

Policy Dialogue

The role of governments in developing agriculture value chains

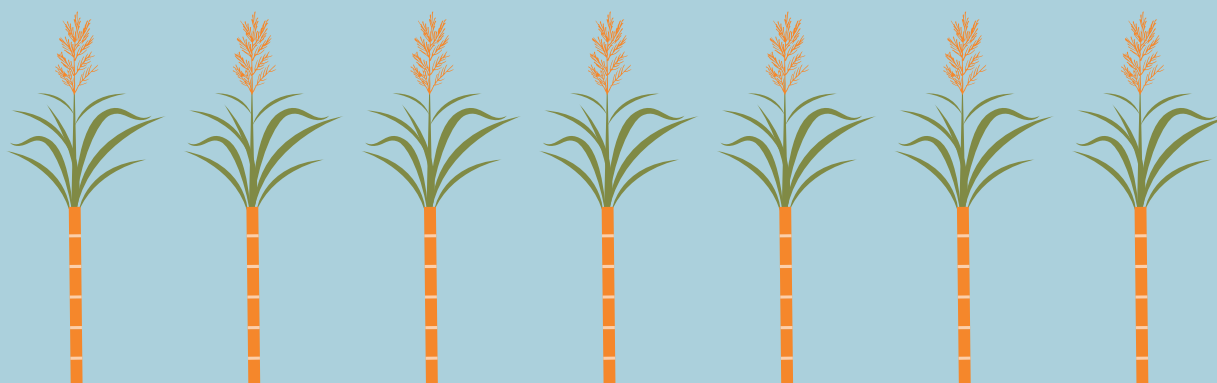
2019



Case study 4

The sugarcane value chain in Mauritius

#MoreThanJustCrops



CONNECT • SHARE • REFORM

Acknowledgements

This case study was written by Dr Kassiap Deepchand (former Deputy Executive Director of the Mauritius Sugar Authority and former Head of the Department of Sugar Technology at the Mauritius Sugar Industry Research Institute) and Dr Vikram Seebaluck (Senior Lecturer and Head of the Department of Chemical and Environmental Engineering at the University of Mauritius).

Ms Shaïna Lutchmeenaraidoo, contributed as a research assistant. Appreciation is given to key sugar industry stakeholders in Mauritius for their informed views used in the writing of this paper.

A special thanks is extended to the Mauritius Cane Industry Authority for facilitating the development of the case study.

Comments and support were provided by Shanaz Broermann from the CABRI Secretariat. Additional comments were provided by Biniam Bedasso, Kit Nicholson and Yash Ramdharee.

For information on the Collaborative Africa Budget Reform Initiative, or to obtain copies of this publication, please contact:

CABRI Secretariat
Cnr John Vorster & Nellmapius Drive
Centurion, 0062
South Africa
www.cabri-sbo.org

Design and layout by Leith Davis
Editing by Laurie Rose-Innes

This publication was funded by the African Development Bank. The findings and conclusions do not necessarily reflect their positions or policies.



AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LA BANQUE AFRICAINE
DE DEVELOPPEMENT

Contents

Executive summary	5
1. The sugar industry in Mauritius	6
1.1 History	6
1.2 Current status	7
1.3 Prospects	8
1.4 Key industry production and economic statistics	9
2. Drivers for change and the industry's dynamics	11
2.1 Key drivers	11
2.2 Dynamics of the sugar industry	14
3. Governmental policies and strategies	15
3.1 Policies and strategies	15
3.2 Funding secured and used	21
3.3 Support to the small-planter community	22
4. Strategic roles of stakeholders and key lessons learnt	23
4.1 Roles of industry stakeholders and their synergies	23
4.2 Key lessons learnt	24
<i>References</i>	25
Annex 1: Key sugar industry production and economics statistics (1985–2017)	26

Tables, figures and boxes

Tables

Table 1: Key sugar industry production and economic statistics	10
Table 2: Summary of drivers for change in the development of the sugarcane value chain	11
Table 3: Measures adopted in the Sugar Sector Strategic Plan 2001–2005	17
Table 4: Highlights of the MAAS Action Plan 2006–2015	18
Table 5: Funding earmarked for the sugar industry under the MAAS Action Plan 2006–2015	21

Figures

Figure 1: A value flow chain diagram for the export of sugars to different markets	8
Figure 2: Revenue flow to planters, millers and power plants per tonne of cane produced in 2017	20
Figure A1: Trend in area under cane cultivation and sugarcane production (1985–2017)	26
Figure A2: Trend in sale price and ex-Syndicate price per tonne of sugar (1985–2017)	26
Figure A3: Trend in GVA/GDP contribution and industry income (1985–2017)	27
Figure A4: Trend in employment and number of small planters (1995–2017)	27
Figure A5: Trend in electricity export from the sugar industry (bagasse and coal) and bagasse percentage share in the country's electricity production mix (1990–2017)	28

Acronyms and abbreviations

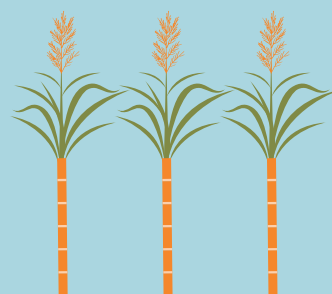
ACA	African Cashew Alliance	MSA	Mauritius Sugar Authority
ACP	African, Caribbean and Pacific	MSIRI	Mauritius Sugar Industry Research Institute
CABRI	Collaborative Africa Budget Reform Initiative	MSS	Mauritius Sugar Syndicate
CPMACB	Cane Planters and Millers Arbitration and Control Board	MUR	Mauritian rupee
CSA	Commonwealth Sugar Agreement	PPAs	power purchase agreements
EU	European Union	SIEA	Sugar Industry Efficiency Act
GDP	gross domestic product	SIFB	Sugar Insurance Fund Board
GEF	Global Environment Facility	SP	Sugar Protocol
GHG	greenhouse gas	SIT	Sugar Investment Trust
GVA	gross value added	SPMPC	Sugar Planters Mechanical Pool Corporation
LDCs	Least Developed Countries	USD	United States dollar
MAAS	Multi Annual Adaptation Strategy	WTO	World Trade Organisation
MCIA	Mauritius Cane Industry Authority		



The case study synthesises the history, status and prospects of the Mauritian sugar industry and relates to the key drivers and dynamics for change in the development of the sugarcane value chain.



Executive summary



The sugar industry in Mauritius is resilient and has constantly developed efficient means to remain viable and competitive in the global sugar sector. Despite the country being a relatively very small supplier of sugar to the international markets, it has faced daunting challenges, like the erosion of preferential markets and guaranteed remunerative sugar prices. The country has been successful in revamping its sugar industry and transforming it into a dynamic, viable economic activity that so far has thrived within a complex socio-political and economic landscape.

This case study was prepared as part of the Collaborative Africa Budget Reform Initiative's (CABRI) value for money in public spending work. It was developed for the Mauritius country review on the role of government in developing agriculture value chains for employment creation and poverty reduction. Mauritius has the distinction of successfully transforming the sugarcane value chain, and the country review provides the opportunity for practitioners across Africa to learn from the Mauritian experience, facilitating peer learning and exchange.

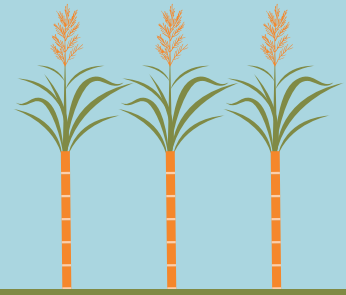
The case study synthesises the history, status and prospects of the Mauritian sugar industry and relates to the key drivers and dynamics for change in the development of the sugarcane value chain. The policy-based interventions and strategies,

including incentives offered by the government to create a conducive environment for private sector investment are documented, as is the support of multiple service-providing institutions playing specific key roles. Emphasis is laid on the judicious use of funds and forgone revenue based on governmental fiscal incentives in improving the viability and competitiveness of the industry, with particular attention given to the more vulnerable small planters' community, which is a minor but vital industry stakeholder.

The key lessons derived from the Mauritian sugar industry, namely the timely and proactive enacted policies and strategies, including: their implementation and co-ordination; the rational use of resources for the rehabilitation and modernisation of the industry; the innovative breakthroughs in producing sugarcane value-added products including focusing on product excellence; the trust and credibility in executing projects based on performance indicators and in compliance with policy-based measures and incentives; and the North–South technology transfer approach including South–South co-operation for knowledge sharing, were key to the progress made by the industry, and which provides replication and capitalisation opportunities for other industries.



Photo: Sugarcane plantation, Mauritius (©Omnicanne)



1.1 History

Sugarcane was introduced in Mauritius some four centuries ago (in 1639) by the Dutch and, by 1641, two processing plants had been established to recover white and black sugars. By 1642, only arrack (rum) was produced. Under French colonisation (1710–1810), approximately 3 600 hectares of cane were planted and 3 000 tonnes of sugar were produced by the two sugar factories in operation. The importance of agricultural development, with sugarcane production as a priority, was realised when the British took over the island in 1810; 11 000 hectares of cane were cultivated in 1825 to produce 10 800 tonnes of sugar in the 110 sugar factories at that time (PROSI 1997).

With the abolition of slavery in 1835, indentured labourers were brought from India as a substitute for African slaves used for cane production. Cane production was then boosted with new cane varieties grown with fertilisers, and a railway system was put in place to transport cane from various parts of the island. These developments enabled the cultivation of 72 000 hectares of cane by 1862 while 259 small factories operated to recover around 150 000 tonnes of sugar. Mauritius was the leading sugarcane producer in the British Empire in the 1860s (Meisenhelder 1997). Since then, several events occurred that were not conducive to expansion. These included pests and diseases affecting the crop, a severe cyclone in 1892, the death of around 10 per cent of the population due to malaria, a drop in world sugar prices, the application of customs duties on British imports, an increase in wages following World War I and social unrest and riots on sugar estates. In 1938, the area under cane cultivation was 60 000 hectares and 37 sugar factories were in operation, producing 320 000 tonnes of sugar (PROSI 1997).

After World War II, the demand for sugar increased in Britain, which boosted production in its colonies, thereby initiating a long-term remunerative market. In 1951, the Commonwealth Sugar Agreement (CSA) came into effect and Mauritius secured a quota of 386 000 tonnes of sugar, which enabled long-term investments in the industry. Cane production was increased with better cultivation practices, as well as sugar recovery in modern sugar factories, combined with an improved financial and administrative set-up.

Mauritius became independent from Britain in 1968. In 1973, 87 000 hectares of land (almost half of the island) was under cane cultivation, and 720 000 tonnes of sugar were recovered in 21 modern sugar factories (Deepchand 2010). The industry had matured by that time and sugar became the main export commodity driving the agricultural economic pillar of the country. In 1975, Britain became a member of the European Economic Community (EEC) and in its negotiations with the EEC, the CSA became part of the deal. The Sugar Protocol (SP), with the assurance of a long-term market with guaranteed prices, became operational. African, Caribbean and Pacific (ACP) countries and India obtained a quota of 1.3 million tonnes of sugar, out of which Mauritius acquired a share of 0.5 million tonnes (Deepchand 2010).

Mauritius has almost always been a reliable supplier of sugar, able to honour its supply commitments to the European Union (EU) under the SP. The prevailing special sugar regime, in place since colonisation, has involved the full participation of the industry at large, and the relationships between various industry partners have always been regulated by the government. Thus, the benefits derived under the protocol have trickled down to the various industry partners, namely the millers, planters, workers and population at large. However, from the year 2000, with the opening of the global market, preferential trade agreements and other barriers to trade began to attract criticism, so much so that in 2001 tariffs were eliminated on almost all imports from 48 of the Least Developed Countries (LDCs) under the 'Everything but Arms' regulations of the EU. Sugar, rice and bananas were excluded, but in 2003 Australia, Brazil and Thailand, three major sugar-supplying countries, challenged the legality of the SP at the World Trade Organisation (WTO) and obtained a favourable ruling, in terms of which 5.1 million tonnes of sugar exports had to be phased out.

A reform package for the sugar regime was put in place with a price reduction of 36 per cent spread over four years. The EU preferential price under the protocol fell from € 524 to € 335 per tonne of sugar in 2008 and Mauritius, as one of the affected SP countries, benefited from EU accompanying measures, such as funds provided by the EU to Mauritius to mitigate the impact of the sugar reforms (Deepchand 2010). However, Mauritius had since 1985, in anticipation of the impending threats to the SP, devised strategic plans and policies to safeguard its acquis under the protocol and

concurrently developed cane-based industrial activities. The focus of Mauritius in this regard has been the sustainable production of sugar and products derived therefrom in a technically efficient, financially viable and environmentally friendly manner for the socio-economic well-being of its population and the country at large.

1.2 Current status

Sugarcane cultivation covered 54 182 hectares of land in Mauritius in 2017, with an annual harvest of 49 974 hectares to produce 3 713 331 tonnes of cane at an average yield of 74.3 tonnes per hectare (Statistics Mauritius 2018a). Cane production from miller-planters and large growers accounted for around 80 per cent, while the remaining 20 per cent was obtained from the small-planter community. Four sugar factories (which decreased to three in 2019) operating in the four cardinal zones of the country produced 355 213 tonnes of sugar (mostly white refined and special sugars) at an average extraction rate of 9.57 per cent (Statistics Mauritius 2018a). Some 122 273 tonnes of molasses and 1 259 000 tonnes of bagasse were produced concurrently as main by-products (Statistics Mauritius 2018a).¹

The gross income obtained from sugar sales in 2017 was 7.182 billion Mauritian rupees (MUR), equivalent to MUR 20 069 per tonne (USD 1 = MUR 34.5 in 2017), and the net revenue, or ex-Syndicate sugar price, was MUR 10 717 per tonne, while a subsidised price of MUR 13 417 per tonne was paid to sugarcane producers (Mauritius Sugar Syndicate 2018).²

The export sugar markets were mainly the EU and the regional market, except for a small amount sent to the United States and world market. The liberalisation of EU production quotas in October 2017 geared the shift of sugar sales from the traditional EU market to regional ones – the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC). A value flow chain diagram for the export of sugars to different markets is given in Figure 1. The sugar industry contributed to a gross value added (GVA) of around 0.65 per cent in the Mauritian economy (or 18.7 per cent in the agricultural economy) in 2017 (Statistics Mauritius 2018a). Direct employment in the industry amounted to 12 200 employees (8 900 males and 3 300 females), in addition to the livelihoods of 13 243 sugarcane planters, including 12 937 small planters (Statistics Mauritius 2018a).

Electricity production by the sugar industry amounted to 1 775 GWh in 2017 (463 GWh from bagasse and 1 312 GWh from coal) (Statistics Mauritius 2018b), generated by three ‘bagasse-cum-coal’ power plants (with installed capacities of 36–90 MW) operating throughout the year, one continuous

power plant (with an installed capacity of 22.5 MW) producing electricity only during the six-month cane-crushing season, and two coal power plants (with installed capacities of 28–32 MW). Bagasse electricity contributed 14.8 per cent of the total country’s electricity production, which was dominated by 80 per cent non-renewable fuels (42.1 per cent coal and 37.9 per cent fuel oils) (Statistics Mauritius 2018b). Independent power producers (mostly from the sugar industry) generated 59 per cent of the country’s electricity needs while the rest (41 per cent) was generated by the utility company, the Central Electricity Board (Statistics Mauritius 2018b).

In 2017, around 56 per cent of the sugarcane molasses produced was used for hydrous ethanol production for export and 12 per cent for the production of potable alcohol (including other derived products) while the remainder (32 per cent) was exported (Mauritius Sugar Syndicate 2018). The revenue generated was around MUR 290.8 million or MUR 2 391 per tonne molasses (or MUR 800 per tonne sugar produced) (Mauritius Sugar Syndicate 2018). Additional revenue through a contribution of MUR 40 per litre of cane-based potable alcohol produced/imported amounted to MUR 99.1 million or MUR 1 152 per tonne molasses (or MUR 500 per tonne sugar produced) (Mauritius Sugar Syndicate 2018).

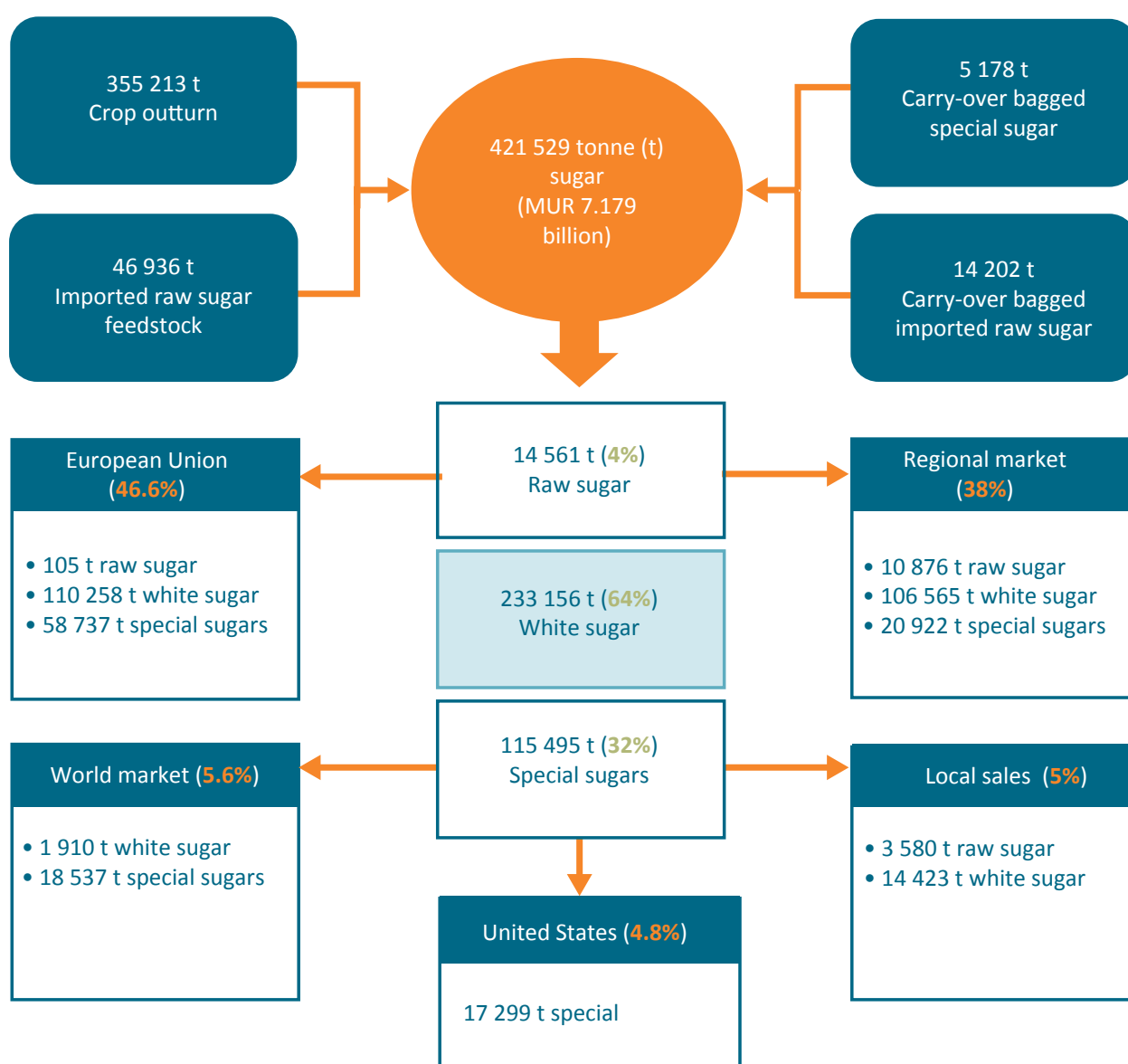
Mauritius has had high exposure to the EU for its sugar market and following trade liberalisation, has diversified within the sugar sector through the production of fairtrade sugar, refined and special sugars, ethanol and electricity. Despite the implementation of government-led strategies, investment in activities related to field and factory modernisation, and value addition and revenue diversification, the industry is suffering from a significant loss of cane lands, in particular those belonging to small and medium planters.

The country has not been able to sustain production of sugar at prices prevailing in the world market. It is also observed that markets for special sugars in the EU are becoming saturated while those for sugar locally and regionally may face oversupply with the loss of preferential sugar markets. Therefore, mitigation measures are being implemented, such as more intense regrouping of small/medium planters to reduce land abandonment, maximising production capacities of refineries with the importation of raw sugar, implementing import duties on direct consumption sugar and alcohol and electricity sales, use of accumulated reserves under the Sugar Insurance Fund for ad hoc sugar price subsidisation, in particular for the small planters, manpower rightsizing, and aiming at the self-financing of support institutions such as the Mauritius Sugar Industry Research Institute (MSIRI).

1 Molasses is the viscous, dark sugar-rich by-product obtained in the cane-to-sugar process from which no further sugar can be recovered economically. Bagasse is the fibrous residue remaining after juice has been extracted from cane in the mills.

2 The ex-syndicate sugar price is the average price paid to producers per tonne of sugar after deduction of all expenditure incurred out of the total sugar proceeds.

Figure 1: A value flow chain diagram for the export of sugars to different markets



Source: Mauritius Sugar Syndicate (2018)

1.3 Prospects

The sugar industry has played key multifunctional socio-economic and ecological roles since its introduction and establishment in Mauritius, and has been a major stimulus in the economic development of the country. Although the industry's economic share has gradually decreased with the diversification of the Mauritian economy into other economic pillars over the years, it remains a major economic, as well as traditional, activity that has not been substituted to date. The strong foundation coupled with continuous, timely modernisation of the industry, including its major diversification into the energy sector over the past three decades, has enabled it to evolve in the extensive, globally

competitive sugar industry despite being a very small sugar supplier. Further rationalisation with the modernisation of agricultural cane production on optimally productive land and up-scaling of the sugar factories (three large-capacity mills in 2019 rather than the previous four) is intended to further decrease the production cost of sugar.

Concurrently, markets are diversified into regional ones and their penetration enhanced through adherence to global sustainability principles and practices with a view to meeting evolving customer needs and expectations. Prospects for tapping the regional market through the new African Continental Free Trade Area (AfCFTA) would benefit Mauritius, provided large low-cost producers outside the continent are not granted preferential access. Accreditation and

certification to international standards (Bonsucro Chain of Custody Standard), together with a focus on sugar quality and traceability, builds credibility and market recognition, while Fairtrade-labelled sugar production (by 29 sugarcane planter co-operatives regrouping some 3 100 planters so far) promotes Mauritius as a sustainable sugar-producing country of origin. The integration of biofertilisers (on a small scale) in the cane nutrients management strategy, coupled with the adoption of good agricultural practices, promotes sustainable production of sugar, which facilitates niche markets and partnerships (Altro-Mercato Ferrero Initiative).

On the other hand, the expansion of energy-related activities (electricity and bioethanol production) of the sugar industry that fetches almost the same revenue as sugar production is complementing the competitiveness of the industry and ensuring its viability. Electricity production from cane residues (already demonstrated commercially) and the production of fuel ethanol being promoted through the 'Renewable Sugar Cane Industry Based Biomass Framework' and 'Ethanol and

Molasses Framework' respectively, both set up in 2018, would further consolidate revenue addition to the industry. These proactive measures are undertaken jointly by the private sector and the government, and are intended to sustain the competitiveness and long-term viability of the industry in the face of the cyclical nature of global sugar prices and global sugar industry dynamics. These bold steps are taken to maintain the multifunctional roles of the industry that crosscut into other sectors like energy, the environment and tourism.

1.4 Key industry production and economic statistics

A summary of selected key sugar industry production and economic statistics over the past decades since 1985 are given in Table 1. The yearly trends over the past two and a half decades is given in Annex 1 (Figures A1–A5).



Photo: Omincane's power plant burns bagasse and coal to produce electricity and steam

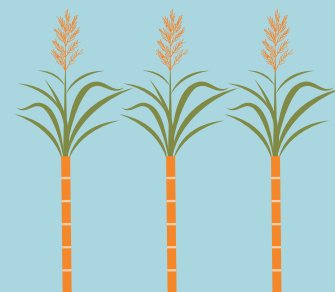
Table 1: Key sugar industry production and economic statistics

Indicator	1985	1990	1995	2000	2005	2010	2015	2017
Area under cane cultivation (x1 000 Ha)	86	82	77	77	72	62	57	54
Sugarcane harvested (x1 000 tonnes)	5 583	5 548	5 159	5 109	4 984	4 366	4 009	3 713
Sugar production (x1 000 tonnes)	646	624	540	569	520	452	366	355
Sugarcane bagasse production (x1 000 tonnes)	1 597	1 659	1 617	1 492	1 535	1 332	1 359	1 259
Sugarcane molasses production (x1 000 tonnes)	154	168	150	144	145	144	132	122
Number of small planters	33 500*	34 413**	28 873	28 257	26 303	20 099	14 213	12 937
Number of sugar factories	19	19	17	14	11	6	4	4
Employment (Total)	46 603	39 945	29 109	24 786	13 803	8 739	6 507	5 925
• Male	34 373	29 873	19 905	17 797	11 246	7 202	5 612	5 223
• Female	12 230	10 072	9 204	6 989	2 557	1 537	895	702
Sugar price (MUR/tonne)								
• Sale price	5 345	8 694	12 670	12 910	19 452	19 563	22 039	20 079
• Ex-syndicate price	4 261	7 337	11 463	11 570	17 626	13 535	13 166	10 717
Industry income (billion MUR)	3.5	5.4	6.9	7.4	10.1	8.9	8.1	7.2
Index for the internal purchasing power of the MUR	-	-	94.3	69.8	54.5	39.7	33.2	31.7
GVA/GDP contribution (%)	15.4	9.9	8.0	7.2	4.2	1.4	1	0.8
Electricity export (GWh)	-	98	125	601	836	1 310	1 431	1 514
• Bagasse	-	53	84	326	302	343	381	338
• Coal	-	45	41	275	534	967	1 047	1 176
Bagasse electricity % country production	7.6	7.9	8.0	24.2	19.9	20.6	17.0	14.8

Note: *Year 1983, **Year 1991

Sources: MSIRI (1986–2015); Mauritius Sugar Syndicate (1986–2018); Statistics Mauritius (1986–2018a); Statistics Mauritius (1986–2018b); MCA (1986–2005); Deepchand (2001)

2 Drivers for change and the industry's dynamics



2.1 Key drivers

The key drivers for change in the development of the sugarcane value chain in Mauritius can be grouped over three distinct eras: (i) the historical foundation and establishment of the industry in the country (1950–1975); (ii) the consolidation and modernisation of the industry as a vital agricultural economic pillar (1975–2005); and (iii) the transformation of the industry into a viable, globally

competitive and sustainable economic activity (2005–2018). The sugar and energy regimes have been interacting during these time periods, and gradually became complementary in mitigating the impact of the changes affecting the long-term economic viability of the industry. Table 2 provides a summary of the key drivers and their impact, followed by their origin and rationale, described chronologically. The policy-based interventions made by the government together with the fiscal measures and incentives, including support to industry stakeholders, are documented in Section 3.

Table 2: Summary of drivers for change in the development of the sugarcane value chain

Era/Time period	Drivers for change	Impact
Historical foundation and establishment of the industry (1950–1975)	Agro-climatic suitability of sugarcane coupled with availability of land in the country and market access for sugar	Agricultural production and expansion of sugarcane throughout the country and export earnings from sugar
	Economic developmental needs of the population and country	Private sector investment facilitated by the government and creation of sustainable livelihoods for small planters and employees
	Conducive political landscape for enhancing agricultural development and embedded sugarcane culture	Earnings ensured food security, improved standard of living and promoted economic development
Consolidation and modernisation of the industry (1975–2005)	Access to preferential export markets with remunerative/guaranteed prices	Industry expansion with higher income for industry stakeholders
	Need for consolidation, expansion and modernisation of the sugar industry to ensure its economic viability	Agricultural modernisation, factory upscaling and centralisation, organisational reinforcement and support to the small-planter community
	Industry diversification into electricity production from sugarcane bagasse	Improved national energy security with diversification of the power-generation mix
Transformation of the industry into a viable, globally competitive and sustainable economic activity (2005–2018)	Reduction in sugar prices following reforms of the EU sugar regime, succeeded by the complete liberalisation of EU sugar production quotas	Completion of all the local sugar industry reforms, which enhanced the economic viability of the industry to make it globally competitive
	Securing new markets for sugar export following the erosion of traditional preferences/markets	Production of refined sugar, including special sugars, which fetch premium prices, to obtain the highest revenue in the sugar-marketing value chain
	Diversification needs for contribution to the country's energy security (electricity production from cane fibres and fuel-ethanol production from cane molasses)	Transformation of the traditional 'sugar' industry into a more vibrant 'sugarcane' industry focused on both sugar and energy production to increase industry income

Historical foundation and establishment (1950–1975)

The inherently favourable climatic conditions for optimal cane growth in Mauritius – more than 1 200 hours of sunshine per annum with mean annual temperatures ranging from 26 to 34°C and an annual rainfall pattern of between 1 200 and 1 500 mm under rainfed conditions (Blume 1985) – were crucial in determining the suitability of the crop in Mauritius. In addition, the concurrent availability of sizable portions of land with soil characteristics appropriate for cane cultivation allowed for the expansion of the crop throughout the country. Three distinct agro-climatic zones, namely the sub-humid, humid and super-humid zones, covering the whole island were identified for cane production in suitable and available lands which could not be matched for other crops.

The economic developmental needs of the population and the country as a whole at the time were key to the development of the sugar industry. The majority of the population were poorly literate and their livelihoods and potential improvement in standard of living, including education could be sustained only by agricultural development. Coincidentally, a significant portion of the population that purchased small plots of land (less than 5 hectares) eventually cultivated sugarcane and formed the small-planter community as a key stakeholder of the sugar industry. The other categories of cane growers, namely the large planters who owned more than 42 hectares of land (miller-planters and corporate planters) and medium planters cultivating between 10 and 42 hectares gave employment to thousands of people in cane agricultural production, harvesting and supply, and cane processing in the several mills in the country. Sugarcane production, thus, developed into a very common practice in the country with most of the people directly or indirectly involved with the industry, which became embedded in the Mauritian culture.

The sugar industry was dominated economically by the corporate sector, while providing sustainable livelihoods to planters and employees, as well as meaningful revenue and foreign exchange to the government. The political landscape during this period was highly conducive to agricultural development given the very low gross domestic product (GDP) (mono-crop economy), poor literacy (unskilled labour), and large employment and food provision needs of the growing population. Staple crops or food necessities for the Mauritian population, namely rice, wheat and other cereals, could not be produced in the country but self-sufficiency was achieved in vegetable production. Earnings from cane and sugar production served as a sustainable means for funding food imports and, thereby, ensuring food security for the population.

As a former British colony, Mauritius benefited from the Commonwealth Sugar Agreement (CSA) in 1951 for the long-term supply of 386 000 tonnes of sugar to the UK at remunerative prices (Deepchand 2010). Savings achieved from cane cultivation enhanced investment in housing and

education for the planters and employees of the sugar industry while the earnings by the government, through its tax regime on sugar sales, enabled the development of the sector and the country. The corporate planters enjoyed sustainable income over the years, which was invested in the sector and other developing economic pillars such as the Export Processing Zone and the tourism sector.

The historical drivers for the foundation of the sugar industry in Mauritius were, thus, the agro-climatic suitability and adaptability of sugarcane in the country coupled with land availability, the economic developmental needs of the population and country, and a political landscape conducive to enhancing agricultural development at that time. Investment was driven mainly by the private sector (miller-planters and corporate planters), which was facilitated by market access via the government and appropriate legislation and regulations.

Consolidation and modernisation (1975–2005)

Access to preferential export markets, together with better and guaranteed sugar sales prices for larger volumes of sugar since 1975, was central to the consolidation, expansion and modernisation of the sugar industry in Mauritius. The higher income enabled the gradual modernisation of agricultural operations, upscaling of sugar factories, reinforcement of organisational structures, consolidation of the small-planter community, and investment in the generation of value-added products in the industry. Diversification into sugarcane bagasse electricity production was the cornerstone of energy security in the country. These key drivers ensured the industry's economic expansion and development until the need for higher competitiveness arose with the introduction of international sugar market reforms.

Mauritius secured a quota of 506 000 tonnes of sugar from the EU under the SP negotiated in 1975, which was increased by an additional 85 000 tonnes in 1995 under the special preferential sugar agreement with the EU, the latter priced at an equivalent 80 per cent of the remunerative SP price (Deepchand 2010). The long-term market access, together with guaranteed remunerative sugar prices for a larger amount of sugar enabled the economic expansion and modernisation of the industry. Cane cultivation practices were modernised, the supply chain (harvesting and supply logistics) was rationalised, smaller sugar factories were centralised into bigger ones to benefit from economies of scale, and additional land under tea cultivation, a dwindling sector, was allocated to cane production by the small-planter community.

The co-ordinating organisation, the Mauritius Sugar Authority (MSA), nowadays the Mauritius Cane Industry Authority (MCIA), and supporting organisations, namely the Mauritius Sugar Industry Research Institute (MSIRI), Mauritius Sugar Syndicate (MSS), Cane Planters and Millers Arbitration and Control Board (CPMACB), Sugar Insurance Fund Board (SIFB)

and the Sugar Planters Mechanical Pool Corporation (SPMPC), were consolidated and aimed at contributing to higher cane yield, enhancing mechanised operations through the establishment of de-rocking schemes, promoting better irrigation techniques for efficient use of water resources, supporting crop diversification for optimal use of land resources, revamping cost-effective supply chain systems extending from manual harvesting to semi-mechanised and fully mechanised harvesting systems, together with high-volume transportation/supply logistics, and enhancing sugar productivity in cane milling activities with reduced production cost, including the production of value-added products.

Particular emphasis was laid on the production of electricity using sugarcane bagasse. Indeed, the sugar industry had been supplying electricity to the Central Electricity Board (on a very small scale) since 1957; however, with the oil crises in the 1970s, early 1980s and 1990s it was found that the industry could become a potential electricity supplier to the grid to decrease the country's heavy reliance on imported fuel oil and vulnerability to fluctuating oil prices (Long, Seebaluck & Leach 2017). Diversification into local energy resources for power generation to improve energy security motivated the government to facilitate investment in sugarcane bagasse electricity production. The adoption of a series of policy reforms boosted niche-level technical innovation and investment in the energy sector. The key measures initiated included the following: the development of suitable electricity supply agreements, or power purchase agreements (PPAs), modulated to the grid's needs; the creation of independent power companies (separate entities for sugar factories and power plants); ensuring availability of raw material for the power plants through bagasse storage, construction of a bagasse pellets plant (which was found not to be viable at that time and abandoned), and promoting savings of bagasse in smaller sugar factories for transfer/sale to centralised bagasse cogeneration plants; complementary use of coal for year-round electricity production in the sugar industry's power plants (using bagasse-cum-coal cogeneration); factory rehabilitation and modernisation for improving energy efficiency, thereby enabling higher electricity export to the grid; and fiscal incentives for investment in modern and state-of-the-art power plants. Funding was secured by the government from the World Bank and the Global Environment Facility (GEF) to implement the policy measures and promote private sector investment in bagasse electricity generation.

Transformation into a viable, globally competitive and sustainable economic activity (2005–2018)

Reforms made in the EU sugar regime in 2006 due to the ruling of the WTO, which entailed a significant reduction in the sugar price by 36 per cent over four years, had a severe impact on the Mauritian sugar industry (Deepchand 2010). Further downward pressure on global sugar prices compounded by the liberalisation of EU sugar production

quotas in 2017 completely eroded all of the traditional advantages from which the Mauritius sugar industry previously benefitted. The Mauritian government was proactive and, in anticipation of these challenges, incorporated reforms to the local sugar industry in its latest strategy and action plan, while amending the enacted policies accordingly to transform the traditional sugar industry into a more vibrant sugarcane industry geared towards both sugar and energy production. The industry is expected to become economically viable, globally competitive and sustainable over the long term.

The sequential policy measures for modernising agricultural production and improving agricultural yield were accentuated, while the upscaling and centralisation of factories was completed to increase sugar productivity and reduce production costs. Sugar refineries were constructed to process raw sugar into refined sugar to obtain the highest revenue in the sugar-marketing value chain. Focus was laid on the production of special sugars having specific qualities, a niche innovation of the Mauritian sugar industry, which invested in the development of these high-value-added sugars over decades, enabling improved market penetrability and fetching premium sugar prices compared to the 'commoditised' refined sugar.

The construction of modern bagasse cogeneration plants annexed to each sugar factory has maximised bagasse electricity production. Further investment is being made for collecting part of the sugarcane agricultural residue left in fields for combustion in existing bagasse cogeneration plants for incremental electricity export to the grid. Concurrently, research and development is being intensified for the production of high-fibre cane (fuel/energy cane varieties) to boost the electricity production potential from cane biomass as required by the 2018 'Renewable Sugar Cane Industry Based Biomass Framework'. Diversification into value-added products is further accentuated with the construction of distilleries for the conversion of sugarcane molasses (another sugarcane by-product obtained during sugar processing) into alcohol for potable and fuel-use purposes, which will be regulated by the development of the 'Ethanol and Molasses Framework' that came into force in 2018.

The government implemented the reforms for the sugar and energy regimes through its enacted policies, and facilitated private sector investment by providing contracts and guarantees (PPAs and proposed regulations for mandatory fuel ethanol blending) and several fiscal incentives in terms of which the government would forgo revenue. It equally used the funds received from the EU during the reform of its sugar regime to co-finance the measures for improving the viability of the industry, including support given to the small-planter community.

2.2 Dynamics of the sugar industry

The drivers for change in the sugar industry in Mauritius are closely associated to the changing aspects of the industry, which evolved from a sugar to a sugar-energy regime that has recently gained impetus as an influence on the environmental regime in the country. Mauritius is faced with the challenge of continuously increasing greenhouse gas (GHG) emissions (23 per cent over the past decade), driven mainly by the power sector (79 per cent imported fossil fuel electricity generation), which targets 35 per cent renewable electricity by 2025 (LTES 2009), while being historically dominated by sugarcane bagasse electricity (15 per cent in 2018). In 2015, the government of Mauritius committed in its 'Intended Nationally Determined Contributions' to reduce the country's GHG emissions by 30 per cent by 2030, with a focus on renewable biomass as the best mitigation scenario for the

power sector (MTNC 2016). This development raised important climate issues for the sugar industry, which extend to the environmental protection of land and green landscaping in the country. The sugar industry in Mauritius, thus, cuts across agricultural production, bioenergy generation, environmental protection and socio-economic development, cumulatively contributing towards agricultural development, energy and environmental security and sustainable economic development in the country.

The industry drivers are also intrinsically linked to the complex politico-socio-economic system in place, which is dominated by the private sector, while the small-planter community, as a minority stakeholder, plays a crucial role in traditionally continuing to produce sugarcane on a small scale. The government, as the regulator, has the key role in ensuring that the sugar industry's inheritance and future developments are equitably shared amongst all the industry stakeholders.



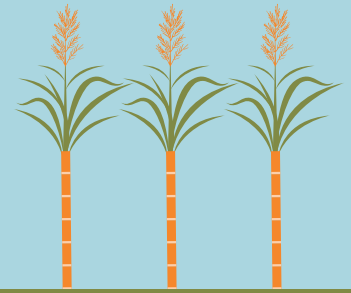
Photo: Harvested sugar cane being processed at Omnicane



Diversification into sugarcane bagasse electricity production was the cornerstone of energy security in the country.



3 Governmental policies and strategies



3.1 Policies and strategies

Since 1985, the government of Mauritius has developed several policies and strategies to improve the viability of the sugar industry and facilitate investment in the sector. The implementation of the policy measures, together with the incentives given, are considered sequentially below, highlighting the drivers for change in the development of the sugarcane value chain, which as a whole ensured the continued economic viability and competitiveness of the industry.

Sugar Sector Action Plan 1985–1990

While the industry has matured over time, a need was felt to work out plans to ensure its future, given that it could not expand further due to limited market and arable land availability in the country (SSAP 1995). There was consensus that an increase in production and profitability could be achieved only through optimal use of land, labour and processing facilities – for instance, exploitation of the bagasse for electricity generation and use of cane tops for livestock feed, use of cane land for improved crop production and the development of a synergy and confidence between all stakeholders.

One top priority was to enhance cane yield per hectare in the small-grower sector, which had a productivity of 80 per cent at that time compared to that of the corporate miller-planters. An extension service fully dedicated to the small growers (Farmers Service Centres) was set up to ensure that efficient measures for cane production were adopted with prepared land (de-rocking) and use of improved cane varieties (high yielding, and pest and disease free), accompanied by supervision and technical assistance. Techniques and cultural practices successfully adopted in the corporate sector were to be extended to this sector.

In cane milling, emphasis was laid on the export by millers of electricity from bagasse, firstly exporting intermittent power (later found not to be modulated to the needs of the utility), then the supply of so-called continuous electricity (from bagasse during the cropping season only), after which firm PPAs were negotiated between the utility and power plants (using bagasse during cropping and coal between cropping

for year-round production). On the basis of the success achieved, millers started to modernise the cane-to-sugar process with a view to exporting maximum electricity to the grid.

The cane growing area was by then divided into 21 factory zones to match the factory operational capacity with the totality of cane produced within the factory area. Subsequently, the areas were redefined considering spare capacity at a given mill based on forecasted cane production, topography and distance for cane transport. This measure minimised transport costs and enabled the creation of milling companies.

Policy measures were put in place to facilitate the implementation of these changes. The government exempted tax payments on the transfer of property, introduced changes in the payment of export duties on sugar by the big corporate entities in the sector and made provision for extending share ownership for millers and sellers of sugarcane-based co-generators of electricity. The World Bank provided support for a study in consultation with all partners and, *inter alia*, provided advice on the creation of the Mauritius Sugar Authority (MSA) in 1984. The support of the MSA was crucial in implementing and monitoring the provisions of the resulting Sugar Efficiency Act of 1988, which encapsulates the major findings of the study.

Bagasse Energy Development Program (1991)

As a small island developing state deprived of fossil fuel reserves, Mauritius has depended significantly on electricity generation from fuel oil. An insignificant amount of electricity has been generated by hydro resources, which peaked at 100 GWh per year upon exploitation of all the potential sites. Thus, alternative local energy resources were sought to reduce the country's dependence on imported fuels, and bagasse electricity was emphasised and facilitated by the Bagasse Energy Development Program (BEDP 1991).

The sugar industry is known to be self-sufficient in energy; bagasse obtained as a by-product of the cane-to-sugar process is used to produce the captive electricity and low-pressure steam required by the factory, while any excess electricity generated is exported to the grid. In Mauritius, one

sugar factory started to export electricity to the public in 1957, beginning with 0.28 GWh of intermittent electricity (produced as and when possible). Since then and until 1980, the number of factories undertaking such activity increased to ten, and 27 GWh were exported to the grid. Thereafter, continuous PPAs were signed and 116 GWh were fed to the grid in 1986, with 73 GWh produced from bagasse and 43 GWh from imported South African coal (Deepchand 2010).

The exportation of co-generated electricity to the grid has a bearing on centralisation, implying that the same amount of cane being processed in fewer sugar factories can have a beneficial impact associated with economies of scale in the cane-to-sugar process, while making available more bagasse to facilitate investment in larger power plants. This enhances efficiency in the conversion of bagasse into electricity and, in particular, the export of electricity to the grid. It is to be highlighted that power plants in a sugar factory represent around 50 per cent of the total investment.

Over the ensuing period, two new, modern power plants came into operation with respective installed capacities of 70 MW (in 2000) and 90 MW (in 2007) operating at 82 bars steam pressure and a temperature of 525°C. The electricity productivity from these plants was within the range of 125–135 kWh per tonne of cane.

Centralisation of sugarcane milling activities (1997)

Sugarcane milling companies have constantly put pressure on the government to allow them to cease milling operations in some factories due to their lack of financial viability and low cane-processing capacity. Closure of mills is regulated by the government because the industry is of national socio-economic importance. Two such requests were turned down, but upon referral to the Supreme Court for re-examination, the ruling was in favour of the companies and approval for closure was granted in 1984. Closure of mills, thus, became an issue together with the impending reforms in agriculture worldwide under the General Agreement on Tariffs and Trade. In the same context, electricity production from bagasse cropped up as an additional issue.

Consequently, a blueprint for the centralisation of mills was prepared in consultation with all industry partners, and it received government approval (BPCSM 1997). This plan places particular emphasis on the socio-economic dimension to the extent that it defines the obligations of the milling companies towards retiring workers and the small planters.

While the millers agreed to close down low-capacity mills and upgrade existing ones with higher capacity, the objective was to process the same amount of cane in fewer factories, thereby achieving the collateral benefits of reduced cost of cane milling coupled with efficiency in the cane-to-sugar process (adopting higher capacity and modernised equipment) and enabling investment in power plants with greater efficiency in the bagasse-to-energy export system.

Workers were entitled to compensation in cash and in kind (the latter in the form of a plot of land developed for residential purposes) as the main benefits. Small planters were to send their cane to existing sites next to the closed mill with weighbridges, cane testing facilities and unloading devices remaining in operation, the miller bearing the cost of their functioning and maintenance. In return, the millers were allowed to recoup costs incurred through the sale of land for residential purposes free of payment of land transfer tax and duties. Additional measures applicable to this activity and more details are given in the blueprint.

Sugar Sector Strategic Plan 2001–2005

While the industry has been making efforts to remain viable through rehabilitation, restructuring, modernisation and centralisation, coupled with diversification at both field and factory levels, two issues have arisen over which the industry has no control. These relate to events at the international level – the erosion of the preferential access of sugar to the EU and trade liberalisation. These events posed major challenges to the industry and, in order to address them, the industry developed the Sugar Sector Strategic Plan to enable it to ensure its long-term viability (SSSP 2001). It became essential to lower the cost of production and to enable competition with the LDC's sugar suppliers. The key measures adopted in the plan are given in Table 3.

The new Sugar Industry Efficiency Act (SIEA) of 2001, capturing the strategies identified including policy and fiscal measures, was promulgated to facilitate implementation of the SSSP through a complete overhaul of the SIEA of 1988. It included the framework to enable the democratisation of ownership of land, investment in cane growing and milling, adopting latest technologies, manpower rightsizing, cost recovery through converted land sales and provision of fiscal incentives, including exemption from taxes applicable to land and capital gains. The SIEA has annexed to it an updated list of plant and equipment eligible for exemption from duties and taxes in line with the strategies and activities defined and to be adopted in the SSSP.

Table 3: Measures adopted in the Sugar Sector Strategic Plan 2001–2005

Strategy	Projected action
Meet export market commitment	<ul style="list-style-type: none"> • Target 620 000 tonnes of sugar production • Promote special sugars in markets in addition to the EU
Upgrade cane-milling infrastructure	<ul style="list-style-type: none"> • Centralise cane milling in 7 or 8 factories rather than in the 14 currently in operation • Reduce sugar losses in cane processing to a minimum
Maximise electricity generation from bagasse	<ul style="list-style-type: none"> • Adopt the successful model of modern bagasse-cum-coal cogeneration plants (technical configuration of 82 bars)
Enhance cane land	<ul style="list-style-type: none"> • Maximise cane land preparation/de-rocking and irrigation • Adopt complete mechanisation of cane field cultivation practices and cane harvesting
Rightsize workforce	<ul style="list-style-type: none"> • Implement a socially acceptable voluntary retirement scheme
Use resources judiciously	<ul style="list-style-type: none"> • Target efficient use of environmental resources such as water
Extend democratisation of ownership	<ul style="list-style-type: none"> • Sale of 5 per cent of shares to small planters in both existing and new power plants
Intensify research & development	<ul style="list-style-type: none"> • Tap into the benefits of value-added products from cane such as ‘Rhum Agricole’ • Work out a co-product development programme

Roadmap for the Mauritius Sugarcane Industry for the 21st Century (2005)

This ‘roadmap’ was created to take stock of the status of the industry and steps that would need to be taken in view of the likely events unfolding at the international level in the sugar sector (RMSI 2005). It served as a prelude to a more comprehensive study, which was subsequently used in the preparation of the Action Plan (2006–2015) of the Multi Annual Adaptation Strategy.

Multi-Annual Adaptation Strategy 2006–2015

This strategy was prompted by reform in the EU Common Agricultural Policy in 2005, as a result of which the sugar price

in Mauritius fell by 36 per cent, the guaranteed price disappeared and sugar production in the EU was reduced by 6 million tonnes (Deepchand 2010). The EU, thus, would become a net importer of sugar originating from ACP countries and the LDCs. Concurrently, a compensation of 64 per cent accrued to the EU farmers, while the ACP producers received support in the form of accompanying measures, with social, and economic indicators attached. In addition, this was coupled with the elimination of the SP, effective from October 2009, putting a limit of 3.5 million tonnes on sugar imports from the ACP states and free access of sugar, effective from October 2015 (Deepchand 2010).

In order to respond to these new developments, the government, in consultation with industry stakeholders, worked out a ten-year Action Plan spanning the period 2006–2015, the Multi Annual Adaptation Strategy (2006). Table 4 highlights the main features of the plan.

Table 4: Highlights of the MAAS Action Plan 2006–2015

Focus	Actions/Targets
The sugar sector in Mauritius	<ul style="list-style-type: none"> • Consolidate its multifunctional roles and not to be considered only as a cash crop • Face the country's lack of an alternative to growing cane as a crop adapted to its agro-climatic conditions and having shown resilience to pests and diseases, and resistant to cyclones and droughts • Reap the socio-economic benefits (e.g. employment, GDP contribution, environmental benefits, energy generation and other co-products) • Provision of a green aesthetic landscape for the tourism industry
Objectives of plan	<ul style="list-style-type: none"> • Ensure long-term viability and sustainability of the industry, while fulfilling its multifunctional roles
Cane production areas (corporate and small growers)	<ul style="list-style-type: none"> • Proper land de-rocking and preparation • Mechanise field operations • Extend cultivation practices including mechanisation to small growers through planters' regrouping • Target production of 5 million tonnes of cane annually
Cane production in difficult areas	<ul style="list-style-type: none"> • Support and maintain production as far as possible in marginal/difficult areas that otherwise would suffer from adverse environmental impacts • Provide income support to the growers in such areas
Sugar recovery	<ul style="list-style-type: none"> • Reduce the number of sugar factories from 11 to 4 implying redundancy for 1 200 factory workers to be compensated as per the Blueprint (BPCSMA 1997) • Focus on 4 sugarcane clusters to operate around 4 sugar factories • Target the production of 520 000 tonnes of direct consumption sugar (80 per cent refined and 20 per cent special sugar) • Enhance the production of electricity and ethanol
Electricity from bagasse	<ul style="list-style-type: none"> • Construct a modern bagasse-cum-coal cogeneration plant annexed to all centralised sugar factories (2 of the 4 factories in the cane clusters already have invested in new power plants operating at 82 bars; another, which invested in the mid-1980s in a 42 bars pressure power plant, was planning to invest in a new plant) • Target 1 700 GWh electricity export from the sugar industry (600 GWh from bagasse and 1 100 GWh from coal as complementary fuel)
Ethanol from molasses	<ul style="list-style-type: none"> • Target the production potential of 30 million litres of bioethanol from 120 000 tonnes of molasses • Focus on a blend of 20 per cent with gasoline was anticipated
Research and development	<ul style="list-style-type: none"> • To play a greater role in the development of better cane varieties and sugarcane co-products

Strategic Environmental Assessment 2007

To complement the MAAS Action Plan, the impact of the strategies and projects identified were studied in order to describe, identify and assess their impact on the environment. Sixty-three experts from various institutions and stakeholders in the industry were convened for consultation. This was complemented by site visits and the collection of data, and included a comparison of the results with those found in the literature. The potential environmental impacts on some areas were identified and studied, with the conclusion that the associated risks were manageable by employing measures to be put in place while undertaking projects (SEA 2007).

Sugar Industry Efficiency Act 1988/2001 (major amendments 2011–2018)

Further amendments were made to the SIEA of 2001 and these took on board new issues that had arisen with the dismantling of the SP, and which were having an impact on industry revenue (SIEA 2018). These included:

- Development of the Sugarcane Sustainability Fund, aimed at fostering the production of sugarcane and bagasse;
- Development of the Renewable Sugarcane Industry Based Biomass Framework to promote production of energy from biomass, including sugar cane, cane trash, high fibre cane, fuel canes, gramineae and other related biomass, generated by the sugar cane industry;
- Ensuring quality sugar products with definitions and characteristics of such sugars, with appropriate certifications by the Mauritius Standards Bureau;
- Implementation of new frameworks for sugar-based agro industry, and ethanol and molasses;
- Development and monitoring of the sugar-based agro industry and generation of value-added or other sugar products through the use of local raw materials applicable to enterprises set up after 2016 – the Ethanol and Molasses Framework makes provision for mandatory blending of ethanol with mogas and for production of ethanol-based goods or use of molasses for beverages and syrups; and
- Provision of revenue to planters for molasses to be based on a basket of prices applied to the sales price of molasses for fuel ethanol, potable alcohol or beverages.

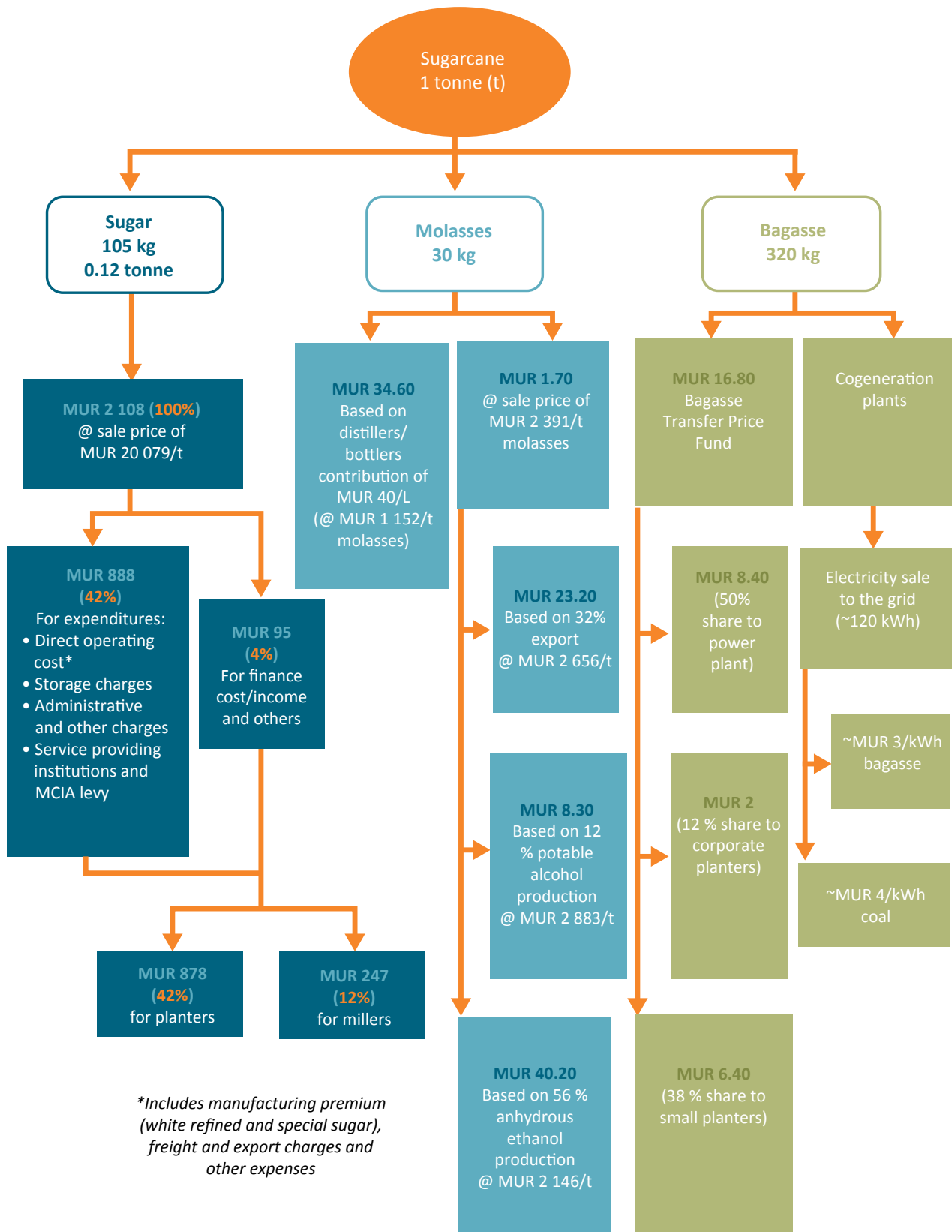
Land conversion has been the major incentive provided to the corporate sector and the Sugar Investment Trust (SIT) to facilitate investment and to meet socio-economic obligations enacted in order to enable implementation of the modernisation and centralisation of cane milling activities, investment in projects aimed at diversification within sugar, and obligations under the SIEA targeted at employees opting for voluntary or early retirement schemes. The island of Mauritius has a limited land area and the government has control over agricultural land that can be converted for purposes other than sugar. Agricultural land includes land that is or has been under cane cultivation and land located in an irrigated area or land subdivided for agricultural purposes. A tax is normally imposed on land to be converted. Moreover, a sugar sector-specific regime of taxes and duties is applied to land developed for other uses prior to its approval by the authorities for conversion. All of the conditions related to measures outlined above are spelt out in the Act (SIEA 2018).

The distribution of revenue to industry stakeholders after implementation of all the policy-based measures, strategies and incentives to sustain the economic viability of the industry so far is illustrated in Figure 2. It shows the revenue accruing to the various categories of producers from sugar sales and its co-products, including duties levied on the sales of co-products.



Photo: Raw sugar stored in Omnicane's warehouse

Figure 2: Revenue flow to planters, millers and power plants per tonne of cane produced in 2017



Source: Mauritius Sugar Syndicate (2018)

3.2 Funding secured and used

Funds have always been sought and obtained for meeting the changes occurring to the Mauritian sugar industry. The World Bank, after working on the Bagasse Energy Development Programme, sanctioned a loan of USD 15 million and a grant of USD 3.3 million under its GEF programme in order to facilitate investment in bagasse-cum-coal power plants, which allowed the utility to adjust or defer investment in oil-based plant, reduce importation of oil, enable the sugar industry to modernise and improve its performance, reduce foreign exchange for importing oil, and reduce GHG emitted by oil-based generation (Deepchand 2010). The full GEF grant and only part of the loan were disbursed. The objective of the loan was to meet the foreign exchange requirement for investment in equipment to save on bagasse in a number of mills and export it to an upgraded centrally located mill where investment in a power plant (bagasse/coal) was projected. This plan did not materialise; in addition, the foreign exchange restriction was lifted in Mauritius. The need for the loan was

no longer felt, and the government requested the cancellation of USD 9 million out of the 15 million.

Since 1985, the private sector has raised more than USD 65 million for the rehabilitation and modernisation of its sugar factories (Deepchand 2001), while around USD 11 million was invested in continuous power plants and about USD 270 million in the construction of firm power plants for electricity generation from the industry. Moreover, investments of about USD 40 million were raised for the construction of a new refinery in 2005, in addition to further investments made by other millers for upgrading their infrastructures for special and refined sugar production. Funding was also obtained for a number of projects identified in the MAAS Action Plan. The projects were earmarked for funding in part of the accompanying EU measures, and the rest to be coupled with other funding sources like the private sector or from other agencies in order to maintain the viability and sustainability of the industry. Table 5 sets out the funding earmarked for the identified projects (MAAS 2006).

Table 5: Funding earmarked under the MAAS Action Plan 2006–2015

Component	Amount earmarked (million euro)
Cane growing activities	
• Field operations	
• de-rocking	35
• irrigation	35
• mechanisation	24
• difficult areas	11
• Voluntary retirement schemes	97
Cane milling activities	
• Centralisation (capital expenditure)	43
• Blueprint	35
Diversification: Co-products	
• Power plant	278
• Ethanol	16
Others	
• Research	14
• Restructuring of cess (levy)-funded organisations	24
• Debt servicing	41
Social safety and contribution to empowerment fund	22
Total	675

Source: MAAS (2006)

3.3 Support to the small-planter community

Small and medium planters occupy a crucial socio-economic position in the sugarcane industry. Their cane supplies are important in optimising investment in the sugar factories made by the milling companies. This vulnerable category of producers has been suffering in terms of loss of sugar earnings, and the area under cane has been declining, one reason being the fall in price of sugar by 36 per cent with the loss of the guaranteed market price under the SP. The small producers, as a vulnerable group, are given full governmental support and, in some cases, such support is also extended to the corporate miller-planters and the millers. The cost of some of these measures is met out of the accumulated reserve in the Sugar Insurance Fund. This is an ad hoc measure in the context of the prevailing low price of sugar to enable the producers to maintain cane production. In collaboration with the corporate sugar sector, the government is paying special attention to this group of producers, given that they have been supplying up to 40 per cent of cane over the past decades. Various measures and incentives have been put in place to induce them to sustain cane production. These are as follows:

- A 'Sugarcane Sustainability Fund' has been established for planters producing up to 60 tonnes of sugar and for those producing above 60 tonnes.
- The distillers/bottlers fee has been increased from MUR 20 to MUR 40 per litre of potable alcohol or rum together with a levy of MUR 40 per litre for imported potable alcohol.
- The insurance premium payable by planters the crop of 2015 has been waived and no premium is payable to planters producing less than 60 tonnes of sugar.
- The import tariff on sugar has been increased to 80 per cent.
- An ethanol framework has been introduced to promote use of molasses for fuel ethanol upon blending with ethanol.
- Some 12 000 ha of land owned by small/medium planters have been de-rocked and planted, and this scheme is to continue under the Sugar Cane Planters Regrouping Project.
- Metayers, mainly small planters cultivating cane on sloped and rocky land, are given additional support measures.
- Support is given to small planters for cane harvesting and transport together with improvement in road infrastructure within the cane fields areas.
- Fairtrade labelled sugar production is being extended to more small planters regrouped in co-operative societies whereby an additional € 40 per tonne is obtained.
- The equity participation of planters, workers, and shareholders in the SIT is extended to production of all value-added products derived from cane – the participation of this group increased from 20 to 35 per cent.
- The focus is upon research and the development of improved cane varieties with high cane yield and sucrose, as well as total biomass for power generation – the new cane varieties developed and services offered can also reach regional or international markets for additional revenue.
- Setting up of an Agricultural Land Management System for optimal land use in the country.
- Providing additional direct support to small planters (e.g. fertiliser subsidy) to sustain cane production.
- Sales of cane field residues (cane tops and trash) for electricity production.



The small producers, as a vulnerable group, are given full governmental support and, in some cases, such support is also extended to the corporate miller-planters and the millers.

4

Strategic roles of stakeholders and key lessons learnt



4.1 Roles of industry stakeholders and their synergies

The sugar industry stakeholders in Mauritius can be regrouped into three categories, namely (i) the regulator; (ii) the growing and processing operators; and (iii) supporting organisations, all together from the governmental/parastatal and private sectors operating in synergy for manoeuvring the challenges and successes of the sugar industry. The organisational regime has been subject to change in terms of co-ordination roles, services offered, workforce rightsizing and ownership participation for safeguarding of the industry and its acquis.

The government acts as the regulator through the Mauritius Cane Industry Authority (MCIA – the Mauritius Sugar Authority prior to 2011), which aims to promote the development of the sugarcane industry and its clusters through policy measures, the creation of an enabling environment with innovative and efficient services, research and development, technology transfer and value addition to address the challenges in the industry (MCIA 2019). In 2011, it brought under its umbrella six ex-service-providing institutions, namely the: (i) Cane Planters and Millers Arbitration and Control Board (CPMACB); (ii) Farmers Service Corporation (FSC); (iii) Mauritius Sugar Authority (MSA); (iv) Mauritius Sugar Industry Research Institute (MSIRI); (v) Mauritius Sugar Terminal Corporation (MSTC); and (vi) the Sugar Planters Mechanical Pool Corporation (SPMPC), including an additional entity in 2014, the Bagged Sugar Storage and Distribution Co. Ltd (BSSD) (MCIA 2019). These changes were made for rationalising the service-providing institutions to improve their cost effectiveness, the quality of services offered and optimal use of human resources. The MCIA is financed by means of a cess (levy) on sugar produced every year, which does not exceed 4 per cent of the ex-Syndicate sugar price; but given the dwindling industry revenue obtained since 2017, the government has financed these organisations and has anticipated ways to provide autonomy and self-financing options in support of organisations like the MSIRI.

The corporate cane growers and millers were regrouped under the Mauritius Sugar Producers Association (MSPA), which promotes the interests of its members and liaises with the government and other industry stakeholders, while the

small planters have regrouped mostly in co-operative societies and the Small Planters Association, which safeguard the interests of this minor but key stakeholder in the industry.

Marketing and sale of all sugars is undertaken by the Mauritius Sugar Syndicate (MSS), which also distributes the proceeds of sugar sales after the deduction of common expenses. The MSS was founded in 1951 and is managed by representatives of all the industry stakeholders with the position of President being rotated between a planter and a corporate representative since 1976. It is a producer-driven non-profit organisation, the objective of which is to maximise the revenue of its members (or the sugar industry as a whole).

The cane payment system in Mauritius provides, inter alia, for penalising millers that perform below the island average efficiency of all the factories in terms of sugar recovery per unit of cane. Such a miller has to make good the shortfall in sugar from his share in favour of the cane growers, and this is apportioned to each one according to the quantity of cane supplied. On the other hand, if a miller is performing above island average efficiency, the apportionment of the sugar to the growers is based on the actual amount (i.e. higher than the one based on average efficiency) of sugar produced. This factor induces all millers to almost perpetually perform above average to the benefit of both the growers and the millers. This system enables competition between the millers. The cane growers are legally obliged to send their cane to the factory in their cane area; thus, the miller is in a way continually investing in modernising his plant to remain competitive. Cane sampling and analysis for payment purposes and the apportionment of sugar and by-products is conducted by an independent body, the CPMACB, staffed by officials of the public service financed out of the cess. Originally set up in 1939, it has been operating under the ministry responsible for agriculture and, since 2011, under the MCIA.

The SIT was established under the SIEA in 1994 to invest in sugarcane growing and milling activities including use of sugarcane by-products. It is managed by planters, employees and government representatives, and ensures ownership participation of these actors in the sugar industry while being represented on all the milling companies.

4.2 Key lessons learnt

The continuous development of timely and appropriate proactive policies and strategies accompanied by co-ordinated action plans over the past decades have created a conducive environment for investment in sustaining the viability of the sugar industry in Mauritius and to meet the challenges faced by the industry. The set-up of an apex, independent organisation to follow all developments occurring at the international level, and liaising and consulting with all the industry stakeholders, while reporting to and advising the government on courses of action, has been instrumental in overseeing and co-ordinating the sector. This organisation acting as an 'honest broker' needs to have the trust and respect of all stakeholders.

Rational use of resources, including environmental resources (land, soil, water, nutrients and waste), technology (mechanised operations and efficient processing), monetary resources (private sector investment, governmental fiscal incentives, international donor organisations and accompanying funds for industry reforms) and human resources (agricultural operations, processing and organisational), have been key to the rehabilitation and modernisation of the industry that has enabled higher agricultural yield and better sugar productivity in factories to reduce the cost of sugar production.

Innovation in the production of sugarcane value-added products such as special sugars, potable alcohol, bagasse electricity and fuel ethanol and their cost-effective scaling up

has enabled a breakthrough into niche markets fetching higher revenue, while the focus on quality products certified through international accreditation ensures long-term market sustainability. Industry diversification and product excellence provided the competitive edge when the industry became mature, saturated and competitive. The Mauritian sugar industry has so far made significant progress in improving its competitiveness and demonstrated resilience to the cyclic nature of the price of sugar and other challenges it has faced.

Trust and credibility gained by the country over time on the part of international funding agencies has enabled implementation of several successful projects by the private sector and the meeting of all its commitments towards those agencies. Many of these projects received governmental guarantees, whereby progress was closely monitored in terms of key performance indicators set at inception and in compliance with policy-based measures and incentives.

Implementation of the projects involved North–South technology transfer and included South–South co-operation for knowledge sharing, which was fully tapped in the sugar industry in gathering experience and capacity building for replication or capitalisation opportunities. Indeed, Mauritian expertise and experience is already being shared worldwide and, in particular in the African region, in areas related to factory rehabilitation, modernisation and operation, as well as support for initiatives related to diversification of the industry.



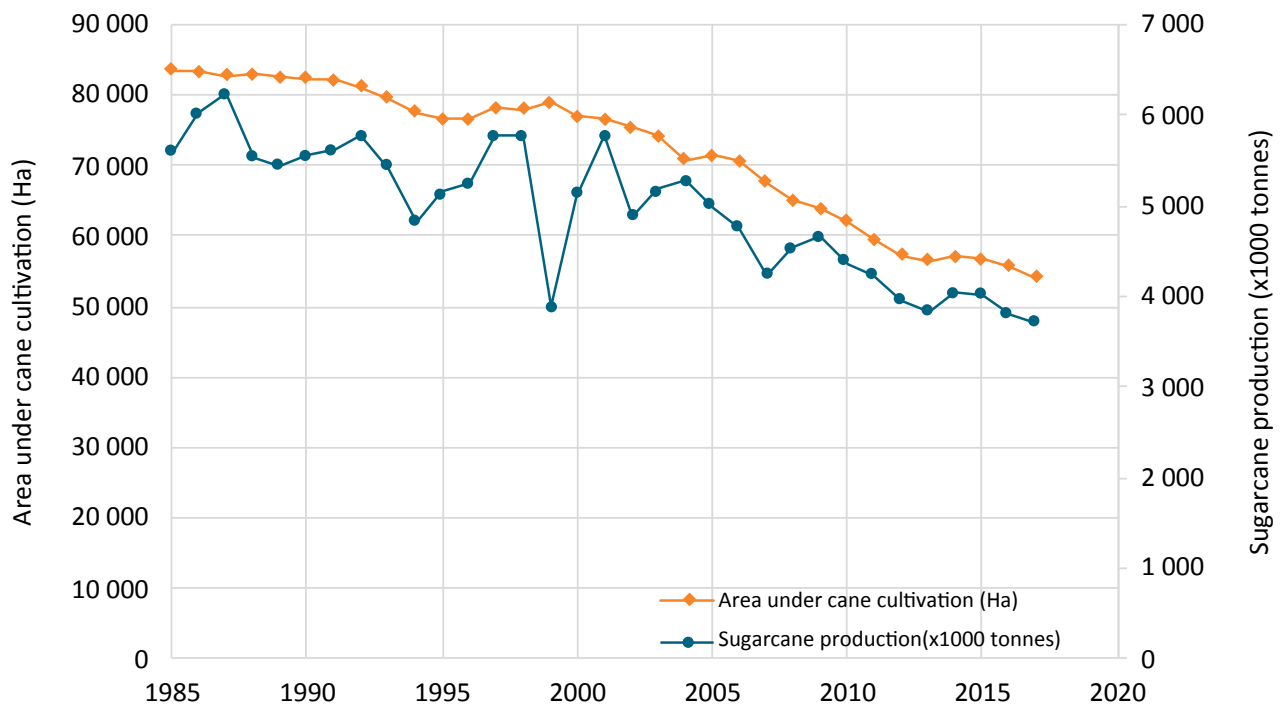
Photo: Sugarcane plantation, Mauritius (©Omnican)

References

- BEDP (Bagasse Energy Development Program) (1991) *Report of the High-Powered Committee on Bagasse Energy Development Program*. Ministry of Agriculture and Natural Resources, Mauritius.
- Blume H (1985) *Geography of sugarcane*. Verlag Dr Albert Bartens, Berlin.
- BPCSMA (Blue Print on Centralization of Sugar Milling Activities) (1997) Ministry of Agriculture, Fisheries and Natural Resources, Republic of Mauritius.
- Deepchand K (2001) Bagasse-Based Cogeneration in Mauritius: A model for Eastern and Southern Africa. *AFREPREN Occasional Paper No. 2*. African Energy Policy Research Network.
- Deepchand K (2010) The sugarcane crop for the sustainable production of sugar and other cane derived products in Mauritius. In Eggleston G (ed.) *Sustainability of the sugar and sugar-ethanol industries*. ACS Symposium Series, Vol. 1058.
- LTES (Long Term Energy Strategy) (2009) Draft Long Term Energy Strategy 2009–2015. Ministry of Energy and Public Utilities, Republic of Mauritius.
- MAAS (Multi Annual Adaptation Strategy) (2006) *Multi Annual Adaptation Strategy 2006–2015*. Ministry of Agro Industry & Fisheries. Republic of Mauritius.
- Mauritius Sugar Syndicate (1986–2018) *Report and statement of account 1985–2017*.
- Mauritius Sugar Syndicate (2018) *Report and statement of account 2017–2018*.
- MCA (Mauritius Chamber of Agriculture) (1986–2005) *Mauritius Chamber of Agriculture Annual Report 1984–2004*.
- MCIA (Mauritius Cane Industry Authority) (2019) Ministry of Agro Industry and Food Security Portal. Available at: www.agriculture.govmu.org
- Meisenhelder T (1997) The developmental state in Mauritius. *Journal of Modern African Studies* 35(2): 279–297.
- MSIRI (Mauritius Sugar Industry Research Institute) (1986–2015) *Mauritius Sugar Industry Research Institute Annual Report 1985–2014*.
- MTNC (Mauritius Third National Communication) (2016) Report to the United Nations Framework Convention on Climate Change.
- PROSI (Public Relations Office of the Sugar Industry) (1997) *Sugar in Mauritius*. PROSI, Port Louis.
- RMSI (*Roadmap for the Mauritius Sugarcane Industry for the 21st Century*, 2005). Ministry of Agro Industry & Fisheries, Republic of Mauritius.
- SEA (Strategic Environmental Assessment) (2007) *Implementation of the Multi Annual Adaptation Strategy for the Mauritian Sugarcane Cluster 2006–2015*. The European Commission and the Republic of Mauritius.
- SIEA (Sugar Industry Efficiency Act) (2018) *Sugar Industry Efficiency Act 1988/2001 (Amendments 2011–2018)*. Republic of Mauritius.
- SSAP (Sugar Sector Action Plan) (1995) *The Mauritius Sugar Authority Action Plan for the Mauritius Sugar Industry 1985–1990*. Ministry of Agriculture and Natural Resources, Mauritius.
- SSSP (Sugar Sector Strategic Plan) (2001) *Sugar Sector Strategic Plan 2001–2005*. Ministry of Agriculture, Fisheries and Natural Resources, Republic of Mauritius.
- Statistics Mauritius (1986–2018a) *Digest of agricultural statistics 1985–2017*. Ministry of Finance and Economic Development, Republic of Mauritius.
- Statistics Mauritius (1986–2018b) *Digest of energy and water statistics 1985–2017*. Ministry of Finance and Economic Development, Republic of Mauritius.
- Statistics Mauritius (2018a) *Digest of agricultural statistics 2017*. Ministry of Finance and Economic Development, Republic of Mauritius.
- Statistics Mauritius (2018b) *Digest of energy and water statistics 2017*. Ministry of Finance and Economic Development, Republic of Mauritius.
- To LS, Seebaluck V & Leach M (2017) Future energy transition policy for sugarcane bagasse cogeneration: Lessons from multi-level and policy innovations in Mauritius. *Energy Research & Social Science* 35: 68–77.

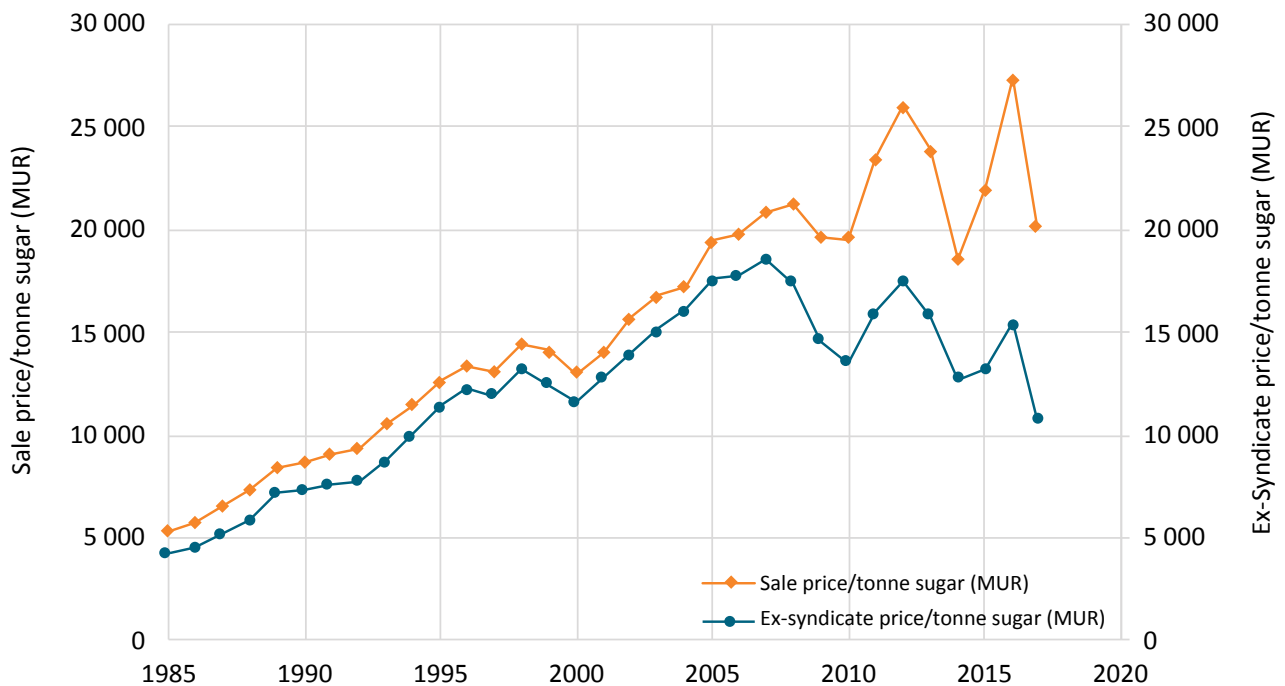
Annex 1: Key sugar industry production and economics statistics (1985–2017)

Figure A1: Trend in area under cane cultivation and sugarcane production (1985–2017)



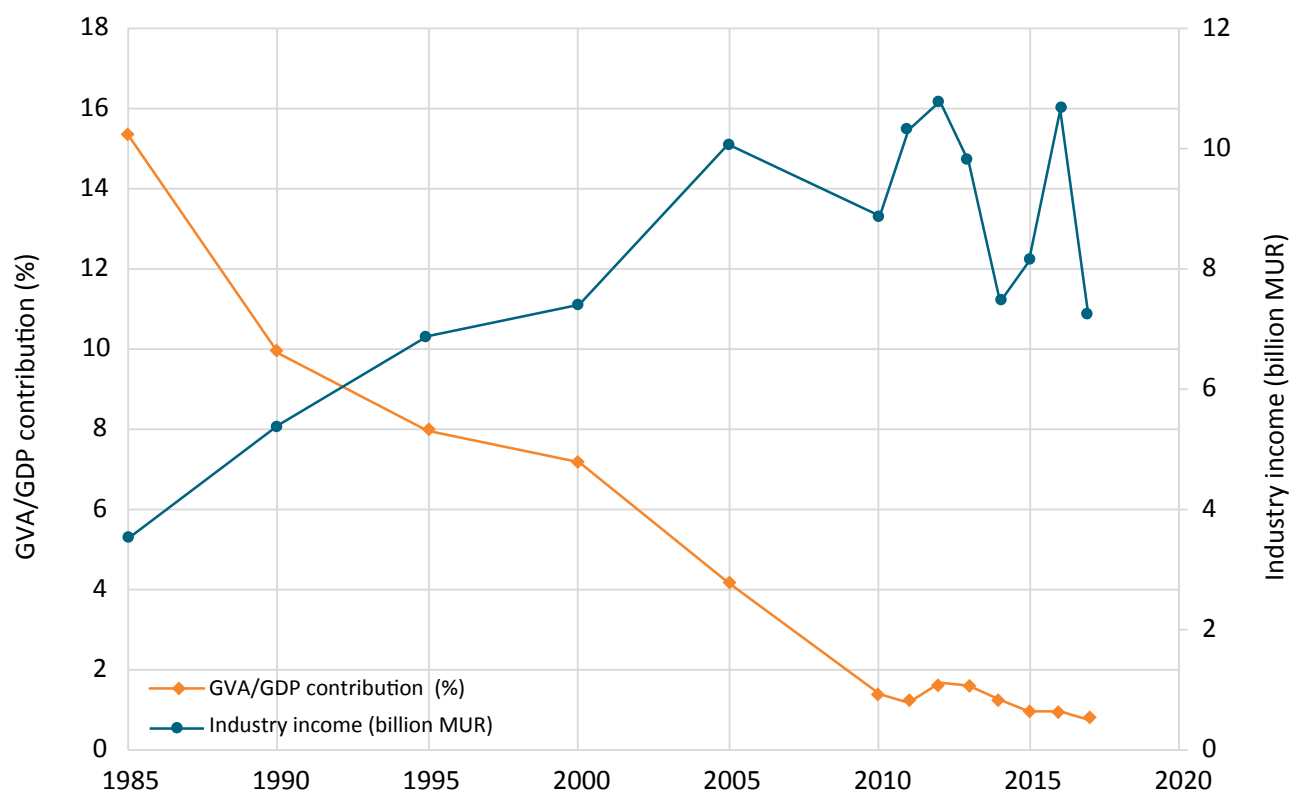
Source: Statistics Mauritius (1986–2018a)

Figure A2: Trend in sale price and ex-Syndicate price per tonne of sugar (1985–2017)



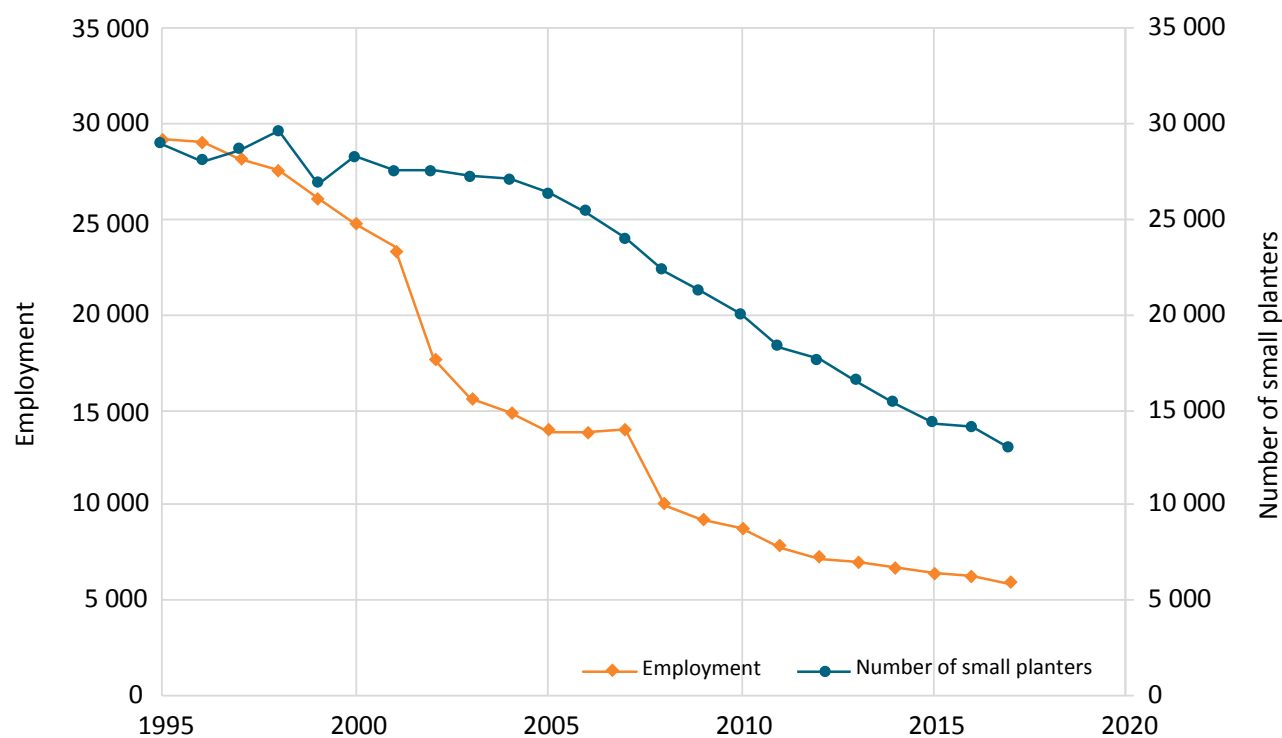
Source: Mauritius Sugar Syndicate (1986–2018); Statistics Mauritius (1986–2018a)

Figure A3: Trend in GVA/GDP contribution and industry income (1985–2017)



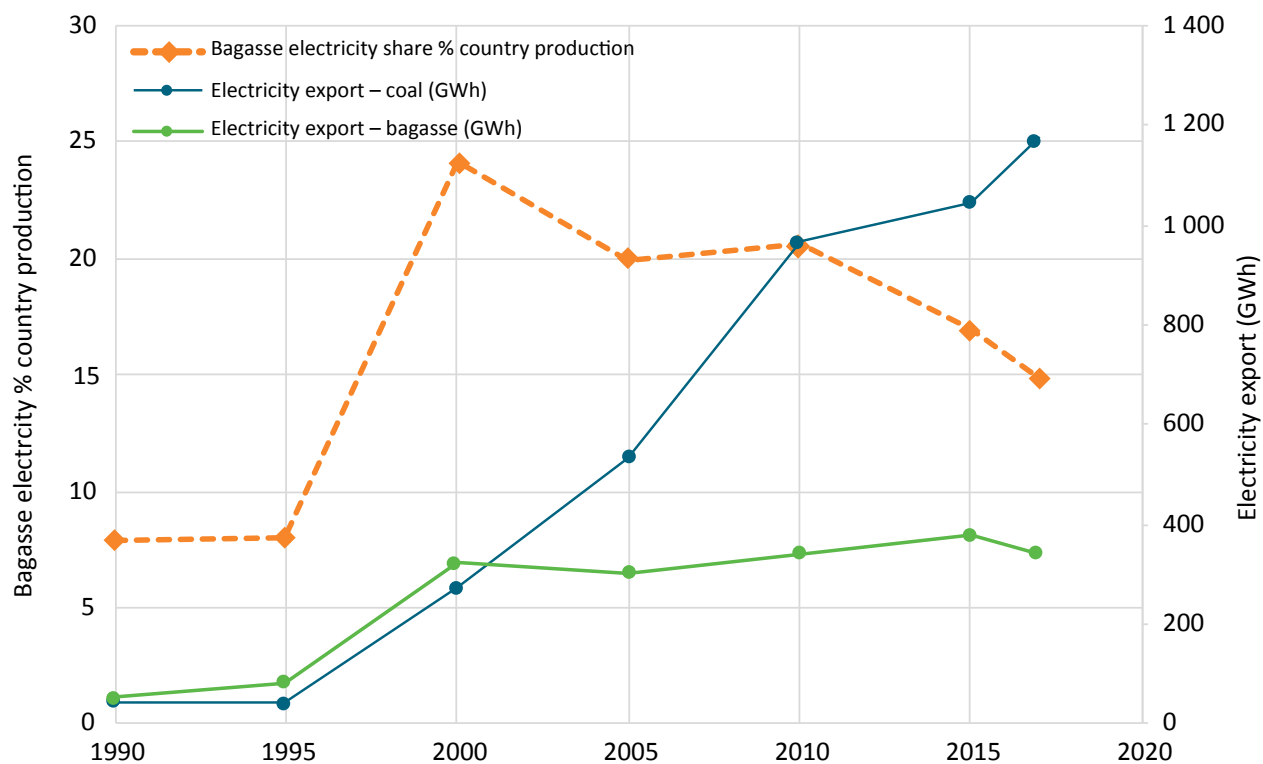
Source: Mauritius Sugar Syndicate (1986–2018); Statistics Mauritius (1986–2018a); MCA (1986–2005)

Figure A4: Trend in employment and number of small planters (1995–2017)



Source: Statistics Mauritius (1986–2018a)

Figure A5: Trend in electricity export from the sugar industry (bagasse and coal) and bagasse percentage share in the country's electricity production mix (1990–2017)



Source: MSIRI (1986–2015); Statistics Mauritius (1986–2018b)