

2020 SRA VARIETY ADOPTION REPORT

1. Introduction

The Variety Adoption Report provides an overview of clean seed programs and adoption of new varieties. The data sets a baseline for comparing clean seed programs across regions and for monitoring improvements over time as changes are made to their operation. The report also provides lead indicators of new variety adoption that are part of the metrics used to assess the performance of SRA investment in plant breeding.

SRA conducts a centralised crossing program at Meringa in the Far North with regional selection programs in each of the main production areas. Early-stage selection trials are conducted on SRA research stations at Bundaberg, Mackay, Burdekin, Herbert and the Far North. In the Burdekin plant breeding is conducted in collaboration with Wilmar Sugar Australia with a 'W' added to the name of varieties released from this part of the program. Advanced clones are tested in Final Assessment (FAT) and Regional Variety trials (RVT) on commercial farms under local best practice agronomic management spanning from Harwood in NSW to Mossman in the Far North. The field trial network comprises more than 73 trials each year. The plant breeding effort is supported by pathology expertise with *Pachymetra* screening conducted at Tully and all other diseases at Woodford. Molecular marker-based selection, statistical support and quarantine are based at SRA Indooroopilly.

Decisions to release new varieties are made by the industry at a regional level. Regional Variety Committees consider the commercial merit of advanced clones based on the agronomic performance data, disease resistance profiles and quality testing results. Clones progress through 'Accelerated' and 'Maximum Propagation' stages and are transferred from SRA to PSOs for multiplication typically prior to the RVC making a release decision. The timing may vary to balance the risk of large propagations being established for clones that are subsequently discarded with the objective of commercial availability soon after release. RVC meetings are open to industry participants and observations, experience and opinion on variety performance are regularly canvassed from the floor. Voting rights are formalised and restricted to local milling companies and grower representative organisations. The RVCs are recognised under the Queensland Biosecurity Act as holding responsibility for varieties meeting minimum disease standards under agreement with the Sugarcane Industry Biosecurity Committee.

PSOs conduct propagation and retail distribution of varieties under the terms of Variety Distribution Agreements with SRA. The agreements include technical guidelines on the hygiene and cultural requirements for clean seed status, Plant Breeder's Rights obligations, and reporting requirements to SRA.

This report steps back through the pipeline from current variety market share to sales of the most recently released varieties. Commercial production data is as published in the SRA Mill Statistics and Varietal Composition reports. The data is publicly available through the web portal QCANESelect®. Benchmarking of clean seed programs commenced from the 2018 season and annual reporting provides visibility of their performance. The data is as reported by the productivity service organisations (PSOs).

2. 2019 Variety Composition and Trends

Q208 was first released in the Burdekin in 2003 and became the dominant variety in 2014 peaking at 35% of national production. Its broad adaptation and performance stability have seen it maintain market dominance and in 2020 it represented 25% of production (Figure 1). Historically Australian sugarcane production has been concentrated on a few dominant varieties and in 2020 the top four represented 68% of the crop (Figure 1).

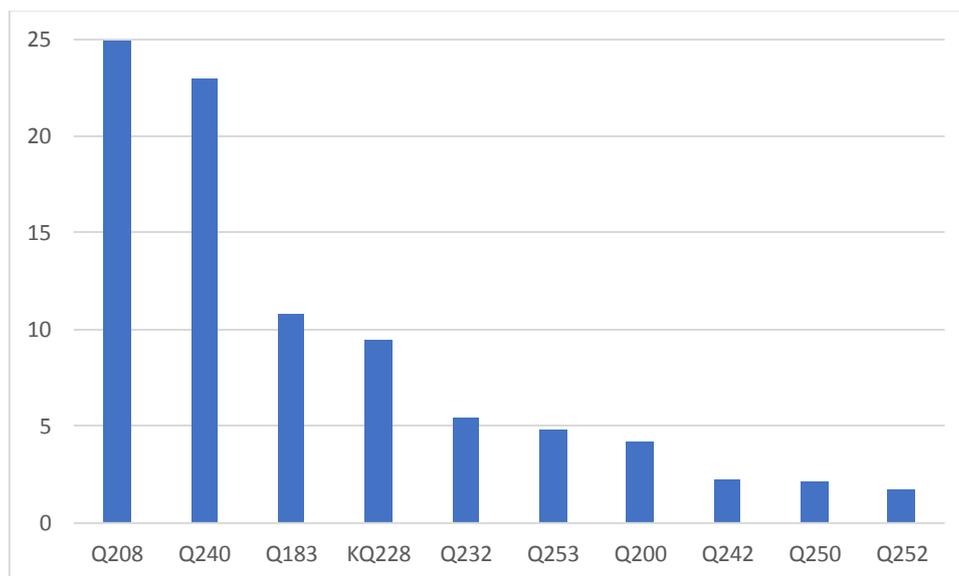


Figure 1: Percentage market share of Australian sugarcane production in 2020.

Changes in the national market share occur relatively slowly as shown in Figure 2. Q240 was first released in the Southern region in 2009, in NSW in 2010, in Central and Herbert in 2012, and the Burdekin and Northern regions in 2013. Q240 has taken 12 years to reach 23% of national production and is expected to continue increasing at the expense of older varieties.

The apparent slow rate of variety adoption is somewhat misleading. Consolidation of the national figures obscures regional differences in release dates and adoption rates. In the Burdekin Q240 increased to 30% of regional production just five years after its local release. This is slower than changes seen in other crops, but there are fundamental reasons for slower variety adoption rates in sugarcane. In annual species the entire crop is planted each year which allows for rapid changes in variety composition, and multiplication rates are high (>70x in cereals and >100x in canola) allowing large scale seed availability of new varieties.

Sugarcane has around 30x annual multiplication rates from whole stalk planting and 10x from billet planting. Less than 20% of the crop is planted each year and these factors limit the speed of change in variety market share. The top 6 varieties account for around 80% of production despite the large number available to growers, and the local importance of varieties with niche adaptation. The dominance of a few varieties is a consistent characteristic of sugarcane production over time and is also observed in other broadacre crops.

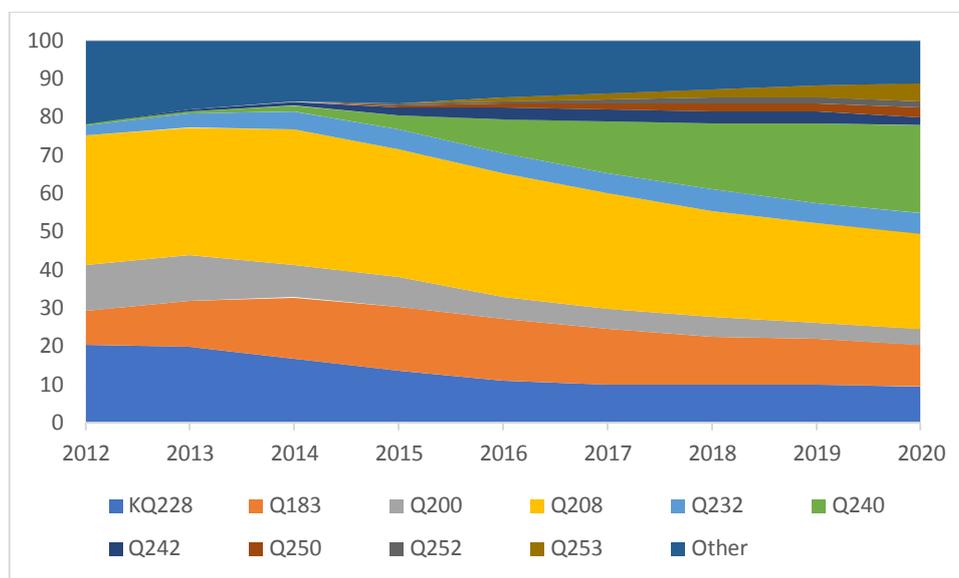


Figure 2: Changes to the variety composition of national sugarcane production.

The near-term outlook for change is an increase in Q253 due to strong adoption in the Herbert and Far North production areas, and the area planted to Q240 is expected to continue increasing along the current trendline indicated in Figure 2.

Market share of varieties is commonly used as a relative gauge of breeding program performance. As shown in Figure 3 varieties from the Burdekin made up 43% of national production, the Southern program 31% and Wilmar 10% in 2020. The national market share of the regional breeding operations provides a lag indicator of performance because of the age of the dominant varieties. Figure 3 provides a view on the success of the regional programs 10 to 20 years ago but is not necessarily a good reflection of their current performance. Examination of lead indicators of variety adoption is required to provide insight into future changes in the production mix and a reflection of current plant breeding performance.

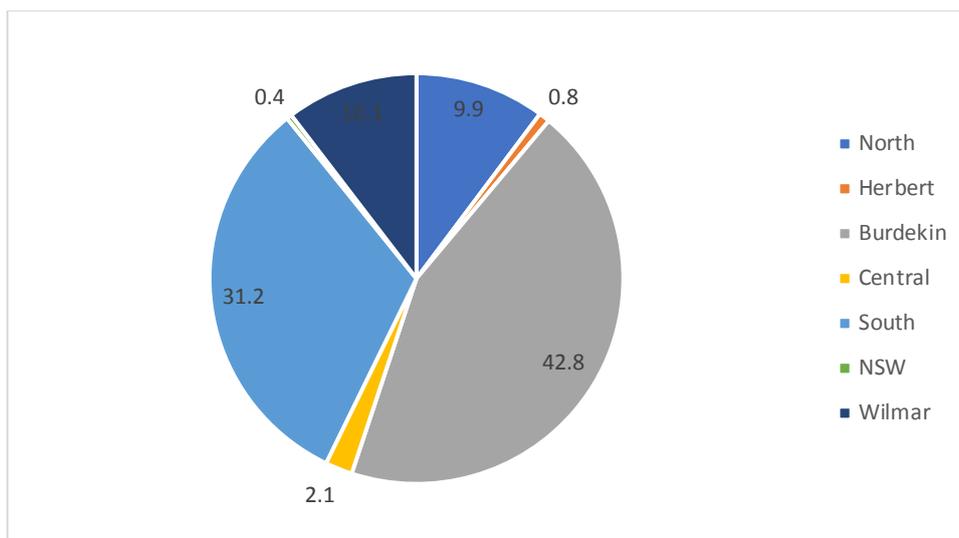


Figure 3: National market share of the regional programs based on 2020 production.

3. New Varieties

BSES and SRA defined ‘new’ varieties as up to seven years from commercial release. For metrics at a state level this relates to the year of first release, while for metrics at a region or mill level it relates to the local release date, so care needs to be taken in comparing different scales. It is not uncommon for release decisions to be made a year or more before planting material is commercially available resulting in zero adoption for up to two years which also needs to be considered in interpreting these metrics. The contribution of new varieties to total production over time in Queensland is shown in Figure 4 and it has declined significantly from over 35% in 2005 to 4% of the crop in 2020. NSW production from new varieties has followed a similar trend and was 3% in 2020. This reflects a period that SRA has not succeeded in releasing new varieties that achieved meaningful grower adoption.

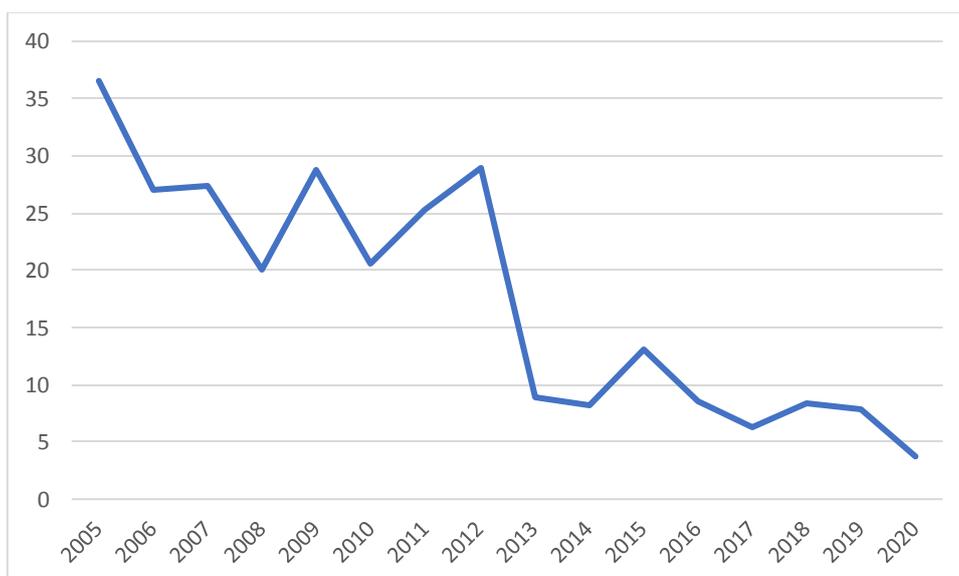


Figure 4: The percentage of Queensland production contributed by new varieties over time.

The presence of dominant varieties that are successful over a long period is a major factor in the trend shown in Figure 4. Examination of the historical record of Australian sugarcane production shows a cyclic nature in the production of new varieties which reflects the transition between major dominant varieties. However, the 2020 value of 3.7% is the lowest production of new varieties in Queensland since 1955.

An increasing trend in the production of new varieties will be one of the first commercial metrics to reflect improvements in plant breeding and grower adoption. However, variety adoption decisions for 2021 are largely set based on propagations established in previous years. Improvements in this metric are expected from 2022 based on recent clean seed sales.

A reporting schedule from productivity service organisations (PSOs) on clean seed distribution was instituted from the 2018 season. The initial data was used for a benchmarking study which illustrated the significant range in scale of the clean seed programs across regions and mill areas. Providing the benchmarking information to PSOs supported a number of changes being considered or planned to scale, starting quantity of new varieties provided by the breeding program, and the addition of alternative types of clean seed such as one eye setts and tissue culture plantlets.

The target of seed sales sufficient to plant 1% of the local mill area was established as a best practice target in the initial benchmarking study. Assuming growers achieve 10x multiplication rates this enables 10% of the local mill area to be planted from material that is one generation away from the clean seed distribution plots. Nine of the mill areas are significantly below the 1% benchmark as shown in Figure 5. Nine of the PSOs increased clean seed sales in 2020 which is a positive result.

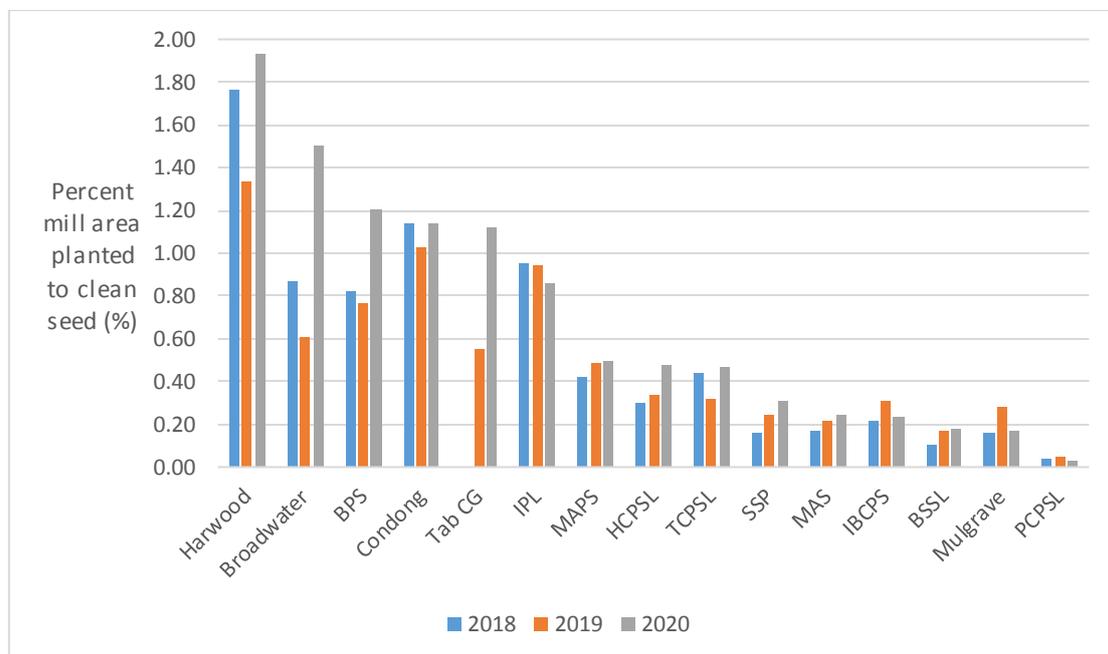


Figure 5: Individual PSO variety sales as a percentage of local mill area. Organisations are sorted in descending order of 2020 sales.

The conversion of clean seed sales to area planted is based on industry average rates. A value of 8 t/ha is used for billet planting except for Broadwater where a value of 10 t/ha is used. Whole stick planting rates are based on 2 t/ha. One Eye Sett and Tissue Culture derived plantlets are converted to planting area based on a value of 7,000 plants/ha. The local mill area is as published in SRA mill statistics and includes the area harvested for milling, planting material, and any area left as standover. Variation in planting rates is acknowledged as a potential source of error however the relative comparisons are considered informative. The values in Figure 5 are also influenced by fluctuations and trends in mill area.

There are biosecurity implications as clean seed makes an important contribution to control of diseases such as RSD, but it is only one factor. On-farm seed inspections, disease surveys and adoption of farm hygiene plans are critical parts of effective disease control. An effective clean seed distribution program is an important component of the local response to biosecurity issues such as an RSD outbreak.

The quantity of clean seed sales in 2019 was equivalent to planting 1658 hectares, equivalent to the 1600 hectares achieved in 2018. Changes to the clean seed programs began to impact sales in 2020 with the area planted increasing to 2124 hectares. Further increases are possible for 2021 however grower demand is subject to seasonal planting conditions and the sugar price outlook.

The sales volume of new varieties has significantly increased as shown in Figure 6. Sales in 2018 were equivalent to 271 Ha planted which rose to 460 Ha in 2019, which is just over 20% of the total. In 2020 sales of new varieties increased to 680 Ha and 32% of the total. This result reflects the improvements made in recently released varieties. The increases are principally driven by SRA11, WSRA17, SRA20, SRA21, SRA22 and SRA26. A key feature of most these new varieties is the combination of strong resistance to both smut and *Pachymetra* without a productivity penalty. If this sales profile can at least be maintained, then the proportion of commercial production from new varieties will increase from the current base of just 4%.

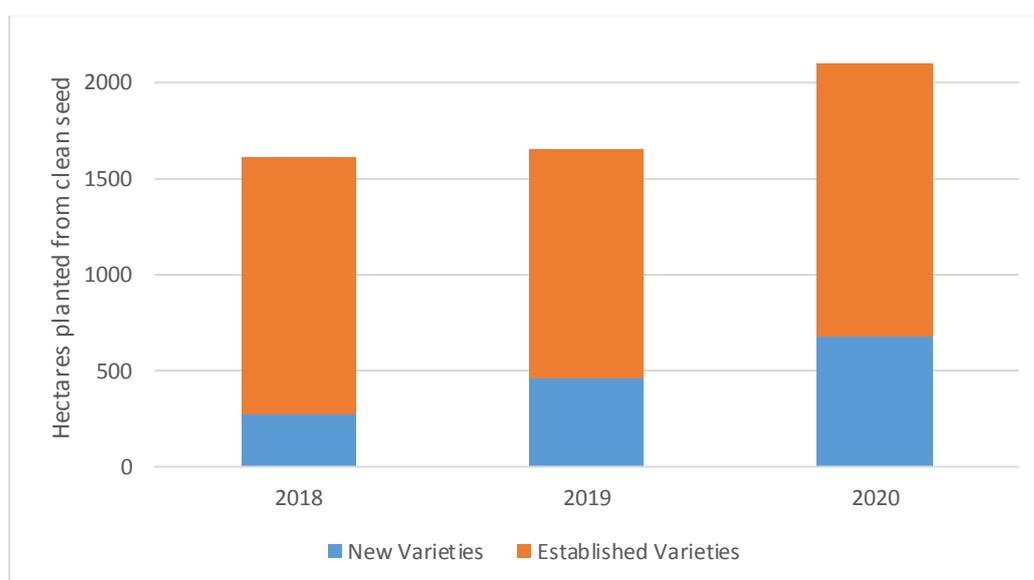


Figure 6: Seed sales of new (blue) and established varieties (orange) expressed as area planted.

The increase in sales of new varieties is not uniform across the industry. Figure 7 shows the percentage of total sales by new varieties reported from each PSO in 2020. The programs vary from a dominant focus on new varieties such as at Mossman (MAS) and Isis (IPL) to a very low proportion of sales as was the case in 2020 at Broadwater and the Tablelands (TAB CG). The release of SRA28 is expected to support further growth in new variety sales for the Herbert and Northern regions. While the NSW mill areas sit below the average for new variety sales the release of SRAW30 is expected to attract grower interest, noting that adoption rates in the two-year production system are inherently slower than one-year production.

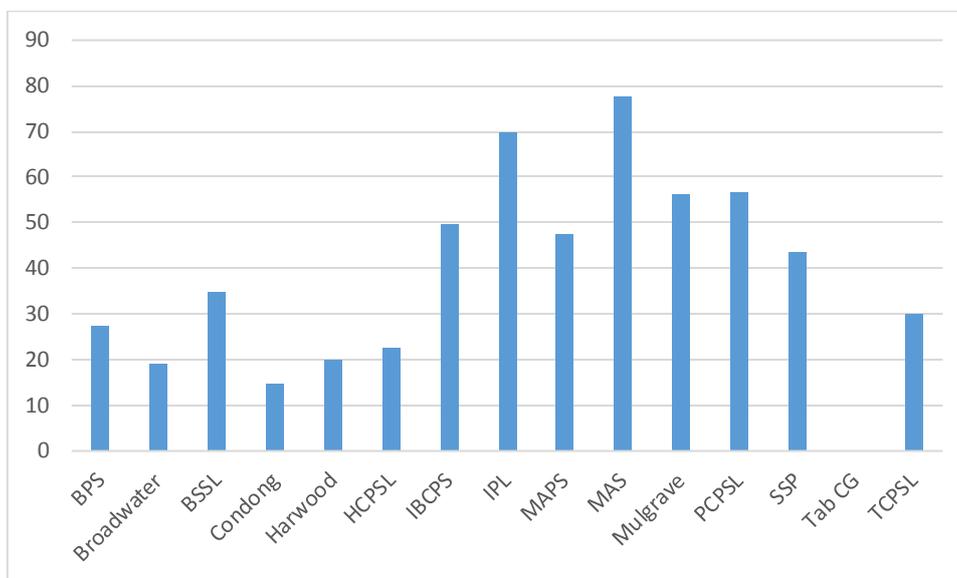


Figure 7: Proportion (%) of new variety sales reported by each Productivity Services Organisation for 2020. New varieties are defined as less than seven years since their first release, not necessarily the year of local release.

Historically clean seed distribution has been based largely on supply of whole stalk planting material. Labour requirements as well as health and safety challenges have seen this decline and in 2020 it represented 32% of clean seed sales on an area basis. Billet supply is considerably more mechanised and suitable for large scale operation and was 66% of seed sales on an area basis. Plantlets derived from tissue culture and one eye setts represent a small proportion of the area planted to clean seed but is a tactically important tool for many growers. Work that is underway to reduce the unit cost of these approaches may lead to increased demand.

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