A demand-driven R&D plan for the sustainability of the Mauritian sugarcane industry

KP Payandi Pillay, Asha Dookun-Saumtally and Salem Saumtally

Mauritius Sugarcane Industry Research Institute, Mauritius Cane Industry Authority, Mauritius; gopal.pillay@msiri.mu

Abstract Recent changes in the global economic environment pose a threat to the competitiveness and sustainability of the Mauritian sugarcane industry. Less area under sugarcane, coupled with the scarcity and high cost of labour and transport, have resulted in an increasing cost of production. This, coupled with factors such as climate change, are strong signals for the Mauritian sugarcane industry to reinvent itself. The loss of a preference selling price in the EU with the abolition of a long standing agreement in 2017 will mark a dramatic change for the local sugarcane sector as a result of reduced sugar prices. The consequences of quota/price erosion are being felt at two levels: (i) lower income for producers leading to further land abandonment and decrease in cane supply to the mills; and (ii) decreased revenue for the industry as a whole, which will impact its viability, competitiveness and positive contribution to the environment. Sugarcane production and land conservation under this crop are essential for the economic and social progress of the country as well as for the tourism industry, and even more important for green energy production, since currently about 15% of the electricity on the grid is provided from sugarcane bagasse. In order to meet these challenges, the Government of Mauritius has taken initiatives through a recent study by LMC International to assess the economic, social and environmental impact on Mauritius on the abolition of sugar quotas in the EU Market. One of the major recommendations emanating from the study is the need for a far-reaching reform to streamline R&D activities that will respond expeditiously to the needs of producers and focus on sugarcane through demand-driven and result-oriented research. To this end, the Mauritius Sugarcane Industry Research Institute (MSIRI), after consultation with its stakeholders, will embark on a research and development agenda for 2016-2020 to address the major challenges. This paper discusses the seven research focus areas that have been identified and highlights some of the constraints that may limit or hinder their implementation.

Key words Cost of production, research and development plan, reduced sugar price, erosion of quota, competitiveness, result-oriented research

INTRODUCTION

Sugarcane was introduced into Mauritius by the Dutch in 1639 and sugar was first manufactured in the island in 1696. The crop is known to be the most efficient converter of solar energy, and thus of biomass production, producing around 35-90 t/ha/year of dry matter (Autrey 2006). It can be considered as a local, renewable and environmentally friendly resource. Besides sugar, the sugarcane plant has the potential to be exploited as a bio-factory for delivering high value-added products including proteins, pharmaceuticals, vaccines, polymers and textiles (Autrey 2006). As to the protection and preservation of the environment, the sugar industry contributes to soil conservation, carbon sequestration and maintenance of a green landscape.

In 2014, at basic prices (excluding taxes and levies), agriculture in Mauritius contributed 3.0% to GDP of which the share of sugarcane was 24.9%. This share decreased from 45.9% in 2007 to 24.9% in 2014. Although sugar contribution to the GDP has been declining, its importance in providing employment is still high and in 2014 it offered 13,200 out of about 44,900 jobs in the agricultural sector. In addition, it has a total multiplier impact of 2.5, compared to 2.1 and 1.6 for the textile and financial intermediation sectors, hence its importance in the Mauritian economy (Sobhee 2014).

Since 2006, the area under sugarcane have been decreasing constantly from 70 781 ha to 58 972 ha in 2014 (MSIRI 2014a). This is a cause of concern in view of the need to ensure the supply of a critical mass of cane to the mills and meeting production objectives (Ministry of Agro Industry and Fisheries 2006). Despite the various measures proposed by the Mauritian government in its 2006-2015 Multi-Annual Adaptation Strategy Plan (2006) to stop land abandonment under sugarcane, the trend has not been curbed (LMC International 2015). The consequences of quota/price erosion are also being felt at two levels: (i) lower income for producers leading to further land abandonment and decrease in cane supply to the mills; and (ii) decreased revenue for the industry as a whole impacting on its viability, competitiveness and positive
Contribution to the environment. Since the last EU sugar sector reforms in 2006, the sugar price payable to producers has been constantly on the decline from USD501 per tonne of sugar in 2006 to USD364 in 2015.

Sugarcane production and preservation of lands under this crop are essential for the economic and social progress of the country as well as for the tourism industry, the more so for green energy production, where currently about 15% of the electricity on the grid is provided from sugarcane bagasse. The Mauritian sugarcane sector has undergone profound reforms over the past decade to maintain its competitiveness. One of the major reforms is the development of sugarcane clusters, i.e. the centralization of smaller factories into larger ones equipped with latest technology to increase milling capacity and efficiency and refiners for value addition. Refined sugars, at a standard marketable quality for the European Union and also special sugars, can thus be produced. The installation of new power plants in each cluster has enhanced contribution to the national electricity production. In doing so, the use of bagasse for combustion is optimized and imports of coal reduced. Moreover, the installation of a distillery in one of the clusters is producing neutral bioethanol for export; some 18.3 ML were produced in 2015. In the near future an Ethanol Framework would be established, which would, inter alia, include the mandatory blending of ‘mogas’ and ethanol as from 1 July 2017 (mogas is automotive gasoline suitable for use in piston-engined gasoline-powered aircraft). The blending of ‘mogas’ and ethanol is in line with the recommendations of the COP 21 meeting and this will further reduce our import of fossil fuel.

To pursue its efforts to enable the sugarcane sector to survive in a completely liberalized market, the Ministry of Agro Industry and Food Security commissioned a study in October 2014 on ‘the Economic, Social and Environmental Impact on Mauritian Abolition of Internal Quotas of Sugar on the EU market’. The study was undertaken by LMC International, and some of its major recommendations were: (i) the sugarcane industry should be maintained now and in the future for economic and environment reasons due to its multifunctional role; (ii) a major shift was required from the ‘business-as-usual approach’ which, if maintained would represent a “sure recipe for disaster”; (iii) adoption of key measures that have the potential to secure the livelihoods of the small sugarcane farmers sector; and (iv) a need for a far-reaching reform to streamline R&D activities that would “respond expeditiously to the needs of producers and focus on sugarcane through demand-driven and result-oriented research”. This paper discusses the R&D activities proposed for 2016-2020 as to contribute to a sustainable Mauritian sugarcane industry.

SUGARCANE RESEARCH IN MAURITIUS

Improvement of sugarcane through conventional breeding has been carried out in Mauritius for over more than a century after it was confirmed that the plant could produce viable seeds. The first Mauritian seedlings were produced in 1891 (North-Coombes 1937) before the creation, in 1893, of the ‘Station Agronomique’ - an experimental station, for organized research in sugarcane (Wiehe 1968) and financed by the sugar producers. In 1913, this led to the foundation of a Department of Agriculture, within which a Sugarcane Research Station operated from 1930. In 1948, following recommendations of an Economic Commission on the sugar industry, the Mauritius Sugar Industry Research Institute (MSIRI) was created in 1953 to take over the functions of the Sugarcane Research Station (Wiehe 1968). It was funded by a ‘cess’ or a levy on sugar proceeds - at that time it was MUR3.50 per tonne of sugar exported (USD 10 cents), which was equivalent to 0.6% to 0.7% of the annual value of the sugar crop; an amount significantly lower than what countries such as Australia, South Africa and Hawaii were then devoting to research. During 1961-2010, R&D revenue from cess money grew slowly until the mid-1970s, but much faster thereafter until the mid-1990s with the introduction of new research disciplines, a larger technical staff pool and expansive wage policies both at national and sectoral levels (Tonta 2011). Since the mid-1990s, there have been cuts in the funds allocated to research and these have coincided with the decline in the sugar price. In 2015, the share of cess contribution to sugarcane R&D amounted to some USD2.5 million.

SUGARCANE RESEARCH PROGRAMMES

The first MSIRI R&D programme was approved in December 1957 by a Research and Advisory Committee (MSIRI 1957). Subsequently, the MSIRI has operated on 5-year programmes, prepared in consultation with its stakeholders. These programmes have always been flexible to cater for the immediate needs of growers and account for unforeseen events. Today, an R&D Committee advises the MSIRI on research programmes and related activities.

Over the years, sugarcane R&D in most of the sugarcane-growing countries, including Mauritius, has provided growers with management practices that are aimed at optimizing productivity of sugarcane cultivation and minimizing environment pollution (MSIRI 2004). These practices have continued to meet the immediate needs of growers, but with new issues, such as decreasing prices of sugar in the world market, increasing costs of production resulting from higher costs of labour
and major inputs such as fertilizers and herbicides and mechanization, more efforts have to be devoted to address these issues.

It is widely acknowledged that the sugar industry has played a vital role in the economic and social development of Mauritius and has contributed significantly in environment protection and the tourism industry. It is also acknowledged that R&D in sugarcane has been invaluable. Mauritian stakeholders have always recognized R&D in sugarcane as an investment for the future and that it is fundamental for increasing productivity and ensuring sustainability. Tonta (2011) showed that investments in sugarcane R&D during 1961 to 1990 have been highly profitable. Rates of return for later R&D programmes were less attractive due to unfavourable conditions such as accelerated decrease in cultivated area, lower sugar price, adverse effects of mill centralization and poor climatic conditions.

THE SUGAR RESEARCH AGENDA 2016-2020

Recommendations made in the LMC International report were discussed in-depth by the MSIRI R&D Committee and the latter recommended that substantial reform be made in the R&D Plan 2016-2010 to achieve rationalization, research focus and effectiveness to improve productivity for a sustainable sugarcane industry. To enable the R&D activities to respond expeditiously to the needs of producers, research strategies are envisaged that are strongly demand-driven and customer-oriented. It is indeed essential to maintain strong linkages with the industry for rapid uptake of new technologies and to enhance collaboration and partnership with local and international institutions.

The objectives outlined in the R&D Plan 2016-2020 are expected to contribute to the long-term sustainability of a resilient Mauritian cane industry and capitalize on the multi-faceted potential of the sugarcane plant to deliver a multitude of components, either naturally or industrially, with limited impact on the environment. The Plan aims to bring improvements in breeding, growing and milling to contribute to industry diversification and profitability. It takes into account major global challenges, such as climate change, emerging diseases and pests, costly energy supply and water scarcity, and strives to keep producers’ interest and profitability in cane growing and restrain land abandonment.

The Plan comprises seven major themes or Research Focus Areas (RFAs) that have been discussed and agreed with the stakeholders. These RFAs are considered essential to solve current and future challenges and will be implemented by multi-disciplinary teams. They are detailed below and some indications of how they differ from past and recent research strategies are highlighted.

Enhanced variety improvement through plant breeding and biotechnology for new cane varieties with high cane yield and sucrose content

Breeding and selection of new varieties aim to produce better varieties with enhanced cane yields and sucrose contents, adapted to diverse agro-climatic conditions and soil types, resistant to pests and diseases and with good ratooning ability. In Mauritius the agro-climatic conditions form three contrasting zones: the sub-humid zone, irrigated and rain-fed zone (<1600 mm rainfall per annum); the humid intermediate zone (>1600-2400 mm rainfall per year); and the very humid central upland zone (>2400 mm rainfall annually). Sugarcane lands also comprise five major soil groups and these are also considered in the selection of varieties; some varieties perform better in certain soil types. Emphasis is also placed on varieties adapted to mechanical harvesting, with good germination, early canopy cover establishment, and suitable for harvest across a wide range of environments and across the harvesting season. The centralization of sugar mills has added a new parameter in the breeding and selection programme; with only four sugar mills, the harvest period has been extended (from early instead of late June to mid-December instead of late November) and this requires early-maturing and late-maturing varieties, and with low flowering aptitude. Moreover, for the super humid zone, varieties with better tolerance to yellow spot disease are targeted, as this can severely affect the crop and sugar yields.

Since its creation in 1953, the MSIRI has released 64 commercial varieties; 52 were developed locally and 12 were imported and selected for suitability to local conditions. Currently, 21 varieties are recommended for planting in diverse environments and for harvesting at different periods of the crop season. Among these varieties, 10 have been widely adopted by the planting community and in 2014 occupied nearly 91% of the cane area (MSIRI 2014b).

With the conversion of the sugar industry into a sugarcane industry utilizing the sugarcane biomass more efficiently and as a renewable source of energy, the development of varieties with higher fibre content is also contemplated. The contribution of biotechnology to complement the sugarcane variety programme is expected to shorten the selection process and, hence, new varieties be made available earlier to growers. The use of marker-assisted selection and application of
genotypic selection in the sugarcane improvement programme, as well as DNA fingerprinting of varieties for germplasm identification and characterization, will no doubt boost information on the potential of the crop.

**Safe phytosanitary status and increased vigilance with respect to existing and emerging diseases and pests**

This theme aims at minimizing the risks of disease outbreaks through disease diagnosis, disease epidemiology, evaluation of promising clones, quality of planting material and biological control of pests. Occurrence of major diseases in parents, new clones and varieties introduced from other countries is to be tested systematically. Mauritius, as in other sugarcane-growing countries, has to face a constant threat of introduction of new pests and diseases as well as the re-emergence of endemic/established plant pathogens. Re-emergence of existing pests and diseases may occur in response to changes in climate and agricultural practices. Surveillance, precise molecular diagnostic tools and reliance on different preventive measures are favoured to minimise their impact. A significant preventive measure is the selection of varieties resistant to the five major diseases, namely gumming, leaf scald, rust, smut and yellow spot. Mauritius has a long tradition of having a sugarcane industry where use of chemicals to control pests and diseases is kept to a strict minimum. This has been possible through the exploitation of sugarcane varieties tolerant to the common diseases and pests prevailing in the country.

**Improved efficiency of inputs through integrated nutrient management for sustainability**

This research area puts emphasis on integrated nutrient management and aims at significantly improving fertilizer recommendations to avoid any wastage and to enhance cost-effectiveness and sustainability. Priority issues such as low nitrogen-use efficiency (25-30%) and high cost of synthetic fertilizers will be addressed. The major objectives are to increase nutrient-use efficiency, particularly of nitrogen, and to reduce reliance on conventional fertilizers. It is proposed to develop a soil-N availability index to predict soil-N mineralization potential and to investigate the efficiency of phosphorus (P) and potassium (K) use so as to fine-tune fertilizer recommendations. In order to reduce reliance on conventional synthetic fertilizers, minimize negative environmental impacts and make integrated nutrient management a part of normal practice for sugarcane production, biofertilizers, soil conditioners, growth promoting substances and organic sources of nutrients will be evaluated. In light of these investigations, the rates of N, P and K will be amended, if necessary.

**Improved production system to increase yield**

An improved production system to improve productivity and to ensure environment sustainability is envisaged. Assessment of Improved Cropping Systems (ICSs) to address the issue of yield decline will be pursued; seed production of leguminous plants to integrate in ICSs will be promoted, and new land clearing and preparation techniques at replanting for reduced tillage will be studied. On-going studies on weed management, efficient use of irrigation and mechanization of field operations will continue.

The ultimate aim of this research area is to propose sound and improved agronomic management practices that enable exploitation of the full potential of new varieties. To achieve a sustainable sugarcane farming system, environmental protection needs to be enhanced through clean management practices such as judicious use of agro-chemicals, especially fertilizers and herbicides, and measures to control soil erosion and consolidate soil conservation.

**Valorisation of sugarcane and co-products**

In moving from a sugar to a sugarcane industry, this research area will look into value-added products. In this respect, different types of canes will be evaluated for different end uses such as juice quality and rhum (made directly from cane juice) quality. A study to investigate the system of collection, transport and processing of cane trash for production of energy is being undertaken. At the same time the negative impact of trash removal from the field on agronomic aspects and soil properties is also under investigation. Other research projects will look at the valorisation of Mauritian sugars, production of new sugars, production of bioplastics and optimum utilization of by-products, such as cane fibre and trash.
Services and links with industry for active collaboration

Improving communication links with the industry for the provision of services to enhance its competitiveness is vital. During 2010-2015 through the ACP Sugar Research Programme funded by the EU, the MSIRI has further enhanced its infrastructure. The availability of a full-fledged international quarantine station for the import and export of germplasm, modern tools for molecular diagnostics and molecular breeding and other analytical instrument, such as near-infrared (NIR) techniques, would provide a conducive environment for provision of high-quality services to the industry.

With the centralization of sugar mills and the recurrent problems of harvest to mill delays that impact negatively on sugar processing, measures to be taken to improve cane quality will be investigated and proposed to the industry. The MSIRI will also continue to provide services to the industry to enable it to meet the stringent quality standards.

For a successful demand-driven and customer-oriented research, a strong linkage with the grower community is essential. This will also facilitate the promotion of sound agronomic practices that will enable all the sugarcane producers achieve competitiveness and sustainability.

Enhanced collaboration and partnership with research institutions abroad and locally

This research area will open avenues for collaborative R&D ventures in partnership with local and international institutions. Amongst others, it will enable the development, early testing, exchange of promising varieties, fuzz material, counteract the inability to cross non-flowering varieties locally and broaden the genetic base of varieties for selection to the various biotic and abiotic constraints. The formulation of new products such as bio-pesticides may also be conducted in partnership with other institutions, local or abroad.

MAJOR CONSTRAINTS LIMITING THE IMPLEMENTATION OF THE R&D PLAN 2016-2020 AND RECOMMENDATIONS

The five-year R&D agenda and the subsequent research projects to be implemented require resources in terms of funding, land, labour, expertise and equipment. This will be a challenge without the participation and the partnership of growers and millers.

Sugarcane research funding has always been from the growers, through a levy on sugar produced and exported. With the decrease in area under cultivation and the decline in annual sugar production from 505,857 t in 2006 to 380,000 t in 2015, it is evident that funding from cess money solely will no longer be sufficient. Since the focus of research will be on a variety of end-products and not on sugar only, other stakeholders, in addition to sugarcane growers, should contribute to funding of R&D. Moreover, the MSIRI will strive hard to generate revenue from analytical services, sale and royalties on varieties, sale of harvested cane, sale of fuzz and provision of consultancy services particularly in Africa. It will also continue to rely on competitive grants and funding agencies.

In the current R&D Plan 2012-2016, some 90 ha of land are under experimentation with some 190 on-farm trials for the various programmes. With the decline in cultivated area, land availability may pose a problem. Apart from land, manual labour for establishment, management and harvest of trials is required. Manual labourers form an ageing group and there is little interest from the younger generation to take over. Mechanization of field operations remains an option, but this will require further investment and modifications in experimental designs. These are being considered.

Implementation of the various activities in the R&D Plan 2016-2020 will also require ‘state-of-the-art’ technologies and equipment, as well as trained, dedicated and motivated personnel. If no short-term investment is required in terms of equipment, recruiting qualified and competent human resources will be essential. Over the last 15 years, there has been no major recruitment, even to replace staff retiring. On-going training for those in place and appropriate training for new recruits will be fundamental to meet the objectives set in R&D 2016-2020.

This research agenda will not limit itself to identify producers’ needs in terms of technological solutions only. All activities earmarked in the R&D Plan are ‘producer-centered’; the full engagement of the producers will result in setting and prioritizing research objectives. It will also take on board any deficit or ‘gaps’ as well as opportunities in terms of their knowledge about new markets, new products, and alternatives to a sugar-based business that may no longer be profitable (Payandi Pillay 2013). Engaging the producers in research is a challenge and requires a conducive environment. Similarly, engagement with research specialists and the extension agents is required.
CONCLUSIONS

The 2016-2020 R&D plan will have clear key performance indicators (KPIs) that will allow progress monitoring. For the materialization of this research plan, sustained resources, both human and financial, will be essential. Progress will be monitored via annual reviews to determine whether KPIs have been achieved and outcomes disseminated to the industry. It will be subject to a formal review at mid-term to assess progress and determine any changes in strategic direction, if necessary.

It can be argued that all investment in the sugarcane R&D programme will be meaningless if the results are not made known and adopted by the growers. Promoting awareness of sound agronomic practices and more importantly encouraging their adoption to enable the local sugarcane industry to achieve competitiveness and sustainability will be the major objective of the R&D Plan 2016-2020. According to the Multi-annual Adaptation Strategy (MAAS) for the Mauritian Sugarcane (Ministry of Agro Industries and Fisheries 2006), the Mauritian sugarcane industry had to attain a critical mass of nearly 5 Mt of cane supplied by the different groups of producers. Over the years, the contribution of the corporate growers has not exceeded 75% of this critical mass despite massive investments in modernizing their farms and the adoption of latest technologies and available good management and crop husbandry practices. This implies that the 25% contribution from the non-corporate growers, which mainly comprise the small growers, will still need to be relied upon to ensure the sustainability and viability of the sugarcane cluster.

REFERENCES

MSIRI 1957. Research programme of the Mauritius Sugar Industry Research Institute. Réduit, MSIRI.
Wiehe PO. 1968. Sugar research and its application in Mauritius. MSIRI, Réduit.

Un plan de recherche et développement axé sur la demande pour assurer la durabilité de l’industrie cannière de la République de Maurice

Résumé. Les changements récents dans l’environnement économique mondial constituent une menace pour la compétitivité et la durabilité de l’industrie cannière de la République de Maurice. Une réduction de la superficie sous la canne à sucre, la rareté et le coût élevé de la main-d’œuvre et du transport ont entraîné une hausse du coût de production. Ceci, couplé à des changements climatiques sont des signaux forts pour que l’industrie cannière mauricienne se réinvente. L’abolition à partir de 2017 d’un accord de longue date avec l’UE pour la vente du sucre mauricien à un prix préférentiel, marquera un tournant pour le secteur cannier local, suite aux prix réduits sur le marché mondial. Déjà, les conséquences de l’érosion des quotas et prix du sucre se font sentir à deux niveaux : (i) baisse de revenu pour les producteurs, avec comme résultats, l’abandon des terres sous canne et un volume de canne réduit envoyé à l’usine ; et (ii) une baisse de revenu pour l’industrie cannière dans son ensemble avec une incidence sur sa viabilité, sa compétitivité et sa contribution positive à l’environnement. La culture de la canne à sucre et son impact sur la conservation des terres sont essentiels pour le progrès économique et social du pays ainsi que pour l’industrie du tourisme et mieux encore pour la production d’énergie verte ; actuellement environ 15 % de l’électricité sur la grille nationale est fournie à partir de la bagasse cannière. Afin de relever ces défis, le gouvernement de la République de Maurice a pris des initiatives, à travers une étude réalisée récemment par ‘LMC International’ pour évaluer l’impact économique, social et environnemental sur l’île Maurice de l’abolition des quotas de sucre sur le marché européen. L’une des principales recommandations émanant de cette étude est la nécessité d’une réforme profonde afin de rationaliser les activités de recherche et développement qui vont répondre
promptement aux besoins des producteurs et de se concentrer sur un programme R & D axé sur la demande et les résultats. À cette fin et après consultation avec ses bailleurs de fond, l'Institut de Recherches Cannières de la République de Maurice (MSIRI) se lancera durant les cinq prochaines années dans un programme de recherche et développement visant à relever les défis majeurs. Cet article se penchera sur les sept axes de recherches qui ont été identifiés et de mettre en évidence certaines contraintes qui peuvent soit limiter ou empêcher leurs mises en œuvre.

Mots clés: Coût de production, prix réduit de sucre, l’érosion du quota, la compétitivité, la recherche axée sur les résultats

Plan de I&D orientado a la demanda para la sustentabilidad de la industria azucarera de Mauricio

Resumen. Los cambios recientes en el ambiente economico global plantean una amenaza para la competitividad y la sustentabilidad de la industria azucarera de Mauricio. Menos area con caña de azucar, acompañado con la escasez y los altos costos de la mano de obra y el transporte, han resultado en incrementos en el costo de produccion. Lo anterior, acompañado con otros factores como el cambio climatico, son señales fuertes para que la industria azucarera de Mauricio se reinvente. La perdida en el 2017 de la cuota preferencial en Europa con la abolidencion de un antiguo acuerdo marcaran un cambio dramatico para el sector local azucarero como resultado de la reduccion de los precios del azucar. Las consecuencias de la erosion de la cuota/precio se estan sientiendo a dos niveles: (i) menos ingresos para los cañeros, conduciendo a mayor abandono de tierras y menos suministro de caña a los ingenios; y (ii) decremento en los ingresos para la industria como un todo, que impactara su viabilidad, competitividad y contribucion positiva al medio ambiente. La produccion de caña de azucar y la conservacion de la tierra bajo este cultivo son esenciales para el progreso economico y social del pais asi como para la industria turistica, y aun mas importante para la produccion de energia verde, toda vez que actualmente cerca del 15% de la electricidad en el pais es producida a partir del bagazo de caña. Para enfrentar estos desafios, el gobierno de Mauricio ha tomado iniciativas a traves de un estudio reciente realizado por LMC International para verificar el impacto economico, social y ambiental en Mauricio a partir de la abolidencion de las cuotas de azucar en el mercado de la Union Europea. Una de las mayores recomendaciones emanada del estudio es la necesidad de una reforma de largo alcance para delinear las actividades de I&D que responderan rapidamente a las necesidades de los productores y enfocarse en la caña de azucar a traves de la investigacion orientada a la demanda y al resultado. Para este proposito, el “Instituto de Investigaciones de la Industria Azucarera de Mauricio” (MSIRI, por sus siglas en ingles), despues de consultas con sus accionistas, se embarcara en una agenda de investigacion y desarrollo para el periodo 2016-2020 para enfrentar los retos mayores. Este trabajo presenta las siete areas especificas de investigaciones que han sido identificadas y subraya algunas de las contingencias que podrian limitar o impedir su implementacion.

Palabras clave: Costo de produccion, plan de investigacion y desarrollo, precio del azucar reducido, erosion de la cuota, competitividad, investigacion orientada a los resultados