2004	332	231
2005	288	244
Total	5,845	5,340

Source: World Bank, 1995. *Fiji: restoring growth in a changing global environment*, The World Bank, Washington, DC.

facing the new government is to negotiate renewal at a time when many landowners, upset about the defeat of the SVT party in the election, are threatening to withhold renewals.

Because of the importance of security of land tenure to investment and to productivity, the outcome of the land negotiation will have a far reaching effect on the industry as well as on the efficiency and sustainability of sugar cane farming in Fiji. Moreover, depending on the outcome of the lease negotiations, the industry will need to develop different types of practical strategies.

At the industry level, if a large proportion of leases are not renewed, the total sugar production will doubtless decrease. Depending on the category of land for which the agricultural lease is not renewed, the impact could be greater than the proportion of land taken out of sugar cane. The impact on displaced rural households could also be significant. However, the extent of any impact is difficult to predict, particularly as the options being considered include separation of the agricultural lease from the area used for housing purposes. In some cases, farmers have other sources of income. Moreover the government has recently decided to offer F\$28,000 as an incentive for farmers to leave the industry if they desire. While a few farmers have decided to take up this offer, a large proportion still await the outcome of the ongoing negotiations.

If land leases are not renewed and the indigenous landowners continue to grow sugar cane, cane production will very likely still decline. Currently, 25 per cent of farmers are indigenous Fijians. In the past indigenous Fijian farmers had generally lower sugar cane yields than their Indo-Fijian counterparts (Reddy 1998). According to Reddy, the cane yield from Fijian farms is about 46 tonnes/ha as compared with 64 tonne/ha for Indo-Fijian farmers. Fijian farmers are also believed to be economically less efficient,

although in global terms both Fijian and Indo-Fijian farmers are highly inefficient. From a study of 397 farm households, Indo-Fijian farmers are estimated to achieve efficiency of about 50 per cent of their potential (at the production frontier) as compared with the 35 per cent of Fijian farmers. It appears that Fijian farmers make less use of inputs such as chemicals, fertiliser and labour, and more use of financial capital. Lack of farming experience and sociocultural differences could also explain the difference in productivity. Ethnic Fijian farmers have only recently become involved with sugar cane farming in large numbers, and the level of expertise is low compared to that of the Indo-Fijians who have been farming cane for over 100 years. However, this conclusion needs to be treated with caution because the analysis is based on only 0.2 per cent of the farm population.

The productivity of farms also depends on the timing of input applications which, to some extent, depends on experience as well as the sociocultural characteristics of a community and their value system. In Fiji, it is widely acknowledged that for indigenous Fijians, maximising income is not the only goal. Maintaining social harmony is equally important, and this has often meant the use of human resources in other competing social activities, at the expense of cane yield. This situation should be adequately considered when developing and designing government policies and industry strategies.

If the land leases are renewed but the tenure is short and insecure, the industry will suffer. It is generally accepted that secure land leases encourage long term investment in productivity-enhancing technology (Feder 1987), and promote socially optimal use of resources, including capital and labour. Long and secure leases also encourage soil conservation practices, and pesticide and fertiliser use aimed at minimising environmental costs by adopting strategies such as integrated pest management, as well as encouraging farmers to produce other more valuable, but perennial crops. Whatever the duration of tenure, detailed bioeconomic research will be required to develop appropriate government policies and farm-level management strategies. Such issues have either been totally ignored or have only been marginally addressed in the past. Given the expected volatility of world sugar prices, farmers would also need to adopt strategies that would help minimise risks. For this, sugar cane-based farmers could consider diversifying into crops other than sugar cane, particularly fresh fruits and other horticultural commodities, for which demand has been growing at a rapid pace. The European Union market alone for tropical fruits, such as papaya, pineapple and mango—crops for which Fiji has shown it has comparative advantage—has more than doubled since the early 1980s. As discussed below, diversification of agricultural activities on sugar cane land could be one of the important options available to farmers to cope with expected changes in the sugar markets resulting from obligations under the World Trade Organization (WTO).

The Sugar Cane Research and Extension Centre of FSC has in the past carried out many field trials to identify, for example, agronomically suitable other crop species and farm management practices for different categories of sugar cane land. On the basis of these experiments they then promoted, through extension services, adoption of particular crops and farm management practices. Such an approach reflects traditional scientists' general concerns with production yields only and ignores any associated demands on farm labour or input costs. Farmers, however, concerned with both costs and returns as important determinants of their farming practices, have thus often ignored extension advice. Future research must include considerations of crop diversification on sugar cane-based farm-level profitability.

Whatever the nature of the final outcome of the lease renewal negotiations, the impact on the industry will be significant. To improve production efficiency on sugar cane farms, the industry will need to adopt very different types of policy decisions and strategies to help Indo-Fijian farmers and Fijian farmers. To design appropriate farm-level strategies, it is important not only to consider the land classes involved but also the underlying causes of inefficiency in different categories of farms: small farms, large farms, Indo-Fijian-managed farms, Fijian-managed farms, freehold farms or leased land. Given the underlying institutional constraints, it will also be important to identify optimal resource reallocation options available to improve farm-level efficiency. Such issues cannot be addressed unless major reforms are undertaken in the Sugar Cane Research Centre.

The Lomé Convention and the WTO

Fiji is a small producer of sugar cane in global terms, contributing only about 0.5 per cent (350,000 tonnes) of annual world sugar production. It relies heavily on preferential access to European Union markets under two sugar arrangements: the Sugar Protocol of the Lomé Convention which was first signed in 1975 and the Special Preferential Sugar Agreement (SPS) signed in 1995, and to a lesser extent a United States import quota. The prices paid under these preferential access arrangements have been up to three times world free market prices.

As a result, Fiji has enjoyed a price subsidy from the EU equivalent to about 3.72 per cent of Fiji's GDP. In 1992 the subsidy was estimated to be worth US\$41 million or about F\$90 million (MacDonald 1994 cited in Prasad and Ackram-Lodhi 1997). Although the Sugar Protocol, as explicitly noted in Article 1, is of indefinite duration, and the Protocol sugar tonnage is contained in the EU schedule of Market Access Offers under the Uruguay Round, its status is unclear under the WTO.

Until recently, the Lomé Convention was recognised by WTO under a waiver arrangement. However, any renewal of the waiver to cover any

successor agreement to the Lomé Convention runs the risk of failing if WTO Contracting Parties, not parties to the Lomé Convention, vote against such a renewal—as is likely judging from recent performance. However, it is unclear what the outcome of the next round of negotiations will be, and what changes may be required for these to be compatible with the WTO's requirements. Under the WTO, the European Union (and Fiji) is bound by three guiding principles: prohibition of import restrictions of all types other than tariffs which are subject to negotiation; encouragement of countries to adopt equal treatment or non-discriminatory strategies when importing products from all foreign sources and internally; and undistorted competition limiting use of domestic and export subsidies (Roberts 1997).

While these arrangements have been in place for some time, they have come under pressure since the GATT Uruguay Round negotiations and the establishment of the WTO. The industry is facing a potential threat of losing its preferential access to the EU market as a result of the European Commission's proposed review of the Sugar Protocol of the Lomé Convention in response to the criticism of the Common Agricultural Policy (CAP) from the WTO. The Fiji sugar industry, like those of the other African, Caribbean and Pacific (ACP) countries, is therefore facing serious threats to its guaranteed quotas from the EU and USA at preferential margins. If the preferences are lost, Fiji and other ACP countries will face the vagaries of free world sugar markets, which have been highly volatile. The world sugar price has fluctuated in the order of 41 per cent, whereas the EU price has changed by about 9 per cent (Hermann and Weiss 1995). Any loss in preferential access if Fiji were forced to sell its sugar at world prices would affect everyone directly or indirectly associated with the cane industry: growers, harvesters, those involved in transporting, and mill workers who have benefited from the welfare transfer. In the long term, Fiji may be forced to become more efficient and better utilise its limited resources. In the short term, however, the adjustment costs could be quite significant.

Currently, Fiji is negotiating the continuation of the Protocol and a longer transition period during which the Protocol will continue to operate as it does presently. The ACP countries want a 10-year transition period instead of the five years being offered by the EU (Dakar (Senegal) Meetings of the ACP Council of Ministers and the ACP-EU Ministerial Negotiations 6–10 February 1999). But this arrangement will only be an interim measure. Ultimately, the preferential arrangement will cease and the severity of the impacts will depend on how rapidly the preferential margin is reduced.

National level impacts

It is speculated that a fall in sugar prices of 15 per cent by the year 2000 could result in a F\$7 million decline in household wages and salaries (Chand and Abello 1997). This could exacerbate rural poverty. Prasad and Akram-

Lodhi (1997), using secondary data, note that farmers who produce less than 200 tonnes of cane could be classed as living below the relative poverty line. They suggest that over 65 per cent of growers are likely to be seriously exposed to poverty. However, this study does not take into account other sources of income that cane farmers may have. Partly because of the insecurity over land tenure and the government's various economic policies, most of the Indo-Fijian families have encouraged at least one member to seek off-farm employment. Many households—the exact number is unknown—in semi-urban areas in western VitiLevu and Vanua Levu have non-farm sources of income; in many cases sugar cane farming has become a part-time activity. Such aggregate-level analyses are useful in raising overall awareness of the social impacts. However, they do not provide a detailed understanding of which category of farmers, where, or on what soil types, are likely to be most affected. This raises the question of appropriate responses to expected trade reforms.

The national impacts of alternative trade reform scenarios are difficult to estimate in the absence of robust base-line data as well as key analytical tools, including an operational economy-wide analytical computable general equilibrium (CGE) or macroeconometric model for Fiji. In Fiji, many economy-wide models have been constructed, usually by expatriate consultants with minimum involvement of Fiji nationals. Mark Sturton and Chris Murphy constructed macroeconometric models in the late 1980s and early 90s (Sturton 1989; Murphy 1992). However, their models have had minimal use in Fiji since their departure because of poor modelling skills within the key ministries. Although training was provided in the use of the models, sustainability of such models is always an issue when the limited core of trained staff have moved on. An adequate core of staff trained in model use and maintenance of their underlying database needs to be maintained to insure against the loss of users through the normal processes of job movement. These measures were not in place in Fiji to ensure the sustainability of the models constructed previously.

Many of these models, moreover, relied on the 1981 input-output database that was constructed using a 1979 survey of various sectors and industries in Fiji. Since then much has changed in Fiji not only because of the impact of the 1987 coups but also because the underlying economic structure has changed. Researchers in the past updated some of the parameters in the input-output table based on their assessment of the industry structure. However, this is less than satisfactory, particularly since the Bureau of Statistics no longer updates the input-output tables although they continue to collect industry specific data.

A new input-output table has recently been developed under an Australian Centre for International Agricultural Research (ACIAR)-funded project, in addition to a new CGE model. Such a model could be used to

carry out simulations of policies that could help to minimise economy-wide impacts of changes in sugar export arrangements. Such analysis should also become part of the Sugar Commission of Fiji's (SCOF) research agenda, as should farm-level bioeconomic analysis to identify potential farm-level impacts.

Farm-level impact

Any changes in the prices paid for Fiji sugar will have significant impacts on the production sector as well. Reddy (1998) predicts the gross return per hectare could drop from about F\$3,050/ha to about F\$2,200/ha for small farms. For large farms, the gross returns could fall from F\$2,800/ha to F\$1,500/ha under world free prices. In terms of financial viability, there is not much difference between the two categories of farms, each having a net return of about F\$500/ha. However, as noted above, these estimates are based on the assumption that farmers maintain their current farming practices and there are no shifts in the input mix. Moreover, the results are based on a very small sample size. Before firm conclusions are drawn and policies formulated to tackle the impacts, a more in-depth economic research using a larger and better stratified sample should be undertaken.

It is believed that long-term viability of farms is uncertain because of declining farm productivity. Average farm level productivity is said to have decreased by 0.6 per cent per annum over the last ten years (SCOF 1997a). However, it is not clear whether this decline in average productivity is due to declining yields or because of more cane being planted on marginal land. Since 1989, sugar cane area has increased by about 15 per cent, mainly in hilly areas. To assess the apparent cause in productivity decline, spatially disaggregated analysis of production by soil type would be relevant. Even in terms of total factor productivity measures, which is a ratio of an index of output to an index of all inputs, Fiji has experienced a slight decrease in total factor productivity over the last 25 years (Reddy 1998). This is despite the introduction of new fertilisers and varieties. Many farmers continue to plant the traditional crop varieties, the reasons for which need to be examined before continuing to breed new varieties and promoting the use of new fertilisers.

If Fiji is to compete on the world market, it must reduce its costs of production. Fiji's average farm level cost (including transportation costs) as a proportion of the total costs of sugar production is amongst the highest in the ACP region (Landell Mills Commodity (LMC) International 1998). About 70 per cent of the cost of producing sugar in Fiji is attributed to on-farm and transportation costs, as compared with 40 per cent in Barbados, 60 per cent in Swaziland, and 50 per cent in Guyana. At the same time the cane yield is amongst the lowest. There is a considerable scope for reducing costs at the farm level as well as in the transportation sector. Farmers rely

on rail and trucks to transport cane to the mills. The rail system of sugar transportation in Fiji has, however, steadily and significantly deteriorated over the years because of under-investment in rail maintenance, inefficient harvesting and loading systems, poor labour practices and incentive systems, lost and inadequate skills, and the institutionalised disempowerment of management (Davies 1997). Other contributing factors to the declining efficiency are the age of locomotives, high repair bills and frequent breakdowns. It is also believed that there is unfair competition from road transport. The industry has already identified the need to increase the efficiency of its transportation sector and is seriously considering reforms, including the introduction of a user-pays system for the rail service. Currently, farmers using rail do not pay for transportation of their cane to the mills.

Industry leaders agree that farm-level costs have to fall by 15–20 per cent, at the same time as efficiencies in the transportation and milling sectors are achieved. However, farm costs cannot be reduced in isolation from the whole household production system and without taking biophysical and socioeconomic factors into account. Cost per unit of output is determined by economic, social and environmental factors as well as agronomic practices, crop management, pest and pathogens control. The Sugar Cane Research Centre's 1995 annual report shows that with good farm management practices present average yield of 55 tonnes/ha can be increased to 70 tonnes/ha. However, such an increase in yield cannot be achieved without a shift in input mix with increased costs.

The FSC has concentrated on providing advice to farmers to increase sugar cane/sugar yield. Currently, the Sugar Cane Research Centre's mission statement commits it to 'advancing industry by excellence in research to improve productivity' and 'to increase[ing] productivity, profitability and sustainability of the industry by producing high yielding disease resistant varieties and by facilitating an efficient extension services.' Consistent with this, research and extension activities carried out by the Fiji Sugar Cane Research Centre (FSRC) have largely been concerned with screening and testing new varieties, detecting pests and diseases and improving crop protection, and agronomic trials to determine optimal fertiliser and agrochemical applications. Fiji Sugar Commission annual reports (for example, 1995, 1996) summarise the results of various agronomic trials. In 1996, FSC conducted research on the effects of nutrition and chemical ripeners on cane yield and sugar content. This research, although limited, highlights the large gap between attainable yield and potential yield on farmers' fields—a phenomenon not restricted to Fiji. Past results suggest that with better farming practices farmers could increase their yields to between 80 and 120 tonnes/ha from an average yield of 55 tonnes (FSC Sugar Cane Research Centre Annual Reports 1996). In Australia too, such

differences can be found between yields in farmers' fields and potential yields identified through experimental trials (Muchow et al. 1997). However, such increases are only possible if agronomically optimal levels of inputs such as fertilisers, herbicides and pesticides are applied at the appropriate times and if these recommended practices are economical. The recommended rates often do not reflect the cost of the inputs and the expected benefits in terms of increases in yields. The implicit assumption has been that productivity and profitability can be increased primarily by increasing cane output.

The opportunity costs of farm household labour are also important determinants of the input mix that farmers utilise. The challenge is therefore to look beyond the potential increases that can be achieved just through improvements in agronomic practices, disease controls and high yielding disease resistant varieties, as has been the practice so far. For Fiji to compete on the world market, the industry should also aim to encourage the use of input and output mix that reduces the variance of net revenue, in addition to providing appropriate incentives to produce sugar cane with higher sugar content.

Without such an approach, industry reforms and adjustments advocated in the strategic plan may not be able to increase industry-level efficiency, farm-level productivity and profitability to the point required to compete without preferences on world markets. Moreover, without such an approach, the sustainability of sugar cane-based farming systems and the environment cannot be addressed. To identify management strategies that reflect the simultaneous consideration of biophysical (natural resource), social and economic factors, integrated bioeconomic research is necessary. Such strategies would need to consider the suitability (in bioeconomic terms) of current sugar cane lands for sugar cane and farm-level resource reallocation options under alternative world market conditions. Much of the information needed for designing such strategies is currently not available.

Integrated biophysical and socioeconomic assessment can help identify appropriate (efficient and profitable) farm-level resource reallocation options under alternative world market conditions. To identify resource use options and design farmer strategies, nested analysis using crop-level biophysical models, farm bioeconomic and household bioeconomic models will be helpful. For this to be possible, the mandate of the Sugar Cane Research Centre needs to be changed to include economic and social science research, adopting a systems approach to its research.

Currently, extension services are aimed at promoting better farm management practices without explicitly taking into account financial costs and benefits. Extension programs encourage farmers to adopt cane varieties suitable for different soil types and environments, the correct timing of

planting and improved planting methods, weed control, appropriate fertiliser use and trash management (FSC Sugar Cane Research Centre Annual Reports 1996). But extension services should also aim to improve farm profitability and resource use efficiency. The recommended strategies are not likely to be adopted without directly linking research and extension services to the needs of the users of the outputs.

The Industry Strategic Plan and proposed restructuring of research and extension

In 1997 SCOF, the peak industry level policymaking body, noted that the industry must embrace the concept of efficiency increases in all sectors and at all levels. SCOF, with representatives from key stakeholder groups (including the government, the FSC, the sole miller, and the Fiji Sugar Cane Growers Council), developed the Industry Strategic Plan (SCOF 1997a, 1997b). The Sugar Commission of Fiji notes that the purpose of the Plan is 'to underpin an industry reform process to improve efficiency in milling, and infrastructure development and sugar cane production' (SCOF 1997b). Its reform agenda primarily deals with increasing efficiency in the transport, infrastructure and milling sectors, as outlined in Table 7.3.

To achieve these targeted efficiency improvements, the Commission has begun industry restructuring. Under the Strategic Plan, a new committee structure comprising the Quality Cane Subcommittee, Industrial Relations

Table 7.3   **Agenda of reform for the Fiji sugar industry**

Phase	Focus	Main strategies
1997–2001	Investing in efficiency	Introduce productivity payments Reorganise industry institutions Revitalise rail transport Invest in mill efficiency Improve public/grower awareness Phase in mechanical loading Start Land Utilisation Board User-pay charges on rail
2002–06	Quality cane benefits	Introduce quality cane payments Set sector based targets Improve rail/farm interface Selective mechanical harvesting Optimal mill efficiency/capacity
2007–20	Best practice culture	Maximise sugar content/acre Expand in Vanua Levu Automated mills Increase mill capacity to 4.6 mt

Source: SCOF, 1997b. *Industry Strategic Plan—Action Plans, 1997–2000*, Lautoka.

Subcommittee, Railway Restructuring Committee, Harvest and Delivery Subcommittee, Industry Investment and Mill Efficiency Advisory Committee and the Sugar Cane Research Advisory Committee has been created. These committees do not make policy but are required to act as inter-organisational teams developing proposals for the Commission, facilitating the implementation of agreed programs, and acting as reference panels. I will discuss two of the subcommittees that have direct implications for sugar production.

Quality Cane Subcommittee

The sugar industry is considering changing the cane payment system to give farmers incentives to produce sugar cane with a higher sugar content. On average, the quality of cane in terms of sugar recovered has declined. In 1968, 7.5 tonnes of cane was required to produce one tonne of sugar (SCOF 1997a). The volume of cane required increased to 9.44 tonnes in 1997 (FSC Annual Report 1998).

The current cane payment system, which is based on the weight of cane delivered, does not encourage farmers to produce cane of high quality. The growers receive about 73 per cent of the total sugar proceeds, with the rest going to the FSC. A cane payment system based on quality rather than volume provides an incentive to farmers to grow those varieties of cane and adopt those farming practices that produce the highest sugar content, consistent with their objective of maximising net revenue.

Choice of the appropriate premium is difficult. Where there is competition in the milling sector, the choice of the premium is left to the market. A single mill competing without taxes or subsidies in the world market is under pressure to provide appropriate incentives. However, this is not likely to be the case in Fiji for some time. With a monopoly miller, the price paid to farmers is best decided administratively by the SCOF, in which all the stakeholders are represented.

Sugar Cane Research Advisory Committee and Sugar Cane Research Institute

The Sugar Cane Research Advisory Committee is one of the six committees established under the Commission. The Committee, chaired by the Deputy Executive Director of Fiji Sugar Marketing, is set up to facilitate the creation of independent research and extension services. However, the focus is still very much to provide 'advice on optimal mix of cane varieties for different soil types, improve farm viability and give a scientific basis to quality control' (SCOF 1997a:11–12).

The Advisory Committee has proposed the establishment of a Sugar Cane Research Institute to replace the existing Sugar Cane Research Centre.

The Centre, which replaced the original Agricultural Experimentation Station, was established to 'breed and release new varieties of cane'. Its focus has remained much the same (FSC Sugar Cane Research Centre Annual Report 1995), concentrating on: detecting and controlling pests and diseases in the cane field; screening new varieties for resistance to disease; determining the nutritional requirements of cane; and deciding on the use of herbicides, pesticides and other agricultural chemicals.

The proposed Sugar Cane Research Institute may have a similar focus. According to the draft Bill, the objective of the Sugar Cane Research Institute will be to enhance the productivity of the Fiji Sugar industry through research aimed at increasing quantity and improving the quality of sugar cane products, improving the method of producing sugar cane products and/or diversifying sugar cane products. The Bill also suggests that the Institute may undertake research required to minimise environmental damage, and maintain the quality of land to sustain sugar cane crops.

The proposed structure of the Institute, as outlined in the Industry Action Plan (SCOF 1997b), reflects a biophysical approach to research. There are to be three research programs: 'Agronomy', 'Breeding and variety' and 'Crop protection'. In addition the deputy director of extension will be responsible for activities such as 'technology transfer, training and library'. The industry, in its Industry Plan, has identified a number of strategies, including those to establish a Land Utilisation Board, to create a policy to penalise farmers who break minimum regulatory standards, to map productivity of all cane farm types, and to measure, and notify all cane farms how to maximise their income' (SCOF 1997a). Whilst such strategies do recognise the need to consider profitability as well as productivity of farms, these needs seem to have been approached in a piecemeal and somewhat *ad hoc* manner (the strategies are considered in the Industry Action Plan under the section heading 'Update the Method of Quality Control'). If the industry is to improve its competitiveness in the world sugar market, the Institute's mandate should adopt a more systems approach and systematically identify the needs of growers and policymakers aimed at increasing and sustaining farm productivity and profitability (efficiency) and environmental sustainability. This would require reorienting research away from increasing the quality and quantity of sugar products, and towards improving efficiency in resource use in a sugar cane-based farming system (including land, labour and capital) and environmental sustainability. The research should also reflect the whole farming system in the context both of international trade as well as in its social and institutional context. Herein lies another challenge—a methodological one—that of developing an integrated analytical framework.

Integrated analytical framework

Analytical frameworks integrating agricultural trade reform scenarios, regional farm level supply characteristics, and household welfare have only recently been attempted. Traditionally, agricultural research and development was dominated by a fragmented sectoral approach, which was suitable only for addressing simple agricultural issues. More recently, a farming systems approach has helped to encourage technology-focussed developments (Collinson 1987). Farming systems research (FSR) has adopted farming systems as the focus of analysis while recognising the socioeconomic constraints on production. However, in practice, the FSR framework has generally failed to accommodate socioeconomic and cultural contexts (Davidson 1987). Generally, there is an absence of integrated methodologies that take advantage of recent developments in individual disciplines and carefully analysed case studies. Many of these approaches are either at a conceptual stage (Grimble and Wellard 1997) or have been applied only in specific case studies.

More recently, integrated approaches such as the Integrated Catchment Management (ICM) approach have been recognised as a useful framework to encourage stakeholder involvement and for the sustainability of development, resource use and decision making (Lundqvist et al. 1985; Easter et al. 1986; Ewing et al. 1997). The ICM approach has been used in most states in Australia to encourage stakeholder inputs in the design of catchment-wide management strategies. This model too, has been criticised for not integrating resource management, socioeconomic development, and implementation strategies (Margerum 1996).

In the face of these shortcomings (RAC 1993; Wallace et al. 1996), a new approach based on the Integrated Resource Management (IRM) paradigm is emerging. This approach recognises the interdependencies of natural, political and social systems, and the inherent characteristics of natural resource use (Bellamy et al. 1996). It also recognises the relevance of insights from scientific domains other than agriculture including ecology, policy science, economics and social science. What is emerging is a new paradigm based on an adaptive approach to ecosystem management and collaborative decision-making (Holling 1995; Wallace et al. 1996).

A number of other integrated frameworks based on computer-based expert systems are currently being developed. For example, at the Centre for Resources and Environmental Studies, ANU, an Integrated Water Resources Assessment and Management (IWRAM) framework based on an unpublished discussion paper prepared by Padma Lal in 1990, is being developed and trialed in Thailand. This framework matches the hopes and plans of stakeholders with known natural and human resources in order to generate alternative development options. In its application,

transdisciplinary methodologies are adopted (see Jakeman et al. 1997; Walker et al., forthcoming). The Cooperative Research Centre for Sustainable Sugar Production (CRC Sugar) is currently developing a Strategic Regional Resource Assessment (SRRA) framework which embodies resource assessment, systems modelling, and options analysis as part of its integrated planning (Mallawaarachchi, pers. comm. 1998). None of these models, however, includes international sugar trade considerations. MacAulay and Owen (1999) developed a comparative static spatial equilibrium economic model of the Australian dairy industry incorporating trade reform scenarios, and state-level supply and demand characteristics and policies to assess the effects of reform on milk producers in different states.

Research and extension link

The work of the Institute must be applied, adaptive, problem-solving, demand-driven and responsive to stakeholder needs. To improve the relevance of research, the Institute must move away from the classic paradigm of top-down, state or industry-sponsored research promoted through extension agents, or experts who identify and conduct the research, and provide technical solutions. Such expert-led and officially sponsored innovations, with a break in relationship between researchers and extension, has been found throughout the world to be highly ineffective in encouraging farmers to adopt new technologies or better farm management practices (Tabor and Faber 1998). Policymakers too have not had the benefit of much of the research carried out by scientists because of the gap between them. There has to be a direct link between stakeholder needs and the research process, and an institutional mechanism needs to be established that encourages greater collaboration and cooperation between researchers, extension staff, growers and policymakers.

The Research (and Extension) Institute must also be proactive by developing a strategic research plan. It must develop an approach that leads to the identification of relevant research priorities of farmers and policymakers. To this end, farmers and policymakers should have a direct say in the research agenda of the Institute. Currently, farmers do not have a voice in the activities of the Research Centre, although they contribute to its costs. The requirements of the policymakers, which may not be the same as the growers or the millers, must also be reflected in the research undertaken. Growers, policymakers and agricultural scientists often view problems in different ways. A grower, focusing on the immediate problem may think purely in terms of financial returns, while scientists, depending on their own disciplinary training, may view a natural resource problem in terms of biological, physical and chemical factors affecting the resource use. For their part, a policymaker may consider the problem in terms of

likely economic and political consequences. All the different perspectives need to be considered when setting the research agenda for the Institute. The stakeholders could then collaboratively determine the nature, scope and combination of disciplines required to address the priority issues facing them, and the Institute's research would then be problem-oriented and its outcomes focused. The proposed structure of the Institute's Board, which includes representatives of various stakeholders (growers, millers and the government), would help in this regard.

However, this needs to be strengthened through the Commission establishing an institutional mechanism for research identification and prioritisation involving the Board and the researchers. To bring about change, the Institute must encompass strong components of information, communication and research-development integration; a mechanism for effective on-farm adaptive research, information and liaison, and farmer-extension and training. The Bill must also provide the means for the Institute to develop a three to five-year research strategic plan in order to encourage it to take a more proactive and forward-looking approach to research rather than just reacting to immediate problems.

To achieve this, a major shift in the research and extension philosophy is also required, focusing on outcome-oriented (action) research (King et al. 1994). Action research, as the name implies, has the dual aim of action and research simultaneously. The aim of the action is to bring about change in a community, amongst policymakers, or within a program through outcome-oriented research that involves farmers, policymakers and other stakeholders throughout the project cycle—from identification of the problem, and planning (analysing the problem and designing a project), to implementation and monitoring and evaluation. Once the Institute takes a proactive approach to research, it could also benefit by prioritising the research, allocating internal research funds and/or seeking external support.

Partnership and alliances with other research institutes

The draft Bill provides for the Research Advisory Committee to include an officer from the Ministry of Agriculture and a representative from the School of Pure and Applied Sciences of the University of the South Pacific. However, to take advantage of expertise available in Fiji and abroad, the Bill needs to provide for partnerships and alliances with other research agencies as well. Alliance and collaboration with the University of the South Pacific and other government agencies, particularly the Ministry of Agriculture, Forestry and Fisheries (MAFF) and Ministry of Planning and Information (MPI), must be fostered. This could help the Institute access research skills across a wide range of disciplines available within Fiji.

Given limited resources in Fiji, the new Institute may not have to repeat much of the traditional scientific research but instead could 'borrow'

technologies and results of research undertaken elsewhere in the world. There is a wealth of information that is available from other ACP countries and others such as Australia, India and Thailand, that Fiji can access. The results of other work could be adapted for use in Fiji and the Institute could then focus on research that is unique to Fiji. Moreover, there are many International Agricultural Research Centres with interests in developing countries which have both expertise and results that the Institute could tap into. As noted by Eyzaguirre (1996), small countries such as Fiji must concentrate on intelligently using external knowledge and relating the results to local needs, networking with other research nodes and managing partnerships with external research bodies and donors.

Proposed institutional structure

To fully embrace the philosophy and strategies suggested above and focus on a more outcome-oriented research and development, a different institutional structure for the Sugar Cane Research Institute would be desirable. The industry has proposed a vertical division of programs into agronomy, breeding and variety, and crop protection, summarised in Figure 7.1. This structure emphasises science-driven research focusing on traditional divisions in research around activities and inputs rather than outcomes in terms of profitability/efficiency. If a purely biophysical approach to research is adopted and the resulting input combination is suggested, farmers are most likely to adopt this because 'benefits versus costs' is most likely to be the main criteria when choosing between farm management strategies.

It is recognised that research related to irrigation, pests and diseases, and intercropping are important, but given the proposed structure and research tradition, it is very likely that the Institute will mainly consider the biophysical aspects of these. Research into costs and benefits of these activities are likely to be ignored or treated as an after-thought under the proposed institutional structure. This is reflected in a proposed structure where the agricultural economist is expected to be responsible to the Head of Extension, as reflected in Figure 7.1.

An appropriate institutional structure is one of the most important preconditions for collaboration and cooperation (Eyzaguirre 1996), and integration of disciplines. For outcome-oriented research it is desirable to organise multidisciplinary teams of 'experts' around problems. This would encourage greater interaction between disciplines, with researchers producing outcomes based on innovative farm-level strategies that also reflect both biophysical and socioeconomic considerations. The Institute would also be able to more effectively utilise its limited expertise and resources in biophysics and economics and other social sciences. An appropriate institutional structure is highly desirable if a research institute

Figure 7.1 Input-based institutional structure proposed in the industry action plan

Figure 7.2 Proposed Sugar Cane Research and Extension Institute structure

is to become more relevant to the needs of the growers and policymakers, and provide information and analyses that the stakeholders can adopt.

To improve the effectiveness of research and extension, an alternative institutional structure, as outlined in Figure 7.2, is proposed. It is suggested that the Institute have three divisions: Farming Systems Research and Extension (which will also include various laboratories and field experimental stations); Engineering and Farm Implements; and a Sectoral Data Centre (including a library). Under such a structure, the Division of Farming Systems Research and Extension will be the centre of all research (field-based trials as well as desk-based bioeconomic modelling and agricultural economics analyses). Bridging the disciplinary divide through the integration of disciplines is only possible if there is a regular dialogue between people trained in the respective disciplines. The Division of Engineering and Farm Implements and the Sectoral Data Centre will, in this alternative arrangement, play a service role. The Sectoral Data Centre could become the centre for all records, farm-level information on things such as input and outputs, prices, costs, plant varieties, diseases and pests, and Government Information Services (GIS). A library of electronic information and hard copies of papers, reports and publications about the sugar industry in Fiji and elsewhere, could also be maintained within this centre. Such an arrangement could help collate and consolidate all published and unpublished material relating to the sugar industry in one place overcoming the current difficulty in identifying information about the industry.

Research capacity

In recent times, the FSC Sugar Cane Research Centre has been denuded of trained and experienced research staff, even in the traditional fields of research undertaken at the Centre. For industry-level assessment and economic policy analysis, Fiji has tended to rely on external consultants, often from Australia and New Zealand. Although their studies have provided valuable analysis, and in some areas of expertise (such as international trade analysis) the industry may continue to rely on expertise drawn from elsewhere, such arrangements are not satisfactory in the medium to long term. The industry must develop in-house capacity to undertake farm-level bioeconomic and policy analyses to identify policies and farmer strategies needed to increase farm-level productivity, profitability and sustainability. While economy-wide impact assessments and broad government policy assessments are the responsibility of the government, the industry needs to build its own capacity in various disciplines if it is to meet the challenges that lie ahead.

In recent discussions between the Australian Centre for International Agricultural Research (ACIAR), FSC, MAFF and MPI, the urgent need to

enhance capacity in the FSC Research Centre (and in Fiji more generally) in order to undertake such transdisciplinary biophysical–economic research was acknowledged. The FSC Research Centre’s staff are primarily agronomists, breeders, chemists, and specialists in crop protection. The new Research Institute must also employ researchers with economic and social science research skills to encourage it to adopt a systems perspective and develop a multidisciplinary research program. The foundation for such a systems approach to research will be laid once the recently approved ACIAR project is implemented.

The ACIAR Project

The ACIAR is currently developing a four-year collaborative and interdisciplinary research project titled ‘World trade liberalisation and the Lomé Convention: potential impacts and future options for Fiji’s sugar industry’. The overall goal of the project is to assist the Fiji Government, the Fiji Sugar Industry and most importantly, the small-hold sugar cane farmers to adjust to the expected reduction and eventual loss in preferential access to the European and USA markets.

The specific objectives of the project are to: identify ongoing and expected international market reforms, including the potential loss of preferential access under the Lomé Convention and other agreements, and estimate their impact on the national economy; assess the bioeconomic viability of sugar cane-based farming systems under current and alternative market reform scenarios; and assess the relative merits of alternative options under the Alternative Trade Arrangements (ATA), for Fiji (ACP)-EU negotiations and identify key farm/household-level options to improve and stabilise household incomes.

To address these objectives, the integrated international trade, bioeconomic and institutional framework outlined in Figure 7.3 will be used. The project is organised into three subprojects, each with specific objectives and expected outputs. A number of analytical tools will be used, taking advantage of recent methodological developments in relevant disciplines. Generally, empirical analysis will be undertaken using nested scales of analysis, as outlined below, adapting appropriate, readily available models to suit the situation in Fiji (see Figure 7.4). The project will make use of an existing international trade model (SUGARBARE), a computable general equilibrium model for Fiji (developed under ACIAR funding), and existing GIS databases in Fiji.

The key challenge in this project will be to develop farm-level biophysical and bioeconomic models—a sugar cane crop model for Fiji and household-based bioeconomic models for different categories of sugar cane farming systems in Fiji. Another major challenge will be to obtain relevant data required for the modelling. Much of the data will need to be collated from

Figure 7.3 Integrated systems analytical framework

existing biophysical and production data available with the FSC and its research stations. However, baseline household-level socioeconomic information and production data will also need to be collected. Biophysical and economic information will need to be integrated to assess and define appropriate responses by Fiji to reforms in the international sugar markets.

This will draw on multidisciplinary research skills across a number of leading research organisations to address these issues. The National Centre for Development Studies, the Australian National University, and the Fiji Ministry of Planning (with the Fiji project leader from Fiji Sugar Marketing Ltd) will lead the project. Expertise in agricultural science, agricultural and resource economics, and geographic information systems will be drawn from the Australian National University and the CSIRO Division of Tropical Agriculture in Australia. Fijian counterparts include the Land Use Division and the Economics and Policy Section of the MAFF, the Centre for Development Studies, The University of the South Pacific (USP) and the

Figure 7.4 Nested scales of analysis

Ministry of Lands. Fiji Sugar Commission will also be a significant collaborator, particularly through active participation of the Fiji Sugar Marketing Ltd in the international subproject. Fiji Sugar Cane Growers Council and Fiji Sugar Corporation will provide data, advice and guidance.

Conclusion

With ongoing reforms in the international sugar trade the Fiji sugar industry is facing major challenges not only in the transport and milling sectors, but equally importantly in the production sector. The results of ongoing negotiations over the renewal of land leases will pose additional challenges, particularly if a large proportion of the leases are not renewed. The government will have to deal with the major downturn in the sugar-based national economy. The industry will need to pay greater attention to ways of increasing the production efficiencies of farms managed by indigenous Fijian farms, for whom profit maximisation may not be the only objective. The proposed Sugar Cane Research Institute will need to move away from its traditional research focusing on fertiliser and pesticide trials to focus on increasing profitability and production efficiencies of sugar cane-based farming systems. The production sector reforms will need to be underpinned by rigorous and integrated biophysical and socioeconomic research reflecting social, economic and environmental considerations. The government has a golden opportunity now to embrace the innovative and holistic approach to research as it lays the foundation for the new Sugar Cane Research Institute.

Note

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