

# **Sugarcane breeding and varieties in the Sugar Association of Caribbean (SAC) industries and prospects for the future**

P. Seshagiri Rao

West Indies Central Sugar Cane Breeding Station, Groves, St George, BB19073, Barbados

Email: [p\\_seshagiri\\_rao@yahoo.ca](mailto:p_seshagiri_rao@yahoo.ca)

## **ABSTRACT**

Breeding has been recognised as important for the Caribbean sugar industries since the discovery of cane seedlings germinating from true seed in Barbados in 1888 and subsequent breeding successes. In 1932, sugarcane breeding became organized on a regional basis with the establishment of the British West Indies Central Sugar Cane Breeding Station (CBS) which came under the direction of the Sugar Association of Caribbean (SAC) in 1962. Information collected for 115 successful varieties grown by SAC industries - Guyana, Trinidad, Barbados, St Kitts, Jamaica and Belize between 1945 and 2005 - was analysed for the reasons behind variety change and degree of adaptation. Germplasm, cane breeding activities, variety selection and testing at the CBS and Variety Testing Stations (VTSs) during the mentioned period was examined for the future prospects in light of changing demands on varieties.

SAC industries replaced noble (*Saccharum officinarum*) varieties with far better cane yielding and ratooning inter-specific hybrids with disease resistance by 1950. Prominent varieties, B34104, B37161 and B41227 were replaced by others such as B62163, B63118, BJ7015 and DB63113 in the 1980s. Later, better yielding varieties like B82238, BJ7504, BT74209, D89138 and DB7869 with local adaptation became prominent. There has not been much improvement in sugar content. Current use of large numbers of varieties with a broader genetic base gives protection against new pests and diseases and reduces genetic vulnerability. The paper discusses the recent positive trends towards the areas of parental improvement, breeding and selection of varieties for higher sugar, fibre and biomass yields for a diversified sugar cane industry.

**KEY WORDS: Sugarcane, Breeding, Varieties, Sugar, Renewable energy**

## **INTRODUCTION**

It is fitting to review the contributions of the West Indies Central Sugar Cane Breeding Station (CBS) and the Sugar Association of Caribbean (SAC) Variety Selection and Testing Stations (VTSs) during the last 75 years of existence to the sugar industries of the region. It is also fitting to record the expansion and contribution of the CBS during the last 45 years under the SAC ownership.

The discovery of naturally germinating sugarcane seeds in 1888 in Barbados and the subsequent initiation of cane breeding have had considerable impact on the production of sugar in Barbados and other countries of the region. The disease resistant and better yielding noble cane varieties bred until 1925 were grown in the Caribbean and beyond. The most popular were BH10(12) and Ba.1569. In 1932 sugarcane breeding became organized on a regional basis with the establishment of the British West Indies Central

Sugar Cane Breeding Station (CBS), Stevenson (1953). This heralded an era of improved production in the face of many challenges which continued under the direction of the Sugar Association of the Caribbean (SAC), formed in 1962, with the cooperation of the Variety Testing Stations (VTS) in a network comprising Guyana, Trinidad, Barbados, St Kitts, Jamaica and Belize which fuelled an expansion of cane breeding research leading to the development of many productive varieties (Walker, 1982, Rao, et. al. 1994, Chave, et. al., 1994, Kennedy, et. al.1994).

Since the late 1960s, the West Indies Sugarcane Breeding and Evaluation Network (WISBEN) has developed much needed varieties for the SAC member industries and other associate members inside and outside the region. Inter-specific hybrid (I-SH) varieties completely replaced the nobles by 1950. I-SH varieties like B34104, B37161, B41227 and B4362 with wider adaptation and better ratooning capabilities were grown in many countries. From the 1980s onwards, varieties selected for local adaptation and better cane yield have occupied large areas. The paper discusses cane breeding and variety testing activities, variety changes between 1945 and 2005 and presents the current developments in the areas of parental improvement, breeding and selection for higher sugar, fibre and biomass yield for a diversifying sugar cane industry within the region.

### **Sugarcane breeding**

Sugarcane breeding for the SAC industries has been carried out by the CBS over the last 75 years in the face of many challenges. The main challenges included breeding for pest and disease resistance, improved cane and sugar yield as well as local adaptation to changing cultural practices and harvest systems. The CBS acquired and maintained large numbers of wild germplasm representing many ecological and geographical regions of the world. It also obtained commercial parents as well as varieties for sugar production. In the 1930s and 1940s the CBS introduced new varieties with disease resistance, higher cane yields and longer ratooning capabilities to replace noble varieties then being grown. At present the live collection consists of over 3,700 clones representing distinct species, early generation inter-specific hybrids (EGISH) and commercial clones. The CBS conducted considerable research into areas such as flowering control, crossing methods, inheritance of cane yield, sugar accumulation, disease resistance and other important characteristics. Research into the parental choice, breeding systems, selection methods, data analysis and experimental designs for variety trials have led to effective and efficient variety development (Walker 1982).

Two important long term parental improvement programmes, genetic base broadening (from 1960s) with the aim of introducing much needed genetic variability for continuous improvement of many characteristics and recent recurrent selection for increased sugar content have created unique populations with great potential for breeding varieties for better cane yield, sugar content and biomass (Walker, 1987; Simmonds, 1993; Rao and Kennedy, 2004; Kennedy, 2005).

The CBS routinely conducts workshops and training sessions for the VTSs and CBS' staffs and has been playing an active role in the exchange of varieties among the members of WISBEN to ensure exploitation of a wider germplasm. Senior staffers of the CBS from time to time visits VTSs to advise on various aspects of variety selection and

testing. The central role played by the CBS and the active part played by the VTSS in WISBEN contribute to a constant supply of productive varieties.

All has been achieved with limited staff and small budgets over 75 years. This could not have happened had it not been for the employment and retention of well trained and devoted plant breeders, the continuous cooperation from the VTSS as well as constant support from sugar industry authorities, and in recent times by SAC. The contributions of the station's long serving former directors - Dr A.E.S. McIntosh, 1928-1945; Mr. G.C. Stevenson, 1932-1962; Mr. D.I.T. Walker, 1957-1988; Dr. P. Seshagiri Rao, 1968-2008 cannot be over emphasized. The work of other research and technical staff of the CBS and VTSS and the inputs of the renowned plant breeder, Prof. N.W. Simmonds as consultant, 1962-1992, contributed to the success. In plant breeding it is important to retain breeders over long periods, ensuring overlap of personnel for continuity of long term breeding programmes. The transition to the current Director, Dr A.J. Kennedy, with over 22 years of experience at CBS, is in keeping with that tradition.

### **Variety selection and testing**

Decentralised selection of varieties from seedlings raised from the fuzzi and testing of imported clones for local adaptation, starting from late 1950s, contributed enormously to the development of well adapted and productive varieties. The main active SAC VTSS were in Guyana, Trinidad, Barbados, St Kitts, Jamaica and Belize. A few other VTSS inside and outside region also participate in the variety development. The VTSS are responsible to select well adapted varieties for the respective local growing conditions taking into consideration cane yield, sugar content, ratooning, pest and disease resistance, herbicide sensitivity, hand and mechanical harvest suitability and other characteristics.

Over the years SAC industries maintained well established VTSS and retained well trained and experienced staff with few exceptions. Raising approximately 200,000 seedlings every year in the region and subjecting them to selection in early stages and testing in advanced stages requires, in addition to considerable physical resources, a cadre of well trained and experienced selectors. Changes in variety requirements meant changing the variety selection procedures and upgrading the cane analysis laboratories. Since selectors are often also in charge of variety extension and work closely with the cultivation managers, they bring useful field information on the varieties and often make necessary changes needed in the selection procedures. Frequent interactions between the CBS and WISBEN staffs provide the forum to address problems and guide the selectors to adopt changes that may be needed.

## Challenges and Variety Change

After replacing the nobles with better yielding I-SH varieties with longer ratooning capabilities and with mosaic and gumming disease resistance, the industries faced a series of challenges including the onset of new diseases, changing cultivation practices, introduction of herbicides, mechanization, increased cost of production and reduced income, especially since the 1970s. These conditions imposed the need for varieties of different characteristics to maintain sugar yields and ensure survival of the industries. The potentially devastating diseases arriving in the region were leaf scald (*Xanthomonas albilineans*) in 1950s and smut (*Ustilago scitaminea*) in 1970s. Leaf scald affected a few varieties sporadically and became endemic in some areas. Certain high sugar yielding and widely grown varieties proved susceptible to smut. Other diseases with less effect were rust (*Puccinia melanocephala*), yellow spot (*Mycovellosiella koepkei*), ratoon stunting disease (*Clavibacter xyli*) and more recently yellow leaf disease (luteovirus). Fortunately, the availability and replacement of varieties with varying levels of disease tolerance or resistance over time resulted in very low levels of yield loss to the industries.

The pace of change of varieties varied considerably from industry to industry. The percentage of area occupied by different varieties in the six SAC countries is given in **Tables 1-6**.

In Guyana within a short time noble varieties were replaced by I-SH varieties, first with B34104 and soon after, when this was found susceptible to leaf scald, by B37161 and B41227 (**Table 1**). When smut arrived in the mid 1970s, two prominent but susceptible varieties, HJ5741 and DB41460, were quickly replaced with smut resistant varieties. B41227, with wider adaptation and resistance to smut, continued to play an important role until early 1990s. Good collaboration between the selection department and field management coupled with Guyana's excellent tradition of variety selection, from fuzzi produced locally and received from CBS, ensured that a large number of substitute varieties were available with none occupying more than 40% of acreage.

**Table 1: Percent Area occupied by Varieties in Guyana from 1945 to 2005**

| Variety  | 1945 | 1950 | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| Diamond  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 10       | 27   |      |      |      |      |      |      |      |      |      |      |      |      |
| POJ2878  | 55   |      |      |      |      |      |      |      |      |      |      |      |      |
| Co419    | 5    | 5    | 1    |      |      |      |      |      |      |      |      |      |      |
| Co421    | 6    | 9    |      |      |      |      |      |      |      |      |      |      |      |
| D14/34   | 3    |      |      |      |      |      |      |      |      |      |      |      |      |
| B34104   |      | 58   | 13   |      |      |      |      |      |      |      |      |      |      |
| B37161   |      | 1    | 30   | 36   | 20   | 3    |      |      |      |      |      |      |      |
| B4098    |      |      | 10   | 1    |      |      |      |      |      |      |      |      |      |
| B41227   |      |      | 34   | 42   | 47   | 35   | 31   | 43   | 24   | 21   | 11   | 4    |      |
| B4362    |      |      | 5    | 2    |      |      |      |      |      |      |      |      |      |
| B47258   |      |      |      | 8    | 2    |      |      |      | 1    | 2    | 3    |      |      |
| D141/46  |      |      |      |      | 13   | 29   | 10   | 6    | 5    | 5    | 5    |      |      |
| D37/45   |      |      |      |      | 3    | 5    |      |      |      |      |      |      |      |
| B51116   |      |      |      |      | 3    | 10   | 8    |      |      |      |      |      |      |
| D158/41  |      |      |      |      | 2    | 3    | 1    | 1    | 5    | 5    | 5    | 7    | 7    |
| D38/57   |      |      |      |      |      |      | 6    | 7    | 3    | 1    |      |      |      |
| HJ5741   |      |      |      |      |      |      | 17   |      |      |      |      |      |      |
| DB414/60 |      |      |      |      |      |      | 11   |      |      |      |      |      |      |
| DB66113  |      |      |      |      |      |      |      | 12   | 29   | 35   | 19   | 15   | 6    |
| B63118   |      |      |      |      |      |      |      |      | 7    | 4    | 1    |      |      |
| DB671760 |      |      |      |      |      |      |      | 1    | 5    | 9    | 2    | 1    |      |
| DB7160   |      |      |      |      |      |      |      |      | 2    | 8    | 9    | 7    |      |
| DB7869   |      |      |      |      |      |      |      |      |      | 1    | 22   | 34   | 33   |
| DB75159  |      |      |      |      |      |      |      |      |      | 1    | 12   | 12   | 6    |
| DB7047   |      |      |      |      |      |      |      |      |      | 2    | 11   | 4    |      |
| DB70172  |      |      |      |      |      |      |      |      | 1    |      | 3    |      |      |
| D89138   |      |      |      |      |      |      |      |      |      |      |      | 2    | 20   |
| D7661    |      |      |      |      |      |      |      |      |      |      |      | 2    | 12   |
| D8415    |      |      |      |      |      |      |      |      |      |      |      | 10   |      |
| D9017    |      |      |      |      |      |      |      |      |      |      |      |      | 6    |
| DB83119  |      |      |      |      |      |      |      |      |      |      |      |      | 2    |
| R570     |      |      |      |      |      |      |      |      |      |      |      |      | 2    |

This kind of variety replacement and cooperation proved its worth in increasing sugar production during a period of unprecedented changes in growing conditions.

**Table 2: Percent area occupied by varieties in Trinidad from 1945 to 2005**

| Variety  | 1945 | 1950 | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| BH10(12) | 21   |      |      |      |      |      |      |      |      |      |      |      |      |
| C0213    | 29   |      |      |      |      |      |      |      |      |      |      |      |      |
| B3337    | 7    | 9    | 32   | 17   | 2    |      |      |      |      |      |      |      |      |
| B34104   | 24   | 37   | 7    |      |      |      |      |      |      |      |      |      |      |
| B37161   |      | 18   | 21   | 15   | 2    |      |      |      |      |      |      |      |      |
| B37172   |      | 11   | 31   | 18   | 3    |      |      |      |      |      |      |      |      |
| B41227   |      |      | 4    | 36   | 61   | 60   | 70   | 77   | 77   | 53   | 40   | 30   | 19   |
| B4362    |      |      | 3    | 1    | 2    | 1    |      |      |      |      |      |      |      |
| B49119   |      |      |      | 2    | 14   | 26   | 5    | 1    |      |      |      |      |      |
| B50112   |      |      |      |      | 6    | 6    |      |      |      |      |      |      |      |
| HJ5741   |      |      |      |      |      |      | 19   | 14   |      |      |      |      |      |
| BT64134  |      |      |      |      |      |      |      | 3    | 5    |      |      |      |      |
| B63118   |      |      |      |      |      |      |      |      | 7    | 6    | 2    |      |      |
| B62163   |      |      |      |      |      |      |      |      | 4    | 3    |      |      |      |
| BB66113  |      |      |      |      |      |      |      |      | 1    | 12   | 14   | 12   | 15   |
| BT74209  |      |      |      |      |      |      |      |      |      | 1    | 13   | 32   | 31   |
| BT72842  |      |      |      |      |      |      |      |      |      | 6    | 10   | 3    | 3    |
| B80689   |      |      |      |      |      |      |      |      |      |      | 4    | 13   | 14   |
| BJ7015   |      |      |      |      |      |      |      |      |      |      |      | 1    | 3    |
| BT871646 |      |      |      |      |      |      |      |      |      |      |      | 1    | 3    |
| DB7869   |      |      |      |      |      |      |      |      |      |      |      |      | 1    |

In Trinidad, following the replacement of nobles with I-SH varieties, there has been a relatively slow change in the variety picture (**Table 2**). B41227 introduced in early 1950s occupied large areas up to 1990s, reaching a high of 87% in 1982. Fortunately, this variety showed resistance to most diseases. Varieties selected elsewhere, especially in Barbados and Guyana, dominated the picture. Only recently, after more than 40 years of selection from fuzz produced by the CBS, has a locally selected variety, BT74209, reached an acreage of 32% in 2000.

In Barbados, variety change from nobles to I-SH was relatively quick with B37161 occupying 90% of acreage by 1950 (**Table 3**). Soon after there was a continuous replacement of varieties with B62163 being the most successful reaching 84% in 1984. In general, Barbados has tended to grow a relatively wide mixture of varieties, except for a period when the industry was going through financial constraints, leading to the long ratooning of B62163. During the last 15 years however, a wider mixture of varieties have been grown with newer varieties, bred after 1985, showing much promise for expansion.

In St Kitts variety change has been gradual with new varieties being tested continuously and replacing the older set (**Table 4**). Being a small industry, instead of selecting varieties from seedlings raised from fuzz, St Kitts adopted a policy of importing and testing approximately 200 varieties selected from Stage 2 in Barbados and a few from

other SAC industries. With a good variety testing programme, St Kitts did very well in variety development without going into the expensive seedling selection process.

**Table 3: Percent area occupied by varieties in Barbados from 1945 to 2005**

| Variety  | 1945 | 1950 | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| BH10(12) | 5    |      |      |      |      |      |      |      |      |      |      |      |      |
| B726     | 3    |      |      |      |      |      |      |      |      |      |      |      |      |
| B2935    | 2    |      |      |      |      |      |      |      |      |      |      |      |      |
| B3439    | 5    |      |      |      |      |      |      |      |      |      |      |      |      |
| B34104   | 7    |      |      |      |      |      |      |      |      |      |      |      |      |
| B37187   | 10   | 1    |      |      |      |      |      |      |      |      |      |      |      |
| B37161   | 63   | 90   | 67   | 8    |      |      |      |      |      |      |      |      |      |
| B4098    |      | 5    | 8    | 3    |      |      |      |      |      |      |      |      |      |
| B41211   |      | 2    | 13   | 26   | 10   | 8    |      |      |      |      |      |      |      |
| B45151   |      |      | 1    | 18   | 17   | 7    |      |      |      |      |      |      |      |
| B4744    |      |      | 4    | 26   | 28   | 31   | 14   | 2    |      |      |      |      |      |
| B49119   |      |      |      | 15   | 31   | 22   |      |      |      |      |      |      |      |
| B52107   |      |      |      |      | 1    | 5    | 2    |      |      |      |      |      |      |
| B54142   |      |      |      |      | 5    | 2    |      |      |      |      |      |      |      |
| B60267   |      |      |      |      |      | 1    | 11   | 3    |      |      |      |      |      |
| B62163   |      |      |      |      |      | 10   | 40   | 59   | 79   | 67   | 24   | 7    |      |
| B63118   |      |      |      |      |      |      | 3    | 16   | 13   | 4    | 3    |      |      |
| B59162   |      |      |      |      |      |      | 19   | 5    |      |      |      |      |      |
| B80689   |      |      |      |      |      |      |      |      |      | 3    | 20   | 9    | 11   |
| B77602   |      |      |      |      |      |      |      |      |      | 5    | 15   | 22   | 16   |
| B74541   |      |      |      |      |      |      |      |      | 1    | 12   | 17   | 11   | 13   |
| B80251   |      |      |      |      |      |      |      |      |      |      | 6    | 9    | 4    |
| B82238   |      |      |      |      |      |      |      |      |      |      | 2    | 18   | 22   |
| B79474   |      |      |      |      |      |      |      |      |      | 1    | 4    | 1    | 2    |
| B71383   |      |      |      |      |      |      |      |      |      | 1    | 2    | 3    | 2    |
| B78436   |      |      |      |      |      |      |      |      |      |      | 2    | 3    | 5    |
| B881607  |      |      |      |      |      |      |      |      |      |      |      |      | 4    |
| B89132   |      |      |      |      |      |      |      |      |      |      |      |      | 3    |
| B89447   |      |      |      |      |      |      |      |      |      |      |      |      | 5    |

In Jamaica variety change has also been gradual. Two popular varieties with high yield and quality were B4362 and HJ5741. B4362 occupied 45% of acreage in 1965 but by the time it was attacked by rust in the late 1970s, acreage was down to 12%. Also the smut susceptible HJ5741, occupying 49% of acreage in 1977, was quickly replaced by resistant varieties by 1982. Two hardy varieties, B41227 and UCW 54/65, have survived for relatively long periods even though on small acreages in the later years. The Jamaican programme has been successful in the selection of locally adapted varieties from fuzzi received from the CBS. In the recent years, with a downturn in the industry, variety replacement has been relatively slow.

In Belize variety change has been very slow (**Table 6**). The smut susceptible B52298 still occupies 63% of area after being introduced in 1960s. Belize joined SAC in 1975 and has been receiving each year around 30 varieties selected by other SAC members. Nonetheless, varieties selected outside Belize still occupy most of the cultivated area as locally selected varieties from CBS supplied fuzzi now occupy 11% of acreage.

In **Table 7**, information is given on the percent area occupied by the prominent varieties with wide adaptation in SAC industries. The first batch of I-SH varieties, B34104 and B37161, had very wide adaptation being cultivated in five countries. The next batch of varieties, B41211, B49119 and HJ5741, were also grown in many countries but in reduced acreage. Recent varieties, B62163, B63118, B80689, DB66113 were grown in two or three countries but occupying large areas only in individual countries. The trend seems to be that modern varieties selected for specific adaptation in one country have narrower adaptation than varieties selected before the 1960s. This suggests it may now be hard to breed varieties with wider adaptation across the region since they may not compete with locally selected varieties.



**Table 5: Percent area occupied by varieties in Jamaica from 1945 to 2005**

| Variety  | 1945 | 1950 | 1955 | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 |
|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| BH10(12) | 21   | 1    |      |      |      |      |      |      |      |      |      |      |      |
| POJ2878  | 11   | 2    | 1    |      |      |      |      |      |      |      |      |      |      |
| B3439    | 16   | 22   | 13   | 2    |      |      |      |      |      |      |      |      |      |
| B34104   | 33   | 54   | 16   | 2    |      |      |      |      |      |      |      |      |      |
| B37161   |      | 4    | 8    | 1    |      |      |      |      |      |      |      |      |      |
| B37172   |      | 6    | 7    | 3    | 3    | 2    |      |      |      |      |      |      |      |
| B41227   |      |      | 18   | 39   | 22   | 20   | 3    | 8    | 11   | 5    |      |      |      |
| B42231   |      |      | 10   | 11   | 10   | 7    |      |      |      |      |      |      |      |
| B4362    |      |      | 14   | 32   | 45   | 44   | 14   | 7    |      |      |      |      |      |
| Co331    |      |      | 1    | 3    | 2    |      |      |      |      |      |      |      |      |
| B49119   |      |      |      |      | 5    | 7    | 2    | 1    |      |      |      |      |      |
| B51129   |      |      |      |      |      | 2    | 6    | 7    | 6    | 1    |      |      |      |
| B51410   |      |      |      |      | 1    | 2    | 1    | 1    | 2    |      |      |      |      |
| B51415   |      |      |      |      |      | 2    | 4    | 3    | 2    |      |      |      |      |
| HJ5741   |      |      |      |      |      | 1    | 37   | 30   |      |      |      |      |      |
| UCW54/65 |      |      |      |      |      | 1    | 24   | 36   | 28   | 17   | 5    | 3    | 2    |
| BJ7015   |      |      |      |      |      |      |      |      | 21   | 31   | 30   | 19   | 10   |
| BJ7013   |      |      |      |      |      |      |      |      | 7    | 6    |      |      |      |
| BJ7504   |      |      |      |      |      |      |      |      |      | 4    | 18   | 29   | 18   |
| BJ7465   |      |      |      |      |      |      |      |      |      | 5    | 15   | 18   | 12   |
| BJ7452   |      |      |      |      |      |      |      |      |      | 10   | 14   | 2    |      |
| BJ7627   |      |      |      |      |      |      |      |      |      | 1    | 6    | 6    | 6    |
| BJ78100  |      |      |      |      |      |      |      |      |      |      |      |      | 10   |
| BJ8226   |      |      |      |      |      |      |      |      |      |      |      | 6    | 3    |
| BJ82119  |      |      |      |      |      |      |      |      |      |      |      | 8    | 8    |
| BJ8252   |      |      |      |      |      |      |      |      |      |      |      |      | 2    |
| BJ82156  |      |      |      |      |      |      |      |      |      |      |      |      | 2    |

**Table 6: Percent area occupied by varieties in Belize from 1975 to 2007**

| Variety  | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2007 |
|----------|------|------|------|------|------|------|------|
| B52298   | 27   | 46   | 44   | 40   | 40   | 35   | 63   |
| POJ2878  | 33   | 19   | 18   | 10   | 8    |      |      |
| MEX5932  |      |      | 1    | 4    | 3    | 10   |      |
| B64278   |      |      | 1    | 4    | 5    | 1    |      |
| PR1048   | 6    | 7    | 10   | 10   | 5    |      |      |
| B67128   |      |      | 1    | 2    | 10   | 5    |      |
| CP701133 |      |      |      |      | 2    | 6    |      |
| CP721312 |      |      |      |      | 10   | 16   |      |
| Q90      |      | 2    | 2    | 1    | 1    |      |      |
| B59136   |      | 1    | 3    | 1    | 1    |      |      |
| BJ5927   |      | 2    | 2    | 1    |      |      |      |
| BJ5721   | 15   | 10   | 2    |      |      |      |      |
| HJ5741   | 11   | 4    |      |      |      |      |      |
| B79474   |      |      |      |      |      | 5    | 5    |
| BBZ8257  |      |      |      |      |      | 11   | 11   |

**Table 7. Prominent varieties with wider adaptation during 1945 - 2005**

| Variety  | Percent area (year of maximum %) |           |           |           |           |           |
|----------|----------------------------------|-----------|-----------|-----------|-----------|-----------|
|          | Guyana                           | Trinidad  | Barbados  | St Kitts  | Jamaica   | Belize*   |
| BH10(12) | -                                | 21(1945)  | 5 (1945)  | 12(1945)  | 21 (1945) | -         |
| POJ2878  | 55 (1945)                        | -         | -         | -         | 11 (1945) | 33 (1975) |
| B34104   | 67 (1951)                        | 55 (1948) | 7 (1945)  | 8 (1946)  | 54 (1950) | -         |
| B37161   | 43 (1957)                        | 24 (1957) | 93 (1949) | 94 (1950) | 8 (1954)  | -         |
| B37172   | -                                | 31 (1955) | -         | -         | 9 (53)    | -         |
| B4098    | 10 (1955)                        | -         | 8 (1954)  | -         | -         | -         |
| B41211   | -                                | -         | 26 (1960) | 51 (1959) | -         | -         |
| B41227   | 50 (1962)                        | 87 (1982) | -         | -         | 39(1960)  | -         |
| B4362    | 5 (1955)                         | 3 (1955)  | -         | -         | 46 (1966) | -         |
| B45151   | -                                | -         | 22 (1962) | 14 (1965) | -         | -         |
| B49110   | -                                | 26 (1969) | 31 (1963) | 11 (1962) | 7 (1966)  | -         |
| B59136   | -                                | -         | -         | 34 (1984) | -         | 4 (1982)  |
| HJ5741   | 18 (1976)                        | 38 (1977) | -         | 33 (1978) | 49 (1977) | 11 (1975) |
| B62163   | -                                | 6 (1987)  | 84 (1987) | 6 (1995)  | -         | -         |
| B63118   | 7 (1984)                         | 8 (1987)  | 22 (1982) | 29 (1984) | -         | -         |
| B79474   | -                                | -         | 6 (1993)  | -         | -         | 5 (1999)  |
| B80689   | -                                | 12 (2005) | 22 (1994) | -         | -         | -         |
| DB66113  | 35 (1987)                        | 15 (2005) | -         | -         | -         | -         |
| DB7047   | 11 (1995)                        | -         | -         | 3 (1994)  | -         | -         |
| DB7160   | 9 (1992)                         | -         | -         | 1 (1999)  | -         | -         |
| DB7869   | 40 (2001)                        | 1 (2005)  | -         | -         | -         | -         |
| BJ7015   | -                                | 3 (2005)  | -         | -         | 32 (1988) | -         |

\*Belize data for 1975-2005 only.

## CONCLUSION

In recent years SAC sugar industries have been facing serious production and economic problems forcing them to look for ways to reduce cost of production and to generate additional income from additional value added products using the total sugar cane plant. At the same time, reducing the tonnes of cane used to produce a tonne of sugar through the improvement of sugar content of the varieties would contribute to lowering cost of production. Varieties with higher fibre and biomass yields with acceptable levels of sugar would also provide an opportunity for use in the production of renewable energy when the price of fuel is rising and causing economic hardship.

Fortunately, SAC industries have at their disposal, at the CBS, a large collection of enhanced germplasm with many desirable characteristics. Parents with brix as high as 30.5° (in the field) are being used in breeding to develop high quality commercial varieties (Kennedy, 2005). Meanwhile, early generation inter-specific hybrids with fibre content as high as 27%, cane yields of up to 125 t/ha with juice brix in the vicinity of 18.5° in yield trials are now being tested for possible use in producing consumer electricity through cogeneration with the juice being converted to ethanol (Rao, et.al. 2007). Breeding and selection programmes are underway to utilize the available germplasm to develop varieties to support SAC industries in their pursuit of generating additional income through the use of the total sugar cane plant. For these reasons, it is essential to maintain well funded breeding and selection programmes with clear objectives instep with meeting the needs of the industry.

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