Sweet and Sour: the Dynamics of Sugar Cane Agriculture

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1 Introduction

This paper examines two different cane sugar industries, those of Barbados and Australia, and considers how and why sugar production has tended to become increasingly problematic in both of these cases. Such tendencies are significant not simply because they threaten the future viability of the industries themselves, but also because attempts to sustain production in situations where industries have become progressively dysfunctional often involves the overexploition of both human and environmental resources. After brief descriptions of the key characteristics of sugar as an agro-industrial commodity and the global sugar economy, the paper focuses first on the Barbadian sugar industry and subsequently on the Australian sugar sector. In both these cases, the discussion attempts to explain why these industries have become increasingly difficult to sustain in recent decades. Several factors may be significant here. Sugar prices have been declining in real terms for some time and within this the global sugar economy has been extremely volatile with prices often fluctuating violently over very short time scales. The central theme of the paper, however, revolves around the ways in which two very different production systems have themselves generated contradictions and barriers to their own reproduction. The final section of the paper considers the significance of this analysis to wider issues such as sustainability and regulation of sugar production at both international and national scales.

2 Sugar and the global sugar economy

Sugar is the most widely produced agricultural commodity in the world. In 1993, global sugar production amounted to 111 million tonnes with a total value in excess of US$28 billion. Just two plants are commercially important sources of sugar: sugar cane which grows in tropical and sub-tropical areas; and sugar beet which is

produced in temperate areas. Accordingly, sugar cane production is generally, but not exclusively, associated with less developed countries, whilst beet production is essentially a feature of the developed countries of Europe and North America. Despite the dissimilarity of production methods, the sugar produced is a uniform product which does not differ significantly in its nature or quality. Thus sugar represents a good example of a major agricultural commodity where the developed and developing worlds are in more or less direct competition with one another (Abbott, 1990:1).

Health concerns and substitution by chemical sweetners and other agro-industrial products such as high fructose corn syrup have served to depress demand for sugar in the North in recent decades. Whilst there is potential for increased consumption in the South, any significant overall growth in consumption in the near future seems at best unlikely (F. O. Licht:1993; Heismann:1993). Indeed, recent patterns of sugar production and consumption indicate a pattern of distinct and persistent overproduction. This appears to be underpinned by a range of factors. On the one hand, the global sugar economy is profoundly distorted by widespread protectionism and support for domestic industries - a feature of which the 'Cairns Group' and particularly the Australian Federal government have been vociferously critical (Miller:1987; Jesson:1991). Sugar production also appears to be highly price insensitive, not least because of the relatively long length of sugar cane production cycles which normally extend to at least four years (see, for example, World Bank, 1986). A key contributory factor to the status quo, however, has been the widespread tendency for Southern countries to either expand existing production or to establish new sugar industries during recent decades. The South now accounts for well over 50 per cent of global sugar production (FAO, 1987:7; Abbott:1990). This expansion of sugar production in the South is somewhat difficult to explain rationally given the wide range of economic, social and environmental problems which are commonly associated with cane sugar production (Coote:1987). In practice, several factors appear to underpin the trend. These include: objectives of self-sufficiency in sugar production; inaccurate predictions of future demand; the ready availability of capital from intergovernmental lending

agencies; and inappropriate responses to short-lived hikes in the sugar price (FAO, 1987:4).

Throughout its history the global sugar economy has always been typified by boom bust cycles engendered by extreme price volatility. Between 1974 and 1985 the spot sugar price ranged between $0.06 per kilogram and $2.60 per kilogram[1] (Borrell and Duncan, 1992:172). To some extent, the volatility of the market has tended to overshadow an equally significant trend for prices to fall in real terms. As Mintz (1985:158) suggests "the steady and cumulative decline in the relative price of sugars is clear enough". This decline is significant because in practice it has defined a progressively stressful context within which producers have had to operate.

Both the volatility of market and the trend for prices to fall in real terms can be explained, in part at least, by the nature of the sugar economy itself. Although global sugar production has risen in absolute terms, the percentage of total sugar production traded internationally has been falling for some time and over 70per cent of the world's sugar is now consumed in the countries where it is produced (Abbott:1990; ISO:1994). A high proportion of the remainder is exported under various forms of bi-lateral agreements. Around 25per cent of the international trade occurs within special agreements. The USA, for example, has various special trading arrangements, particularly in Central America, the Caribbean and the Philippines. The rationale for these has often been as much strategic as economic. European Union policy has also had a highly significant effect on the global sugar economy. On the one hand, the EU is now one of the world's largest producers and exporters of sugar. Over and above this, the EU also has formal trading arrangements with a large number of Southern cane producing countries. These arrangements are formalised under the Sugar Protocol of the Lomé Convention first signed in 1975. The objectives of the convention involved granting some protection to 64 African, Caribbean and Pacific (ACP) countries who then had trading arrangements with members of the European Community. The Protocol incorporated those colonies and former colonies which had traditionally exported sugar to Britain under the Commonwealth Sugar Agreement (CSA). Australia was the only CSA signatory which was subsequently

excluded from the Protocol. Under the terms of the Protocol, the EEC agreed to import 1.3m tonnes of raw sugar from the ACP countries. Each sugar producing ACP country was allocated a quota based on historical trading patterns. Barbados, for example, was granted a quota of 54,000 tonnes of sugar. These quotas receive a guaranteed preferential price related to the 'A' quota price paid to European beet producers[2]. Since 1975, European intervention prices have normally been higher than the world market price for sugar, and at a superficial level, at least, the arrangement appears to benefit ACP countries (see figure 1). Although it was a net importer of sugar in 1975, the EC was exporting over 5m tonnes onto the world market by 1981 (Coote, 1987:100). Accordingly, all imports from ACP countries have been effectively re-exported onto the world market since the late 1970s. However, pressures for change in EU agricultural policy seem to indicate that the future of the ACP agreements are at best uncertain.

Given the small size of the residual market for internationally traded sugar, the global sugar economy is in practice a 'thin market'. Such markets are very vulnerable to the effects of relatively small variations in output or disruptions to existing trading patterns and tend to react dramatically to any such events. As it currently operates, the global sugar market serves to: (a) increase the volatility in the price of openly traded sugar on the world market; and (b) to depress the price for sugar on the open market in the long term. According to Sturgiss, Tobler and Connell (1988), the joint effects of EU, US and Japanese policies has been to depress the world price by around one third whilst increasing price volatility by 28per cent. In practice, long term supply contracts offer little protection from this trend as they are necessarily negotiated within the context of structural overproduction and the very depressed prices which occur in the open market.

There have been a number of attempts to regulate international sugar trade and prices during the twentieth century. The most significant of these have been those promoted by the International Sugar Organisation (ISO) which incorporates both sugar exporting and importing countries. The ISO promoted a series of International Sugar Agreements (ISAs) in 1953, 1958, 1968 and 1977. These agreements attempted to keep sugar prices within predetermined bands by allocating Basic Ex-

port Tonnages (BET) - effectively voluntary export quotas - to producer countries, and through the development and controlled release of buffer stocks. In practice, the ISAs proved to be almost totally ineffective with prices straying outside bands for almost as much time as they stayed within them (see figure 2). When the 1978 ISA lapsed in 1984 it was subsequently extended for a further 2 years, but no new agreement was negotiated. The effective failures of successive ISAs has been held to reflect various problems including: non-participation of major parties including at various times both the EU and the USA; non compliance with BETs; free riding; and demand trends for sugar which have tended to be much more static than has often been predicted (Abbott:1990, FAO:1987).

The global sugar economy has been and remains typified by structural overproduction, volatility and increasingly depressed prices. Many sugar producers have found this to be an increasingly uncertain and stressful context in which to operate. Certainly, this has been the case in the two industries examined here. Although the Australian and Barbadian industries are very different in terms of their structures, levels of capitalisation, mechanisation and exposure to the free market, both have found sugar production to be a progressively more difficult endeavour. To some extent, the problems encountered in these locations do reflect the nature of global sugar economy. However, the specificity of dysfunction has varied according to specific local factors, as have governmental and producer responses to the problems which have emerged. The analysis here will attempt to provide a multi-level explanation of the dynamic and transformational processes which have affected and often served to prejudice the sugar industries of these two countries.

3 The Barbados sugar industry

Barbados has a long history as a sugar island. English settlers established the first permanent European presence on Barbados in 1627 and within twenty years sugar production had become firmly established (Beckles 1990; Watts 1987). Indeed sugar rapidly came to dominate the island and the lives of its people and continued to do so for the next three hundred and fifty years.

Throughout almost all of its history the Barbadian sugar production has been dependant on the exploitation of various forms of coerced labour. Sugar estates on Barbados were first developed through the use of indentured labour, mainly British craftsmen and labourers contracted to work on the island for specific periods. However, it soon became obvious that the scale of labour required could notadequately be met in this way and estate owners turned to the purchase of slaves to meet their labour requirements. There were 6,000 slaves working on estates in 1650 and approximately 20,000 by 1653. By the mid 1660s there were more slaves on the island than there were whites. In 1833, when slavery was abolished in the British Caribbean, the slave-white ratio had reached over six to one, with over 80,000 slaves and less than 13,000 whites (Watts, 1987:311).

Legacies of this, often unfortunate, colonial history still influence the Barbadian sugar industry today. Some 100 plantations, typically around 100 hectares in size, remain the basis of sugar production. And, perhaps even more consequentially, the racial and class structures which historically underpinned plantation based sugar production also retain considerable significance. Over 95 per cent of the present day Barbadian population of around 259,000 are of African descent. Approximately 4 per cent of the total population are white with about half of these being indigenous Barbadians, the remainder being recent immigrants. Certainly, racially based tensions are apparent enough and these are frequently expressed in black antipathy to sugar production and to a white 'plantocracy' which in popular perceptions at least is still understood to control the industry (Beckles: 1990; Drummond and Marsden: 1995a).

Barbadian sugar production, which had stood at about 50,000 tons in the first decade of the twentieth century, tripled in the period up to 1970, peaking at over 200,000 tons in 1967 - the year following independence. However, the industry started to contract during the 1970s and was plunged into crisis during the early 1980s when both planters and the factory sector experienced liquidity problems (see figure 3). These problems led the Barbadian government to embark on a massive programme of support for the industry. During the 1980s, the Government of Barbados (GOB), mainly through the loans and

securities provided by the Barbados National Bank (BNB), supported the sugar industry with what, in the context of Barbados' small size, were extremely significant sums of money.

A number of specific reasons were cited to legitimate this extremely high level of support. Although earnings from sugar exports have fallen dramatically in recent years, sugar exports still represent one of very few sources of foreign exchange for Barbados. It is also widely claimed that unlike the situation with the tourist industry where a high proportion of inputs are imported, most of the earnings from sugar are retained within the island. However, Barbados' sugar production would not be viable outside the context of the ACP agreement, and as the GOB were most certainly aware, any failure to fulfil their quota would almost certainly prejudice Barbados' future access to this extremely preferential market. Thus maintaining production at a level which would allow the quota to be filled was seen as being vitally important. Even though sugar industry employment in the early 1980s was much less significant than it had been in the past, support for the industry was seen as a way of maintaining jobs at a time when unemployment levels were already high. The agro-industrial nature of sugar production was also seen as being significant, because a 'critical mass' exists below which the industry could have no chance of operating profitably. In a situation where less cane is being produced, the essentially fixed costs of the milling sector would become increasingly significant and would undermine the profitability of the industry as a whole.

Sugar cane is also seen as being important to the island's environment. In particular, it is widely claimed that it is highly significant in preventing soil erosion. The contention is that sugar cane provides uninterrupted ground cover for a period of at least four years and thus protects the thin and easily eroded soils. Certainly, several areas where cane land has been abandoned have experienced severe problems of erosion in recent years. It has also been suggested that any large scale change in the island's vegetation cover, such as would occur if sugar cane production were to cease, might well transform the island's hydrological characteristics and thereby prejudice the island's water supply security. Maintaining a landscape with a high amenity value commensurate with visitors' perceptions of a green and productive

tropical island is also held to be important to the tourist industry.

A further argument frequently cited by many planters to legitimate support for the sugar industry is that few, if any, alternative forms of agriculture are viable on the island. This would appear to be a dubious contention. The Barbados Ministry of Agriculture has suggested that a more diversified agriculture is both desirable and possible and has maintained this as a primary policy objective for some time (GOB: 1956; 1965 & 1988). Although non-sugar agriculture is now more significant in terms of GDP, sugar cane still accounts for majority of agricultural land on the island. Indeed much of the value of non-sugar agriculture on Barbados is accounted for by the intensive production of chickens and pigs which has developed in recent years.

The explicit rationale for GOB support of the sugar industry encompasses two sets of arguments. First, the industry may or may not be worth sustaining because of what it is, for example, because of the foreign exchange it can generate. Second, it is also recognised that should the industry collapse, this might well produce a range of problems such as accelerated soil erosion, increased unemployment and changes in the island's hydrology; all of which might well be considered unsustainable in themselves. Thus there may well have been a strong case, at least for short term support of the industry while new forms of agriculture were established. In practice, however, the nature of GOB support for the industry has extended beyond this.

Despite the a massive amount of support afforded the Barbadian sugar industry during the 1980s, it was quite apparent by the early 1990s that the situation had gone from bad to worse. Sugar production which had already declined by over 60 per cent between 1967 and 1980, fell by another third between 1981 and 1992, dropping to around 50,000 tons - a level of production which was insufficient to meet both domestic demand and the EU quota. In 1992, production was still highly inefficient by international standards with, for example, around 40 per cent of the harvest still being cut manually. Both the factory sector and many individual plantations had accrued debts which they had no hope of servicing. Moreover, at a macro-economic level, the overall industry debt was beginning to have serious consequences for the

GOB.

By 1992, BSIL[3] - the company which operated Barbados' three sugar mills - had debts of around B$170m with over 80 per cent of this total either owed to or underwritten by the Barbados national Bank (BNB)[4]. Plantation debt to the BNB amounted to B$113m with approximately B$30m owed to other creditors. Some 52 plantations were unable to service their debts at this time. Around 40 were not unable to continue production because they could not meet their day to day operational costs. These heavily indebted plantations accounted for 13,000 acres or 46 per cent of the cane land in Barbados. A total of B$ 249m (88 per cent) of the total industry debt could be regarded as delinquent in June 1992 (Booker Tate:1993). By this time GOB loans to the plantation sector amounted to B$6,800 per acre of plantation - a figure considerably above the value of agricultural land. A large number of individual plantations each had debts of over two and a half million Bajan dollars and the total industry debt to the BNB represented approximately B$1000 per person in Barbados. By the early 1990s, the Barbadian sugar industry had come to the very edge of total collapse. Sugar production had fallen consistently for twenty years and was no longer sufficient to meet both the EU quota and domestic demand, and the industry had massive and effectively unserviceable debts. In 1993 the GOB engaged Booker Tate[5] to manage an eleventh hour and somewhat desperate restructuring of the sugar sector. Although Booker Tate claimed, correctly, that considerable potential existed for efficiency gains through more rational use of machinery and consolidation of production units, they themselves recognised quite clearly that even if such gains could be achieved, these were unlikely to be sufficient to make the Barbadian sugar industry viable.

4 The Australian Sugar Industry

Although the establishment of the Australian industry post-dated that in Barbados by some 200 years, it did initially mirror the Caribbean model in that it was based on plantations. However, problems in maintaining adequate labour supplies resulted in a transformation of the industry structure to one based on large numbers of relatively small family farms and

centralised mills at the end of the nineteenth century (Graves: 1993). Today some 6,000 family farms and 28 privately and co-operatively owned mills, over 95 percent of which are located in Queensland, remain the basis the Australian sugar industry. The majority of these farms are similar in size to Barbadian plantations with most having between 30 and 90 hectares of cane (Sugar Industry Commission: 1992:23).

Largely because of the need to address the tensions which emerged between farmers and the milling sector, a wide ranging regulatory system was established in the early years of this century. For the last seventy years, almost every aspect of the Australian sugar industry has been highly regulated. Statutory controls have covered not only the amount and location of land on which cane could be grown, but also whether or not that land might be sold and at what price. Farmers were obliged to deliver their cane to a particular mill, and the framework for determining the price they would be paid was set out in legislation. The domestic market was protected and prices were fixed. Compulsory acquisition powers covering all sugar production also underpinned a system of centralised marketing whereby all Australian sugar was sold through the state governments or their agents.

Although the regulatory system which evolved was extremely comprehensive and in some ways detailed and complex, actual government involvement in the day to day operation of the industry was never that great. The Commonwealth government's role was largely confined to strategic considerations such as international terms of trade. Most statutory controls on the sugar industry have been enacted at state level, but in practice their operation was normally delegated to various industry bodies such as the milling companies and producer organisations. In practice, the regulatory system functioned effectively because of the total inter-dependence of different sectors of the industry. It allowed a very high degree of control to be achieved through the use of a limited number of measures. For example, by controlling the output and incomes of the mills it was possible to delegate more detailed regulatory functions to this level.

A further difference between the Barbadian and Australian sugar sectors lies in the almost total commitment to modernisation which has been a key feature of the Australian Industry. Australia has been at

the forefront of development of specialised technology for sugar cane agriculture for several decades. The use of modern technology has become deeply ingrained in the culture of Australian sugar cane agriculture. Virtually the entire crop was being harvested mechanically by 1973 (Lance Jones & Co., 1975). A sophisticated cane transport and sugar handling infrastructure exists throughout the cane producing areas of Australia. There are, for example, approximately 3,900 kilometres of specialised narrow gauge railway for transporting cut cane from fields to the mills. A total of 70,000 hectares of sugar cane land are irrigated in Queensland with several areas benefiting from specially constructed irrigation schemes. Australia also has a highly developed sugar industry research and development infrastructure spanning both the agricultural and milling sectors (Queensland Sugar Corporation:1992a)

During the last thirty years Australian sugar output has more than doubled, rising from 1.3 million tonnes in 1960 to over 3.3 million tonnes in 1990, (see figure 4). Throughout this period, productionist policies have produced periodic increases in the amount of assigned land which rose from 300,000 hectares in 1970 to 360,000 hectares in the early 1980s. There has also been a trend to further intensify an already highly mechanised and chemicalised production system.

By the 1990s, Australia was producing around 3.5 per cent of total world sugar output. production Approximately 80per cent of Australian production, worth well in excess of A$1 billion, was being exported[6] which made Australia the world's third largest sugar exporter with around 10per cent of international trade, after Cuba - 24per cent and the EU - 20per cent (Queensland Sugar Corporation, 1991:6; F.O. Licht, 1994). Traditionally, Britain had been the primary market for Australia's sugar exports and in 1954 this trade was formalised under the terms of the (British) Commonwealth Sugar Agreement. When the CSA expired in 1975, Australia was the only former party to the agreement not to be included in the ACP Protocol of the Lomé Convention. Thus from 1975 onwards Australia had to find markets for substantial quantities of sugar exports within the global sugar economy. A large proportion of subsequent exports took place under a series of bilateral arrangements with importing countries, most notably with Japan. However, whilst these

agreements may have created some degree of price stability for the industry, they never included any great premium over prevailing world market prices (Queensland Sugar Corporation (1992c). By the end of the 1980s Australia was exporting the majority of its sugar to nine main destinations. Japan accounted for 20per cent of all exports, Malaysia 19per cent, Canada 15per cent, South Korea 13per cent, the USSR 11per cent, China 7per cent, Singapore 6per cent, the USA 6per cent and New Zealand 3per cent (Sugar Board, 1991). Between 25per cent and 30per cent of these exports were covered by long-term contracts which existed with Malaysia, South Korea, China and the Soviet Union (ABARE, 1991:17). The Australian sugar industry has probably been more exposed to world prices that of any other major producer. According to the Senate Committee on Industry Science and Technology, (1989:12), if the exposure of exporting countries is ranked on a scale of 0 - no exposure, to 4 - complete exposure, only two countries: Australia and Thailand rate a score of 3

Not least because of this high degree of exposure to the global sugar economy, the Australian sugar sector has found the last fifteen years extremely stressful. Farm incomes have generally been very low and many farmers have been quite unable to make a living from cane production. Large numbers of farms have high and unserviceable debts. The economic stress on the industry is also creating a range of other problems. There are particular problems with inter-generational transfer and the average age of cane farmers is now in the high fifties. 'Get big or get out' was very much the institutionally promoted industry watchword off the 1980s, and whilst most farmers were willing enough to accept this philosophy, it has begun to have dire consequences for many individuals as small and medium size enterprises are being replaced by larger production units. Around 1,500 family farms disappeared between 1970 and 1986 (Powell and McGovern, 1987:17).

The Australian government's primary response to these developments has been to deregulate the sugar industry. Deregulation of the agricultural sector has part of wider Australian government policy for some years (Lawernce *et al*, 1992; Alston, 1991) and in fact, the sugar industry was the last major sector of Australian agriculture to undergo deregulation. However, by the late 1980s a comprehensive

programme of deregulation of the sugar industry was being instituted and by 1994 virtually all controls on the industry had been removed[7]. Given the extremely high level of regulation which had previously pertained within the Australian industry, this agenda has involved, and is likely to continue to involve, profound and potentially highly significant transformations of the most basic structures of Australian sugar production. In practice, deregulation of the Australian sugar industry amounted to a neo-liberal response to what were perceived as increasingly significant barriers to efficient production, However, whilst deregulation may well allow the industry to remain internationally competitive in the short term, it is almost certain to engender new contradictions and sources of dysfunction which will prejudice the longer term development of the industry.

In ways which are closely paralleled throughout the world, the Barbadian and Australian sugar sectors have both experienced increasingly profound problems in recent years. In Barbados, production has declined steadily and the industry has apparently reach the point of total collapse despite the guaranteed market and preferential prices provided by the ACP arrangements. Last gasp attempts to restructure the industry have focused on measures to increase the technical efficiency of production. In Australia, output has not fallen, but the industry has been highly stressed by a sustained period of depressed sugar prices on the international market. The key response to this has been to deregulate the industry. Whilst this may reduce production costs in the short term, it is almost certain to create or accentuate other problems, such as the increasingly untenable position of the family farm.

5 Regulating sugar production

It is hardly profound to suggest that producing sugar has become increasingly stressful and problematic. Neither is it particularly trenchant to contend that both general factors such as the nature of the global sugar economy and contingent factors such as the levels of technology being used in particular locations, are significant in this. The volatility of the market and the increasingly depressed sugar price are widely accepted as factors which affect most, if not all, sugar producers. Hence the

ill-fated attempts to develop International Sugar Agreements. Equally, attempts to explain the problems which sugar industries face often cede considerable significance to purely local factors. In practice, however, locally contingent factors are usually held to be synonymous with efficiency measured in terms off cost competitiveness. Both the sugar industry restructuring programme in Barbados and the deregulation of the Australian sugar industry have the central aim of promoting greater efficiency. This sort of reductionism is probably inappropriate. Apart from the fact that there must be some limit to the incremental efficiency gains which can be made, factors other than efficiency can support or undermine industries such as these. And, even more significantly, any analysis which focuses on these two levels of causality in isolation is likely to be incomplete because developments within these industries need to understood as outcomes which reflect not just structural mechanisms and contingent factors but also the processes of structuration which link these. This paper attempts to explore this relationship through a multi-level interpretation of events incorporating key insights from regulation theory.

The original rationale for the regulationist project stemmed directly from the recognition that capitalism is not an equilibriating process (Aglietta:1979). Thus, regulation theory has attempted to explain how capitalism could survive despite crises congenital to the logic of capital accumulation. The suggestion is that conflict is avoided or at least postponed through a mode of social regulation (MSR) - an ensemble of norms, institutions, organisational forms, social networks, and patterns of conduct - which constitute the conditions necessary for continued capital accumulation. Thus regulation theory replaces the notion of 'reproduction' with one of 'regulation'. (See, for example, Aglietta:1979; Boyer:1990; Jessop:1990).

Regulation theory is based on the premise that the emergence of contradiction and dysfunction is an inherent feature of the capitalist dynamic. Although regulationist thinking has been primarily concerned with the ways in which capitalist economies as a whole have been sustained over relatively long time horizons, the logic which it employs remains pertinent to the analysis of individual sectors. Contradictions which prejudice entire 'regimes of accumulation'[8] must, necessarily,

be constituted in increasing dysfunctionality within individual sectors. And as the Barbadian and Australian sugar sectors demonstrate, at least some socio-economic formations do tend to become increasingly dysfunctional and crisis prone through time. Regulationist thinking posits a particular view of view of contradiction and crisis which is of considerable relevance to the analysis of problems which have beset the sugar industries being considered here:

"Embedded within this approach is the possibility of different forms of crisis: (a) short 'conjunctural' crises requiring minor adjustments (for instance, incremental technological changes, expanding spatial divisions of labour, and institutional adjustments); (b) structural crises (or crises of a particular mode of development) leading to qualitative changes in the organisation of the accumulation process; (c) crises resulting from fundamental contradictions in the capitalist mode of production itself." (Moulaert and Swyngedow, 1989:329).

An important point here, is that the contradictions which have served to prejudice sugar production in the two case studies included here, and indeed elsewhere, have generally been perceived of and addressed in terms of 'conjunctural crises', when they might well often be better understood as reflecting the second and third types of crisis outlined above. Certainly the approach adopted in Barbados has sought to maintain the industry through 'minor adjustments' without any qualitative restructuring of the accumulation process or the regulatory context in which this occurs. In Australia, the sugar industry's problems have been interpreted as a structural crisis, but the restructuring engendered by deregulation is hardly likely to promote qualitative changes in the organisation of the accumulation process. Indeed in both of these cases, regulation has legitimated and enabled strategies which serve to sustain the established structures of the accumulation process. They have served to sustain the value of capital and the validity of established patterns of social relations rather than the basis of sugar production or for that matter the environmental and social basis of that production. A more detailed examination of developments within the Barbadian and Australian sugar sectors illustrates the nature of this dialectic.

The inclusion of Barbados within the ACP agreement provided a guaranteed market and preferential prices which it was anticipated would allow the island to continue producing sugar after independence. However, these expectations were clearly unrealistic as the industry soon experienced a range of problems. When returns to the agricultural sector fell during the early 1980s, one widespread response by the plantation sector was to extend ratoon lengths. When a first crop of sugar cane is cut, the remaining stalks or 'stool' will regrow to produce a further crop. This process is known as ratooning and can be repeated almost indefinitely, but yields and sugar content fall with each subsequent harvest. Four or five ratoons are normally seen as an optimal compromise between cost savings in avoided cultivation and falling returns from lower yields. The nature of ratooning is such that planters can get something of a free ride for a number of years, but such a practice soon becomes irrational as falling returns outweigh saved cultivation costs. A clear trend to falling yields experienced during the 1980s appear to indicate that ratoons were extended and indeed that other inputs were reduced beyond those which would have been commensurate with any rational long term survival strategy (Drummond and Marsden:1995a). Thus an existing problem of decline in the industry was accentuated to a point where the GOB were pressured into providing massive amounts of support to the sugar sector. However, again this proved to be a manifestly imperfect strategy as production continued to fall. In practice, it is clear that little of the support provided to the industry was actually invested in sugar production and that large amounts of capital were transferred out of sugar production to other sectors of the economy and probably abroad during the 1980s (Drummond and Marsden:1995a). Two factors seem to have underpinned this trend. First, a situation had developed where sugar production was not unprofitable per se, but where it was relatively less profitable than other investment opportunities, such as the rapidly developing tourist industry. Second, it had become increasing apparent to all concerned that the future of the Barbadian sugar industry was at best insecure, not least because of uncertainty regarding the future of the ACP arrangements. In this situation, it became rational for estate owners to cease investment in sugar production and to transfer capital out

of sugar and, in practice, this is what has occurred very widely. This type of explanation for the demise of the Barbadian sugar sector provides a telling commentary on the potential of the GOB's latest attempt to address the problems of the sugar industry by engaging Booker Tate to restructure the industry. Booker Tate intend to try and sustain production by promoting efficiency gains, but inefficiency is only part of the problem here. Equally significant is a pattern of social relations and property rights which have persisted from the island's colonial past. These have allowed a small economically, and hence politically, influential elite group to effectively sustain their individual interests irrespective of the consequences for the sugar sector or the wider development of Barbados.

The history of Australian sugar production also embodies a number of moments which exemplify the ways in which various contradictions tend to arise and the imperfect and temporary nature of the strategies used to address these. The plantations around which the Queensland industry was formed became increasingly dysfunctional because of labour supply problems towards the end of the nineteenth century and the industry structure changed to a system based on family farms. The inherent flexibility and potential for self exploitation provided by a family farmming structure allowed the industry to continue to function effectively for several decades. By the 1940s and 50s, however, new problems of ensuring adequate labour supplies had again started to emerge despite the comprehensive system of regulation which had been established within the industry. In this instance, the problem was addressed by substituting capital and technology for labour and again this allowed the industry to function effectively for some time. Despite the fact that production methods continued to become progressively more technologically efficient in subsequent decades as farmers invested in progressively more capital intensive production systems, the industry had again become increasingly dysfunctional by the 1980s as low sugar prices prejudiced the economic position of the vast majority of cane farmers. The primary solution to this was to deregulate the industry. This is allowing rationalisation of the industry structure to something which is, in some ways at least, more sustainable. For example, the removal of the assignment system has facilitated the pre-existing trend to larger, tech-

nically more efficient and more cost effective production units. Deregulation has allowed presures to 'get big or get out' to be realised in practice, and now the family farm is clearly and profoundly prejudiced. Whether or not this is considered to be morally unacceptable is hardly the point, more significant is that fact that the flexibility of family farming structure has, more than any other factor, been the key to Australia's success in sugar production for almost a hundred years. An apparently expedient solution to one contradiction with the industry has been partially successful, but it has contributed directly to the demise of the family farm and thus it will in all probability have created new barriers to the reproduction of the Australian sugar industry.

6 Exigency, expediency and expendability

These case studies provide incisive commentaries on notions of sustainability and the nature of the regulatory process. Both of the Barbadian and the Australian sugar industries have become increasingly stressed through time. In each case, problems have emerged and a range of more or less objective strategies have been promoted to address these. Some of these strategies have been successful in that they have allowed the industries to continue to function, but almost invariably, they have been imperfect as solutions, in at least two ways. First, they have tended to involve progressively severe forms of exploitation. A good example of this is the way in which the modernisation of the Australian sugar industry has produced increasingly chemicalised environments and in some locations problems of water mining and salinisation. In Barbados, strategies which have resulted in land being taken out of sugar have frequently resulted in problems of accelerated soil erosion. Second, in both of these cases, the strategies adopted have tended to create new and usually more severe contradictions and potential for dysfunctionality within the industries. For example in Barbados, it is easy enough to see how extended ratooning prejudiced the future of the sugar sector. In Australia, the processes which are sustaining ever greater sugar output at ever lower costs are clearly destroying the family farm - a development which is likely to have quite profound consequences for the industry in the longer

term.

Each of the contradictions and strategies which have occurred in these two industries are different in that they are specific, but they are hardly singular. All are related to an omnipresent tendency for the industry and the socio-economic formation in which it is constituted to become progressively more stressed and crisis prone through time. Each specific moment of contradiction is just that a moment in this process. Similarly, the outcomes engendered are contingent and may vary from place to place and at different times, but elements of commonality exist. The outcomes realised in practice tend to reflect increasingly profound forms of exploitation and, despite this, they remain temporary and imperfect solutions to the industries' problems.

Notwithstanding expedients, such as the provision of credit, subsidies, the application of new technologies, or the acquisition of new markets and so on, regulation is always likely to involve an incidental devaluation of both natural and human resources. It is usually a matter of where and when this occurs. As these case studies demonstrate, particular instances of regulation may, temporarily, postpone the expression of economic dysfunction and crisis, but in doing so they tend to fundermine the undamental social and ecological fabric of sustainability. Whilst particular elements of regulation or particular regulatory instruments may avert particular crises, they tend only to redirect rather than counteract the tendencies which give rise to these events. Without regulation the accumulation process cannot function, but inevitably there comes a point where the dynamic can only be maintained through systems of exploitation which are by their nature unsustainable. Increasingly therefore, the capitalist accumulation process requires modes of social regulation which justify and legitimate materially unsustainable forms of exploitation. Whilst the MSR as whole remains intact, increasingly exploitative and degrading practices are always going to be legitimated and empowered. Thus there will always be a tendency to increasingly unsustainable outcomes.

A key point here is that modes of social regulation come about through a process of experimentation and struggle rather than through objective promotion *per se*. As particular contradictions or crises emerge, more or less objective strate-

gies are devised to address these. Which strategies are actually realised is largely determined by the wider mode of social regulation which selectively legitimates and empowers some whist negating others. As they are currently constituted, modes of social regulation condition development in ways which are fundamentally biased. To some extent, this reflects the fact that regulation is normally articulated through existing power structures. In Barbados, it is easy enough to understand how an economically and politically powerful elite group has subverted the political agenda to its own ends. In Australia, the power structures are less transparent, but clearly there are interests there which are more significant and more influential than the family farming sector. However, the problem is more basic than this. Modes of social regulation come about through a process of experimentation and struggle in which their validity is determined by their correspondence to an object of regulation defined by the exigencies of the capitalist dynamic (Drummond and Marsden: 1995b). The wider modes of social regulation in both Barbados and Australia relate to a specific object of regulation which is external to either the sugar industries of these countries, their environments and their populations. In both of these cases the MSR has ascribed flexibility and priority to purely capitalist and class interests rather than the material or social basis of sustainability. The usual outcome of this has been the legitimation and actualisation of increasingly exploiatative practices and the degradation of environmental and human resources and sugar industries which are ever more crisis prone.

As much of the twentieth century testifies, the inherent unsustainability of socio-economic formations can be postponed, but in practice only through measures which tend to involve other forms of unsustainability. A useful conceptual distinction arises here between what might be termed *formational sustainability* and *material sustainability* (Drummond and Marsden: 1995a; Drummond and Symes: 1996). The former is both the overriding object of regulation in capitalist societies and the condition which ensures the viability of a particular mode of social regulation. What tends to occur in practice is that the inherent unsustainability of socio-economic formations - particular capitals and the class structures associated with these - is deferred, but only through processes

which involve increasingly severe forms of exploitation. The essentially inconsequential unsustainability of social formations is translated into other more materially and morally significant forms of unsustainability. As the viability of a particular socio-economic formation becomes threatened, strategies designed to preserve the value of capital and the viability of extant patterns of social relations are devised and promoted. Contradictions which emerge in a particular place at a particular time are deferred through the provision of credit or subsidies, or exported through protectionism or the exploitation of new resources and markets. Which strategies are actually 'successful' is determined by the mode of social regulation which selectively legitimates and empowers some strategies whilst invalidating others.

7 Conclusions

Moulaert and Swyngedow's explication of different forms of crisis can help clarify the implications which this interpretation of regulation has for the sugar case. The analysis here suggests that the contradictions which tend to prejudice sugar production do often reflect fundamental contradictions in the capitalist mode of production itself. Regulation can hardly negate these. However consideration can and should be given to what constitutes the most appropriate forms of regulation within the context which this defines. In practice, most attempts to regulate sugar production have involved either policies designed to control overall levels of production - the ISAs or the Cairn's Groups arguments in favour of a total liberalisation of international trade; or what Moulaert and Swyngedow term minor adjustments to what are perceived as 'conjunctoral crises' - incremental technological changes and the like. Where more profound measures have been promoted, such as the deregulation of the Australian sugar sector, these have not involved qualitative changes in the organisation of the accumulation process. Rather the opposite, the regulatory measures enacted have been largely determined by the wider mode of social regulation and, in practice, they have served to sustain established class structures rather than the environmental and social resources which underpin sugar production. The effective regulation of sugar

production requires a reappraisal not just of the structural properties of the global sugar economy or specific feature of local production systems, but also of those elements of the MSR which link structurally defined tendencies to the practices and outcomes actually realised. At present, MSR are defined by an object of regulation which is centrally concerned to sustain economic growth and through this to protect extant class structures. Thus environmental and social resources are devalued before established patterns of social relations are invalidated. As the transition from plantation based production to family farms demonstrates, production can be sustained through strategies which devalue property rights and power rather than the material basis of sustainability, but this is not what currently happens. Regulation of sugar industries needs to be concerned as much with the norms and values which legitimate and empower specific instruments as it is with the instruments themselves.

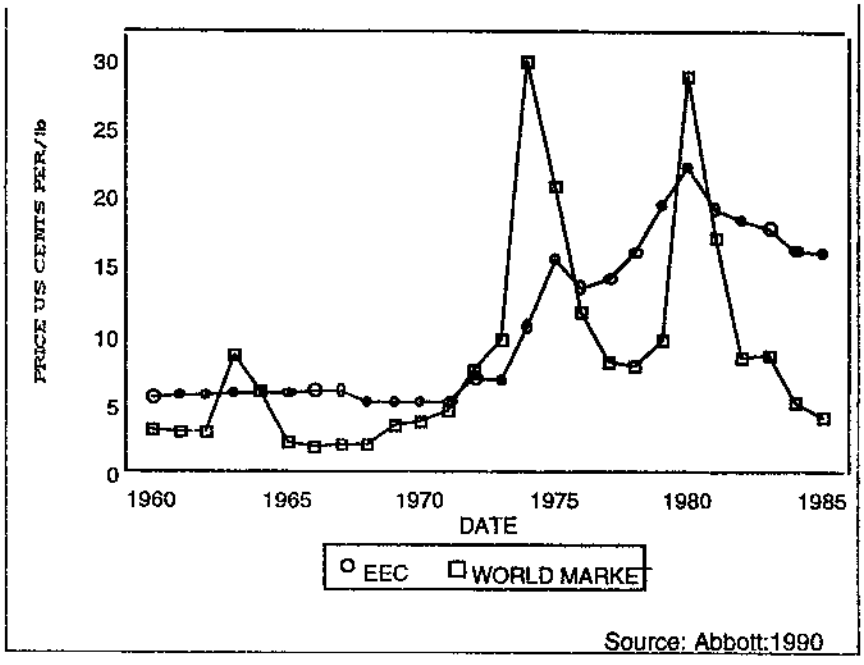


Figure 2. **ISAs and world sugar prices**

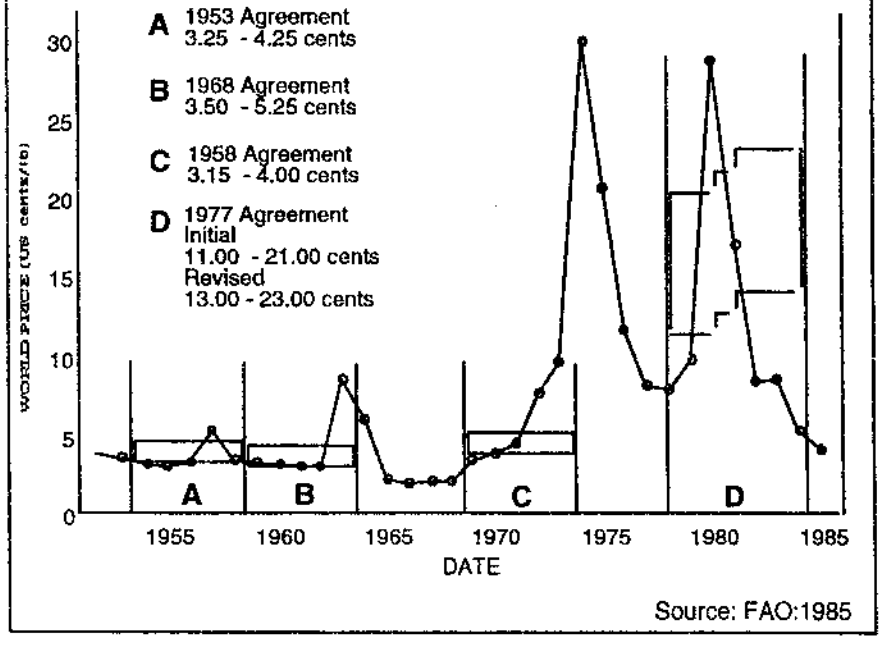
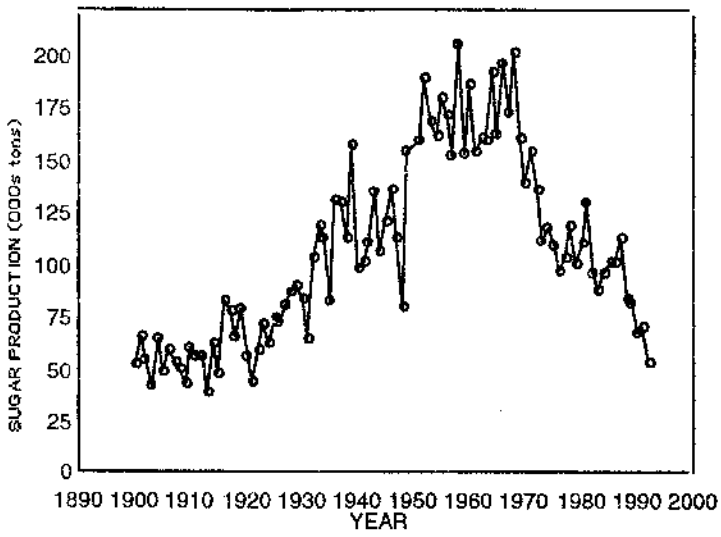
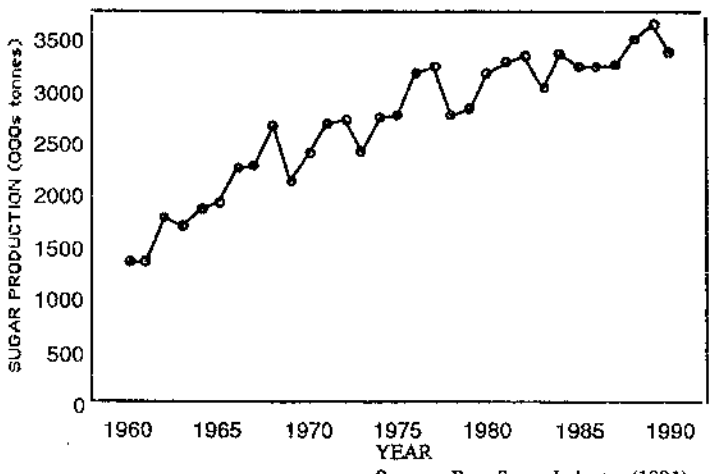


Figure 3. **Barbados Sugar Production 1900 to 1992**



Source: BSIL

Figure 4. **Queensland Sugar Production 1960 - 1990**



Source: Raw Sugar Industry (1991)

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Notes

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1 In 1985 values.

2 For an explanation of the EU sugar regime see Coote (1987); Borrell & Duncan (1990); Abbott (1990).

3 BSIL. Barbados Sugar Industries Limited. Share ownership in the company was restricted to major sugar producing landowners on the island.

4 The Barbadian dollar is formally linked to the US$ at a rate of B$2 = US$1.

5 Booker Tate is a jointly owned subsiduary of Tate and Lyle and Booker.

6 At 1995 exchange rates, A$1=c.£0.50, c.US$0.75).

7 The one aspect of the regulatory system which remains is the single desk marketing arrangement for all Australian sugar exports.

8 In regulation theory, a distinctive period of sustained accumulation is referred to as a 'regime of accumulation'.