BSES Limited

FINAL REPORT – SRDC PROJECT BSS179

DEVELOPMENT OF A STRATEGY FOR SELECTION OF HIGH-CCS CULTIVARS FOR HIGH-FERTILITY ENVIRONMENTS IN NORTHERN QUEENSLAND

by

N BERDING, AP HURNEY, and RS SWAIN

SD04018

Contact:
Dr Nils Berding
Principal Scientist
BSES Limited
PO Box 122
Gordonvale Q 4865
Telephone: 07 4056 1255
Facsimile: 07 4056 2405
Email: nberding@bses.org.au

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SUMMARY

The need to develop a strategy for cultivar development for high-fertility soils present in northern Queensland was driven by industry concerns regarding a declining CCS pattern in years prior to commencement of this project. In addition, there was an increasing appreciation that high-fertility soils producing some 3,000,000 t of the 7,500,000 t of cane produced in the region had been under serviced in terms of crop-improvement activities. This resulted largely from inadequate or inappropriate equipment to assess objectively small-plot trials that present physically challenging conditions, ie high tonnage crops of a heavily sprawled or lodged condition.

The strategy embodied in this project was to grow three populations of clones of commercial yield and CCS potential under these conditions, as typified by Innisfail and Tully Series soils, and determine whether above-ground plant traits could act as predictors of crop erectness at harvest. If any trait or traits could be determined, then screening for clones with potential harvest erectness could be conducted in a less physically challenging growth stage early in the crop's history.

Intuitively, one would expect that the maintenance of crop erectness would involve some tradeoff in terms of crop size, eg stalks may be shorter or thicker, and tonnage reduced. Thus, to maintain sugar production, increased sugar content (CCS) would be required. Hence, early season (June) as well as harvest CCS was assessed and considered with cane yield and crop erectness in the assessment of clones.

Each series consisted of two assessment trials, HF1 and HF2. The HF1 stage was an unreplicated format of clones of acceptable crop habit - erect and with low suckering propensity, commercial yield potential, and with high early-season CCS - drawn from the second selection stage of the crop-improvement program conducted from BSES Meringa. Superior clones from the HF1 assessment, conducted over plant and first-ratoon crops, were further assessed in a replicated trial format, the HF2 trial.

In both stages, early season crop habit and CCS, and harvest habit, CCS and yield were determined in plant and first-ratoon crops. In the series 1 and 2 HF1 trials, data were collected from all clones for seven traits considered to fully describe the above-ground phenotype of the plant: stalk number, length and diameter; leaf number; length and width of the last fully-expanded leaf; and length of plant top. The correlations between these and crop habit determined in the same plots early in the harvest season, and at harvest, generally were weak, although some were significant. Regression analysis revealed no strong predictive values from these traits, and there was little consistency among the assessments in terms of predictive value.

Consequently, in 2001 and 2002, data were collected from a mixture of HF1 and HF2 trials for two structural stalk traits. These traits were distilled from a study, conducted in Colombia, attempting to model resistance to lodging in sugarcane using a small number of cultivars. The traits used consisted primarily of engineering measures of stalk strength, a Charpy determination, an impact test of stalk strength, and a force displacement test, in which the force required to displace a stalk a set distance, through 20° at 1 m above ground level, from its resting position was determined. Adequate genetic variation existed

for these measures, but extensive correlation and regression analyses failed to detect any consistent or significant relationships.

In attempting to predict crop erectness, use of seven, above-ground phenotypic traits and two structural stalk traits failed to provide any predictive capability. This is disappointing, as this strategy was thought to encompass study of the major, above-ground plant variables that may influence crop habit. No major component is thought to have been overlooked, so we conclude that a below-ground component(s), or its interaction with an aboveground component is critical.

There was considerable variation for CCS, ideotype, and yield components among clones within each of the three series of clones, or populations, evaluated in this project. Clones assessed as having commercial potential in each series of trials were advanced to a series of five multi-environment trials, or final assessment trials (FATs), conducted in the core program operated from BSES Meringa. Any of these clones can be nominated for cultivar status should their FAT evaluation warrant this.

1.0 BACKGROUND

When this project was proposed in 1996, there was considerable disquiet in the northern Queensland industry concerning the occurrence of low CCS in years immediately before 1996. Specific cultivars were being blamed for this, but this concern could be refuted with some confidence. Record, or near record crops had been grown, and lodging had been extensive. Open-canopy conditions had occurred in combination with high soil moisture and excessive soil nitrogen during the harvest period. Exposure of the basal portion of the crop to high light levels resulted in premature shooting of basal stool buds that develop into immature stalks, or suckers, prior to harvest of the mature crop. The importance of the interaction between soil moisture and excessive soil nitrogen, during the harvest season, and its effect on sucker development and traits, and the impact on CCS, was clearly demonstrated in the companion project BSS221 Environmental stimuli for sugarcane suckering in the wet tropics.

Suckers result in higher extraneous matter levels. In years prior to 1996, random stool samples with over 50% of the stool biomass consisting of suckers at harvest had been recorded in the Mulgrave Mill area. The dilution effect of suckers alone is significant. Paired samples from plots of 25 clones in a replicated yield trial harvested at Meringa in 1995 revealed a difference of 6.9 CCS units between clean mature stalks (16.5) and stripped suckers (9.6). This impact and quantification of the differential occurring between mature stalk CCS and mill-realized CCS subsequently was elaborated in the companion project BSS220 Understanding why potential field CCS is not realized at the factory.

Selection of clones with low suckering propensity under open canopy conditions probably is unrealistic, as physiologically there is little difference between the processes of sucker and ratoon shoot initiation. Ideotype selection to maintain a closed canopy crop condition was an option considered worth pursuing, and development of a selection strategy to select clones was explored in this project. The feasibility of this was suggested from examination of selection records from stages 2 and 3 at BSES Meringa. A high proportion of clones fail to be selected from these stages because their yield is below a threshold that gives a net merit grade (NMG), a statement of the economic worth of a clone, high enough for selection. The NMG equals sugar yield, relative to a set of standard cultivars, multiplied by an appearance grade, a subjective assessment of commercially important, non-yield economic characters. All selection up to and including this stage is conducted on medium-fertility land, a constraint imposed by the practicalities of conducting sugarcane selection activities on high-fertility land that produces high-tonnage, lodged crops.

This project was initially linked to BSS180 Assessing clonal and nitrogen interactions on CCS in sugarcane in the wet tropics, and subsequently developed links to research conducted in projects BSS220 Understanding why potential field CCS is not realized at the factory, and BSS221 Environmental stimuli for sugarcane suckering in the wet tropics.

2.0 OBJECTIVES

- Development of a breeding strategy to produce erect, high-CCS clones that will maintain a closed-canopy crop condition on high-fertility soils in northern Queensland.

High-fertility soils in northern Queensland produce some 3,000,000 t of the average 7,500,000 t of cane harvested in the region. Improvement of CCS for this production from the high-fertility soils would return an additional $4,500,000 each season across the range of mean CCS from 10.0 to 16.0. High yielding crops on these soils lodge and produce open canopy conditions that allow sucker development. Suckers have a marked negative impact on realized CCS, and increase extraneous matter levels. Ideotype selection will be performed for clones that have a high CCS and are less vigorous, remain erect, and therefore minimize lodging. These clones would produce acceptable cane yield, but would have high CCS so changes to sugar yield would be minimal. An additional benefit would be that as these clones would be more inclined to remain erect, they would avoid the reduction in CCS that occurs on lodging.

The strategy embodied in this project was simply to grow three populations of clones of commercial yield and CCS potential under these conditions, as typified by Innisfail and Tully Series soils, and determine whether above-ground plant traits could act as predictors of crop erectness at harvest. If any trait or traits could be determined, then screening for clones with potential harvest erectness could be conducted in a less physically challenging growth stage early in the crop's history.

In attempting to predict crop erectness, use of seven, above-ground phenotypic traits and two structural stalk traits failed to provide any predictive capability. This was disappointing, as this strategy was thought to encompass study of the major, above-ground plant variables that may influence crop habit. No major component is thought to have been overlooked, so we conclude that a below ground-component(s), or its interaction with an above-ground component is critical. There was considerable variation for CCS, ideotype, and yield components among clones within each of the three series of clones, or populations, evaluated in this project. Clones assessed as having commercial potential in each series in BSS179 were advanced to a series of five multi-environment trials, or final assessment trials (FATs), conducted in the core program operated from BSES Meringa. Any of these clones can be nominated for cultivar status should their FAT evaluation warrant this.

3.0 METHODOLOGY

The strategy used was to conduct an early season CCS and ideotype screen of tentative selections from the Selection Stage 2 (clonal assessment trials, or CATs) in the program conducted from BSES Meringa. In this way, we were dealing with a segment of the population that had commercial yield potential and acceptable CCS sufficient to yield a NMG that was high enough to require its plant(P)-crop selection grade to be considered in conjunction with its first ratoon crop assessment. An ideotypic constraint was imposed in the selection criteria, with the objective of favouring clones that maintained crop erectness. Even though the selection was conducted early season (June), loss of crop erectness at this early stage would have been compounded as the season progressed, resulting in further loss of CCS and perhaps development of increased suckering. Any clone showing a propensity for sucker development at this stage also was rejected. Clones that were designated as tentative selections based on their P-crop performance, and survived the screen imposed for crop habit and sucker propensity acceptability, were subjected to a CCS screen. Clones falling in the higher end of the distribution for CCS were propagated for the next screen, the first stage in this project. All this early season screening was conducted at BSES Meringa, a moderate rainfall environment, on land of moderate fertility. Although this meant that the emerging populations designated for further screening had been subjected to prior selection, and the results from this, particularly for relationships among ideotypic traits assessed, may have been biased, this was the most practical approach in line with the objective of the project.

The selected clones from this assessment were planted into un-replicated plots each of four rows 10 m long on high-fertility sites (Innisfail and Tully Series soils) in the Innisfail (1997, first HF1 assessment), Kennedy (1998, second HF1 assessment), and Mulgrave (1999, third HF1 assessment) regions (HF1 designation means high fertility, stage 1 assessment) (see Figures 1-3 for a summary of activities in each series). These trials were subjected to early and harvest CCS determinations, selection for acceptable ideotype, and collection of harvest yield. The CCS data, ideotype, and yield data were also collected in the first-ratoon crop. Augmented designs were used in all these assessments, with four relevant standard cultivars being replicated in each assessment. In addition, data were collected in these stages to attempt to define ideotypic and physical traits that were measurable, or determinable, early in the growth cycle and that may act as predictors for crop erectness during the late crop, or harvest period. This was driven by practical considerations. If such a trait, or traits, could be measured during the growth phase of the crop, when an erect habit was prevalent, this would reduce the considerable physical burden, and potential errors associated with working in badly lodged crops during the harvest period.

The ideotypic traits used were considered to fully describe the above-ground phenotype of the plant. They were: stalk number, diameter, and length; number of leaves; length and width of the last fully expanded leaf, known as the leaf showing the last exposed dewlap (LED); and the length of top of the plant, defined as being the length from the node subtending the last clinging leaf to the LED (this length contained the young stem below the meristem, the leaf sheaths still furled around the stalk, and the unfurled leaves above the meristem). Subsequent to the assessment of these phenotypic traits, two physical stalk traits were assessed: stalk hardness, as determined by a Charpy test; and a stalk

displacement test, in which the force required to displace a stalk through a fixed distance from its resting position was determined. These tests were developed from a range of mechanical tests applied to stalks in a Colombian report on modelling habit in a small number of cultivars.

As proposed, the first and second HF1s were based on ratoon data from the CAT populations evaluated at BSES Meringa and Tully. The third HF1 was drawn from BSES Meringa alone using clones with high CCS in the P-crop of the CATs, as other material was not available.

The phenotypic descriptors were collected in the P- and 1R-crop of the series 1 HF1 and the P-crop of the series 2 HF2 trial. Results for analyses of these data and their relationship with early-season and harvest-season appearance (ideotype) grade are given below.

Because of the failure to obtain positive results with the phenotypic descriptors predictors of crop erectness at harvest, two structurally related stalk tests were evaluated in trials in in 2001 and 2002. These tests, a Charpy impact test and a stalk displacement force test are described in Section 7. These tests were applied to clones in the series 1 and series 2 HF2 trials (the second assessment used in each of the three series evaluated in this project, and described below) and the series 3 HF1 trial in the 2001 season. In the 2002 season, data for these tests were collected from the series 1 and 2 HF2 first-ratoon trials, the series 3 HF1 first-ratoon trial, and the series 3 HF2 plant-crop trial.

Clones of acceptable ideotype from the HF1 assessment were propagated and then entered into a replicated trial, or HF2 assessment, again located on Innisfail or Tully Series soils. This used three replicates, of a randomized-block design, and a plot format of six rows by 10 m. CCS was determined early in the harvest season and at harvest, ideotype was assessed at the same times and yield data were collected at harvest. These assessments were located Innisfail (series 1 HF2 trial and series 3 HF2 trial) and Mulgrave (series 2 HF2 trial).

Early season (June) CCS and crop-habit assessments and harvest CCS, crop-habit assessment, and yield data were collected from the series 1 and 2 HF2 plant-crop trials in 2001, and the same data for the series 1 and 2 HF2 first-ratoon-crop trials and the series 3 HF2 plant-crop trial in 2002, and the series 3 HF2 first-ratoon-crop trial in 2003.

To aid an understanding of the trials in this project and their progression, schematics for each of the three series in the project are given in Figures 1-3. All details regarding trial locations and movements of clones from selection and propagation sites are detailed in these Figures.

Figure 1 Summary of planting activities for Series 1 from 1997 to 2002

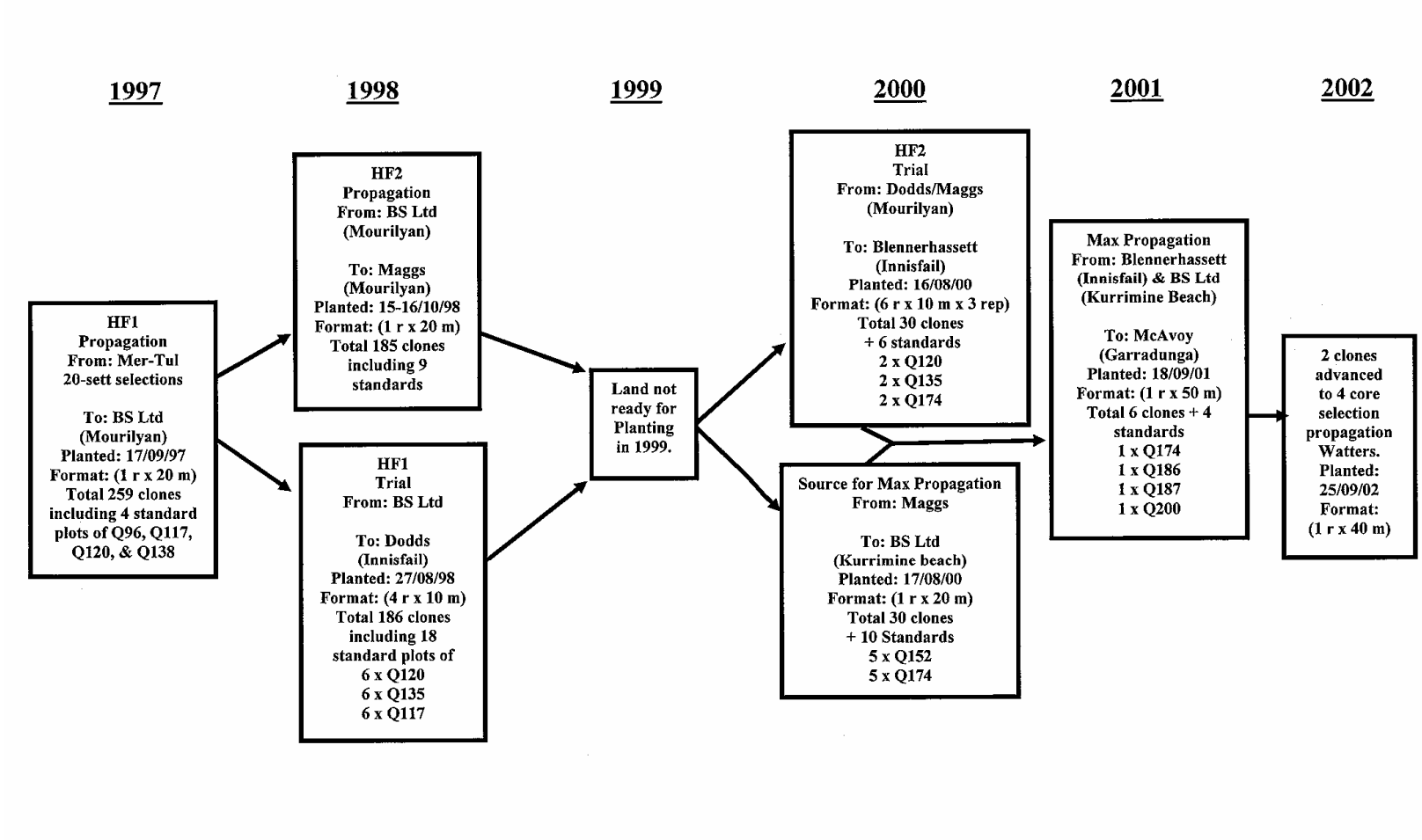


Figure 2 Summary of planting activities for Series 2 from 1998 to 2002

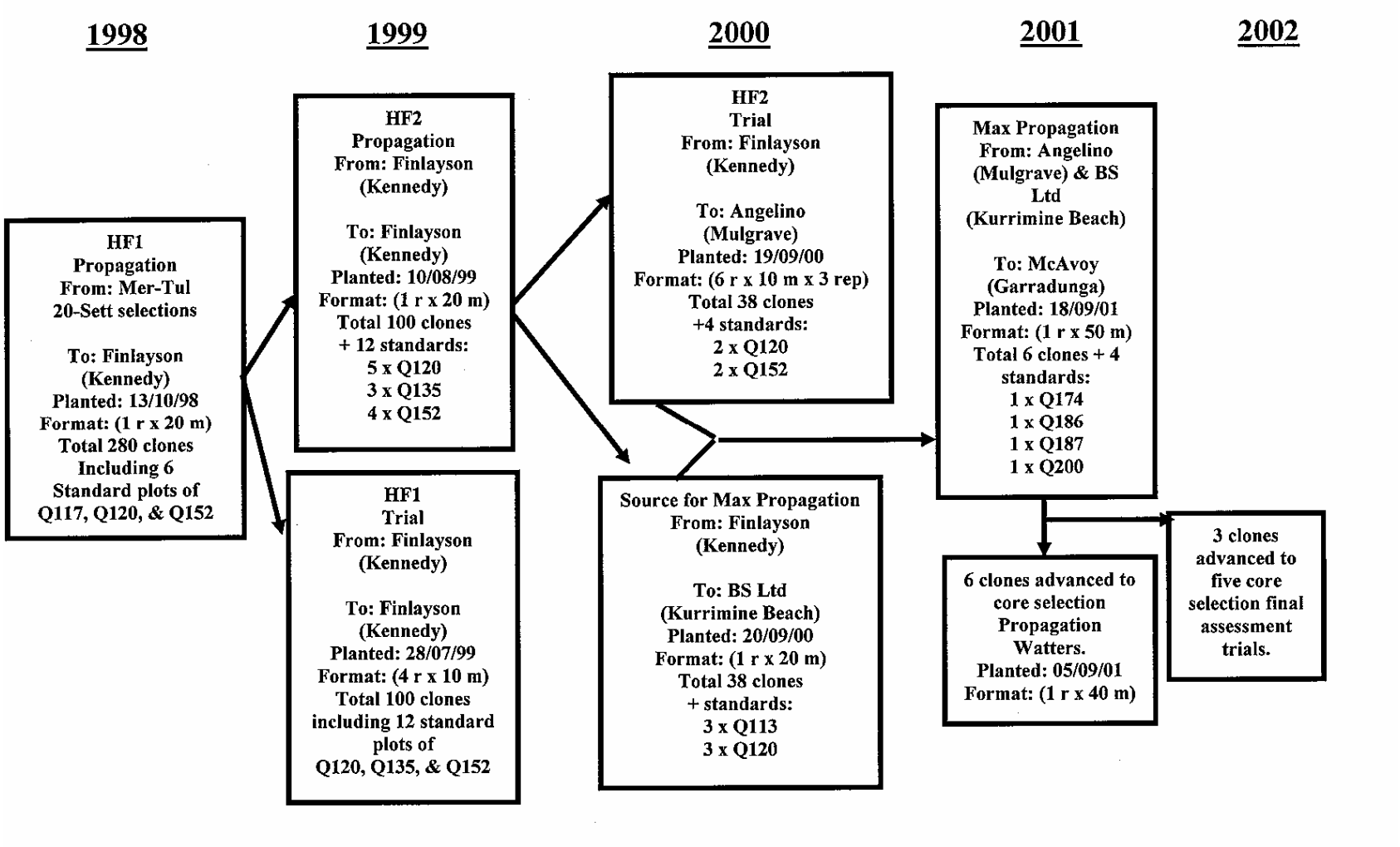
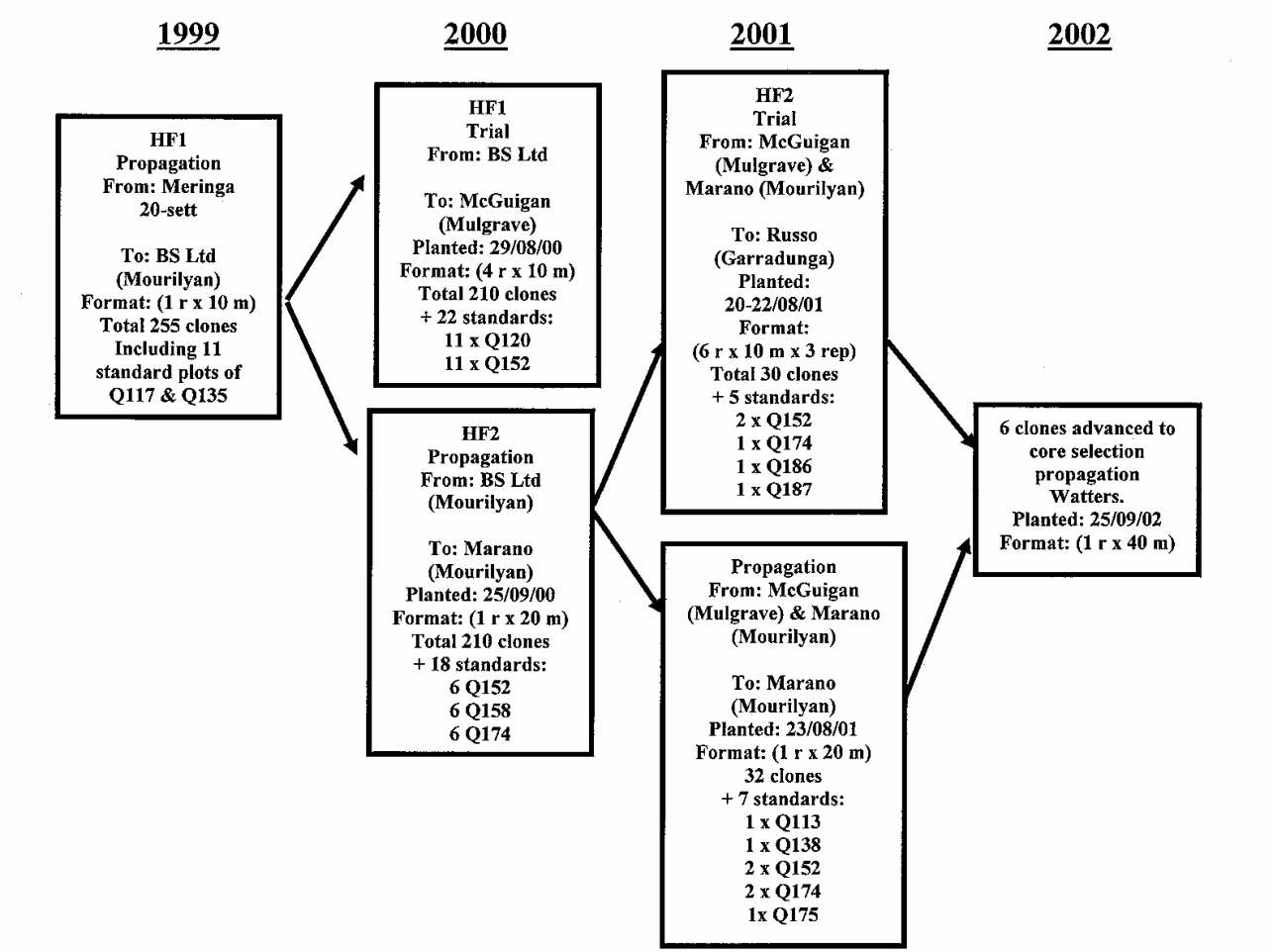


Figure 3 Summary of planting activities for Series 3 from 1999 to 2002



4.0 SERIES 1 TRIALS

4.1 Base material

Material was available from selection of the plant crops (1996) of the Stage 3 populations at BSES Meringa and BSES Tully. Two-stalk samples were removed from the first-ratoon crop of these populations for CCS determination for clones designated as tentative selections. For Meringa, tentative selections had a NMG ≥10.0 and at Tully a NMG ≥ 7.0. Sampling at Meringa was conducted from 30 June-3 July 1997, and for Tully from 7-9 July 1997.

The Meringa population was planted over five blocks, each being planted as an augmented design with a sub-block size of ≈ 40-45 plots (1 row by 10 m). The cultivars Q113, Q124, Q138, and Q158 were repeated over sub-blocks. These cultivars also were sampled for CCS at the same time as the clones. An analysis of variance of the cultivar values was conducted over sub-blocks within each block. The sub-blocks term was not significant in any of the Meringa analyses. The individual clonal CCS values from each block were expressed as a percent of the mean block CCS value for the cultivars. Selections were made from these data aggregated over blocks. Table 1 details the number of clones, number sampled for CCS, and number propagated.

Table 1 Number of clones available, number sampled for CCS, and number propagated at BSES Meringa in 1997

Block	Available samples	No. of CCS samples	No. of clones propagated[1]
A3	94	44	13 (4)
A4	319	158	52 (4)
F1	716	342	41 (10)
L2	200	90	11 (2)
L4	215	106	18 (2)
Total	1544	740[2]	161

[1]Numbers in brackets indicate the number of random clones from each block. Random selection also may be CCS selections.

[2]The 740 samples came from 599 clones, 132 standard cultivars, and 9 additional cultivar plots.

The population at BSES Tully was planted over three blocks, with sub-block size being ≈50 plots (1 row x 10 m). Cultivars used were Q117, Q127, and Q138. Procedures used at Tully closely followed those used at Meringa. The sub-blocks term was significant for all blocks, and so clonal CCS values were expressed as a percent of the mean sub-block CCS value for the cultivars. Selections were made from these data aggregated over sub-blocks. Table 2 details the number of clones, number sampled for CCS, and number propagated.

Table 2 Number of clones available, number sampled for CCS, and number propagated at BSES Tully in 1997

Block	Available samples	No. of CCS samples	No. of clones propagated[1]
T16	325	209	58 (6)
T17	349	155	14 (3)
T18	317	127	12 (5)
Total	991	491[2]	98

[1]Numbers in brackets indicate the number of random clones from each block. Random selection also may be CCS selections.

[2]The 491 samples came from 370 clones, 108 standard cultivars, and 13 southern clones that were subsequently excluded from the selection process.

Table 3 details the truncation values (as percent of cultivar mean) used for routine selection to obtain the designated numbers (nominal 100 per site). The total number was proportioned over sites (124 from Meringa, 76 from Tully) relative to the population size at each site. An additional 10% was selected at each site to allow for possible losses in the cold-water-soak/long-hot-water (cws/lhwt) treatment of selections (Table 3).

Table 3 Truncation values for selection expressed as a percentage of the cultivar means

Station	Type	Cutoff CCS % value	# Clones
Meringa	Selections	≥102.2%	124
	Extra 10%	≥101.6% and <102.2%	12
Tully	Selections	≥102.96%	76
	Extra 10%	≥102.41% and <102.96%	8

Table 4 presents mean CCS values for each cultivar over sub-blocks, and mean block CCS over cultivars and sub-blocks for the Stage 3 population at Meringa. Table 5 presents similar data for the Tully population, but cultivar means are on a duplicate plot basis within sub-blocks, and sub-block means are averaged over these cultivars.

Table 4 Cultivar and combined block CCS means for the Meringa Stage 3 population

Block	Q113	Q124	Q138	Q158	Mean
A3	12.6	13.3	13.1	11.4	12.6
A4	12.6	12.5	13.1	11.7	12.5
F1	13.8	13.4	13.9	13.7	13.7
L2	12.4	12.8	13.5	11.8	12.6
L4	14.4	13.9	14.6	13.4	14.1

Table 5 Cultivar and combined sub-block CCS means for the Tully Stage 3 population

Block	Sub-block	Q117	Q127	Q138	Mean
T16	1	15.11	15.48	15.88	15.49
	2	14.71	15.18	14.30	14.73
	3	14.29	15.36	15.17	14.94
	4	15.81	15.19	15.54	15.51
	5	14.68	14.95	9.87	13.16
	6	14.65	14.52	14.48	14.55
T17	1	15.08	14.83	15.26	15.06
	2	14.50	15.43	15.30	15.08
	3	15.08	15.52	15.48	15.36
	4	13.98	14.50	15.41	14.63
	5	15.17	14.85	15.07	15.03
	6	15.41	15.26	15.78	15.48
T18	1	15.03	15.32	14.56	14.97
	2	15.54	15.74	15.48	15.58
	3	15.73	15.36	16.16	15.75
	4	15.02	14.44	14.49	14.65
	5	13.43	14.53	15.56	14.50
	6	14.50	13.99	14.11	14.20

The source population contained a wide range of variation for CCS, with the Meringa population ranging from 4.4 to 15.4 and the Tully population from 8.5 to 17.6 (Table 6). Surprisingly, the mean for the Tully population was 1.7 units higher than the Meringa population, but this merely may reflect the fact that the Tully population was established from the Meringa population using plant crop results. The Tully Stage 3 population, assessed as a plant crop in 1997, was a sub-set of the Meringa Stage 3 population assessed in the plant crop in 1995. However, a substantial difference between population means would not be expected because of differences in genetic composition. The threshold values used for the tentative selections differed by 3 NMG units. This may explain portion of the differential. However, the bulk of the differential probably arises from the fact that the Tully population was established by truncation selection from a larger Meringa population, ie the lower graded portion of the population was discarded. Although selection was based on NMG, indirect selection for CCS via NMG could be quite powerful. Additionally, the Tully data were surprising in that the maximum CCS value recorded (17.6) was 2.2 units above the maximum recorded at Meringa.

The selected clones from Tully maintained a CCS differential of 1.4 units over those selected from the Meringa population (Table 6). The selection differential between the selected and source populations was 1.6 and 1.3 for Meringa and Tully, respectively.

Table 6 Selection results for 1997 showing the mean CCS of the source population and for the selected clones at BSES Meringa and BSES Tully

Location	Source population				Selections			
	#	Mean CCS	Min.	Max.	#	Mean CCS	Min.	Max.
Meringa	599	12.4	4.4	15.4	124	14.0	12.8	15.4
Tully	370	14.1	8.49	17.6	76	15.4	13.6	17.6

4.2 HF1 propagation

The selections from both populations were cws/lhwt and planted to a farm in the Silkwood area (Bundaberg Sugar's Nucifora farm). The treated material could not be planted to the field for up to 2 weeks after treatment, because of heavy rain received in August. Individual plot germinations were assessed on 5 December. Germination overall was not good, but adequate to establish the HF1 trial in 1998. The buffer provided by the inclusion of an extra 10% selection assisted in overcoming this problem, but with minimum reduction in the selection differential.

4.3 HF1 trial

Twenty-stalk bundles were cut from the 1997 propagation and were planted to a rich-land site on Bruce Dodds' farm in Innisfail in August 1998 using a four row by 10.5 m plot format (9.5 m cane, 1.0 m space between plots). The plot length was longer than normal to ensure accuracy and ease of sampling in a potentially heavily lodging crop. There were 204 plots in total, comprising 186 clones (Appendix 1) and 18 standard plots (six each of Q117, Q120, and Q135).

Some variation in plot lengths existed, and this was measured in rows 1 and 2 for each plot in December 1998 (Table 7). Yield determined at subsequent harvests was adjusted to a net area basis based on the mean row length per plot.

Table 7 Summary statistics of plot length data extracted from rows 1 and 2 of the series 1 HF1 trial

Row	Min.	Max.	Mean.	SD
Row 2	6.40	10.45	8.37	0.54
Row 3	6.10	9.50	8.34	0.55

Data collected in 1999 from the plant crop were:

February

- Number of stalks in randomly-placed 1.5 m quadrats in rows 2 and 3.
- Height of cane for the ground to the last exposed dewlap (LED) for five randomly chosen stalks from both rows 2 and 3.

- Basal stalk diameter for five randomly chosen stalks from both rows 2 and 3.
- Length of cabbage (LED to node subtending the last clinging leaf (LCL)) and number of leaves within the cabbage for five randomly chosen stalks from both rows 2 and 3.
- Length and width of the LED leaf for five randomly chosen stalks from both rows 2 and 3.
- Plot erectness, on a scale of 0 (perfectly erect) to 10 (fully lodged, obtained by: - [percent of the plot not erect (0 - 100%)] x [severity of the displacement (0 = perfectly erect to 100 = fully lodged]/1000.

June

- Plot appearance grade assigned.

July

- Six-stalk CCS sampled removed for analysis by NIS.

September

- Trial sampled for harvested CCS, appearance graded, and harvested and weighed.

These traits were considered to describe all obvious phenotypic attributes of the plant in the 'grand' growth phase that may contribute to habit later in the crop's life. The rationale behind the description was the hope that one or more of these would provide early season descriptors that may predict crop habit during the harvest season. Elucidation of such a set of descriptors and application of these, in addition to screening for early-season CCS would help achieve the objective of this project.

Sampling of plots for CCS, assignment of appearance grades, and harvesting techniques were as routinely used in BSES crop improvement operations. Quality components were analyzed using near infra-red spectroscopic analytical techniques used routinely at BSES.

The sub-sampling strategy was tested using the error ratio test from the analysis of variance. This test, defined as $s\sigma_c^2 / \sigma_s^2$, should have a value > 3.0 if the sub-sampling strategy used results in acceptable precision. All sub-sampling except that conducted for stalk number, which used two 1.5 m quadrats, was acceptable (Table 8). The variation among clones, judged relative to the sub-sampling error, was highly significant for all seven traits.

Table 8 Efficacy of sub-sampling strategy used for seven ideotype traits measured in the plant crop of the series 1 HF1 trial as determined by the error ratio test (ERT)

Ideotype trait	Error ratio test[1]
Cane height (cm)	20.7
Stalk diameter (mm)	11.6
Cabbage length (mm)	13.2
No. leaves	8.4
Leaf length (mm)	15.6
Leaf width (mm)	20.3
No. stalks/ha	2.4

[1]ERT= $s\sigma_c^2 / \sigma_s^2$, = F - 1 from the analysis of variance.

Clonal means for the seven ideotype traits and the estimate of plot habit (erectness) are given in Appendix 1. Summary statistics for the clones assessed show there was a broad range of variation for all characters measured (Table 9). In particular, there was already a broad range evident for clone habit, as determined by the erectness grade.

Table 9 Summary statistics for seven ideotype traits for 186 clones assessed in the plant crop of the series 1 HF1 trial

Trait	Mean	Maximum	Minimum	SD
Cane height (cm)	1848.6	2909.0	1301.0	256.9
Stalk diameter (mm)	25.8	34.0	18.0	2.8
Cabbage length (mm)	525.8	898.0	225.0	149.7
# Leaves	7.2	9.0	5.0	0.9
Leaf length (cm)	157.3	191.7	114.9	13.4
Leaf width (mm)	44.9	61.0	31.0	5.7
# Stalks/ha	80,522.3	139,048.0	34,286.0	16245.4
Erectness	0.5	9.0	0.0	1.3

Relationships among the ideotype traits and among these and erectness were variable, and generally weak, although a number were significantly different from zero (Table 10). The strongest relationship existed between cabbage length and number of leaves (0.810).

Table 10 Simple relationships (*r*) among seven ideotype traits and erectness determined in the plant crop of the series 1 HF1 trial

Variable	Stalk diameter	Cabbage length	# Leaves	Leaf length	Leaf width	# Stalks/ha	Erect-ness
Cane height	-0.004	0.368**	0.297**	0.034	-0.016	-0.129	0.434**
Stalk diameter		-0.114	0.006	0.087	0.452**	-0.444**	-0.079
Cabbage length			0.810**	0.101	0.081	0.161*	0.168*
# Leaves				0.075	0.062	0.056	0.176*
Leaf length					0.121	0.218**	-0.013
Leaf width						-0.290**	-0.118
# Stalks/ha							-0.085

** $P \leq 0.01$; $P \leq 0.05$.

Appendix 2 presents clonal means for the July CCS determination and appearance grade evaluation of the plant-crop summary statistics for these data again show the considerable variation present for these to early season determinations (Table 11).

Table 11 Summary statistics for two pre-harvest season traits for 186 clones assessed in July in the plant crop of the series 1 HF1 trial

Statistic	CCS[1]	AG[2]
Maximum	16.62	10.0
Minimum	9.25	0.0
Mean	13.08	5.23
SD	1.10	2.7

[1]Commercial Cane Sugar; [2]Appearance grade;

Clonal data for the harvest of the plant crop are also are presented in Appendix 2, and summary statistics (Table 12) show that broad variation again exists for all characters measured.

Table 12 Summary statistics for six harvest-season traits determined for 186 clones assessed in September in the plant crop of the series 1 HF1 trial

Statistic	CCS[1]	AG[2]	NMG[3]	TCH[4]	TSH[5]	RSY[6]
Maximum	18.07	12.33	18.52	118.29	18.33	1.77
Minimum	11.55	1.23	0.90	29.71	4.95	0.47
Mean	15.71	8.83	8.86	66.67	10.46	1.00
SD	0.99	2.20	3.22	14.33	2.32	0.23

[1]Commercial Cane Sugar; [2]Appearance grade; [3]Net merit grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield.

The results of the clonal assessment undertaken in the HF1 trial in the plant crop are summarized in Appendix 3. The clones were ranked the sum of rank performance for the three traits adjusted appearance grade (AAG), CCS, and net merit grade. The top 30 clones by this measure (422-522) were designated for inclusion in the HF2 trial.

A major interest in this study is the possible use of the ideotype traits, measured in February, as predictors for the assessment of habit (erectness) given in February. Additionally, use of these together as predictors of the appearance grade assigned early in harvest season (July), or these and the July AG as predictors for the harvest AG (September) is also of interest. Summary statistics for these three scenarios (Table 13) show for all three that the coefficient of multiple determination (R) was only moderate. Cane height and leaf width were the only significant predictors for erectness, with the latter being 26% as important as the former. Three traits, # leaves, leaf length, and erectness were significant predictors of the July AG. Leaf length and erectness were 62% and 76% as important, respectively, as the # leaves. Cane height, leaf length, erectness and July AG were significant predictors for the September AG. The July AG was the most important of these, and relative to this, the other traits were 39, 3, and 81%, respectively, as important as the July AG. While the importance of the February erectness grade and the July AG as predictors of the September AG is positive, these do not assist in determining phenotypic or physiological traits that may be more substantive and predictive measures of habit.

Table 13 **Multiple linear regressions statistics for use of ideotype traits as predictors for erectness, or use of these and erectness, or a subsequent appearance grade, as predictors of July and September appearance grade in the plant crop of the series 1 HF1 trial**

Dependent	Independent	P	Relative b'
Erectness (February)	Cane height	< 0.001	100
(R = 0.448)	Leaf width	0.094	26
Appearance grade	# leaves	<0.001	-100
(July)	Leaf length	0.015	-62
(R = 0.408)	Erectness	0.003	-76
Appearance grade	Cane height	0.008	-39
(September)	Leaf length	0.096	-3
(R = 0.690)	Erectness	<0.001	-81
	July AG	<0.001	100

Data collected for the first-ratoon crop of the HF1 trial was identical to the traits described above. The efficacy of the sub-sampling strategy used was again tested using the ERT. With the exception of leaf width, ERT values for all traits were smaller in the ratoon crop than in the plant crop. All except that for number of stalks were > 3.0 (Table 14), indicating that the sub-sampling strategy used again was satisfactory. Variation among clones was highly significant relative to the sub-sampling error for all seven traits.

Table 14 **Efficacy of sub-sampling strategy used for seven ideotype traits measured in the first-ratoon crop of the series 1 HF1 trial as determined by the error ratio test (ERT)**

Ideotype trait	Error ratio test[1]
Cane height (cm)	14.8
Stalk diameter (mm)	9.8
Cabbage length (mm)	9.5
No. leaves	6.7
Leaf length (mm)	12.2
Leaf width (mm)	20.8
No. stalks/ha	2.3

[1]ERT = $s\sigma_c^2 / \sigma_s^2$, = F - 1 from the analysis of variance.

Clonal means for the seven ideotype traits as well as the pre-season habit assessment (erectness) are given in Appendix 4 for the 186 clones assessed and the 18 plots of the three cultivars. Summary statistics for these (Table 15) again shows a broad range of variation for all ideotypic traits. As in the plant crop, considerable variation was displayed for the pre-season determination of habit.

Table 15 Summary statistics for seven ideotype traits determined for 186 clones assessed in September in the first-ratoon crop of the series 1 HF1 trial

Variable	Mean	Maximum	Minimum	SD
Cane height (cm)	1255.0	1790.0	606.0	198.3
Stalk diameter (mm)	25.7	34.7	18.0	3.4
Cabbage length (mm)	474.2	756.0	290.0	78.2
# Leaves	7.9	10.0	7.0	0.7
Leaf length (cm)	150.7	176.0	108.0	11.2
Leaf width (mm)	55.9	78.0	41.0	6.4
#Stalks/ ha	88,423.7	152,092.0	24,715.0	22,114.6
Erectness estimate	1.9	9.0	0.0	2.5

The simple relationships among these seven ideotype traits and erectness (Table 16) generally were weak, although a number attained significance. Again, the largest value was recorded between cabbage length and number of leaves, a relationship that was clearly largest in the plant crop.

Table 16 Simple relationships (*r*) among seven ideotype traits and erectness determined in the first-ratoon crop of the series 1 HF1 trial

Variable	Stalk diameter	Cabbage length	# Leaves	Leaf length	Leaf width	# Stalks/ha	Erect-ness
Cane height	-0.106	0.132	-0.101	-0.122	-0.044	0.098	0.258**
Stalk diameter		-0.037	0.154*	0.073	0.508**	-0.408**	-0.229**
Cabbage length			0.544**	0.082	0.082	0.044	0.195**
# Leaves				-0.108	0.128	-0.132	0.081
Leaf length					0.050	0.069	-0.091
Leaf width						-0.201**	-0.157
# Stalks/ha							-0.085

**$P \leq 0.01$; $P \leq 0.05$.

Repeatability measurements among the seven ideotype traits and erectness measured in the HF1 plant crop and first-ratoon-crop (Table 17) showed no relationship between erectness measured in the two years. The repeatability for the seven ideotype traits ranged from 0.30 to 0.88, with all being highly significantly different from zero. Generally, relationships among traits across years were weak, although a small number were significant and were consistent (Table 17), eg cane height vs erectness (moderate and positive), # stalks vs stalk diameter (moderate and negative), and stalk diameter and leaf width (moderate and positive). These reflect similar relationships evident among these traits with a year (Tables 10 and 16).

Table 17 Correlation coefficients (*r*) and their significance between seven ideotype traits and erectness measured on 186 clones in the plant and first-ratoon crops of the series 1 HF1 trial

First-ratoon crop	Plant crop							
	Cane height	Stalk diameter	Cabbage length	# Leaves	Leaf length	Leaf width	# Stalks /ha	Erect-ness
Cane height	0.596**	-0.076	0.114	-0.068	-0.132	-0.061	-0.104	0.358**
Stalk diameter	-0.222**	0.675**	-0.173*	-0.049	0.012	0.464**	-0.313**	-0.076
Cabbage length	0.308**	-0.068	0.427**	0.433**	0.091	-0.006	0.051	-0.011
# Leaves	0.010	0.044	0.110	0.312**	-0.008	0.082	-0.060	-0.101
Leaf length	-0.055	0.161*	-0.064	-0.082	0.802**	0.049	0.112	-0.004
Leaf width	-0.114	0.364**	0.110	0.030	0.122	0.883**	-0.167*	-0.066
#Stalks/ ha	-0.024	-0.479**	0.138	-0.047	0.042	-0.319**	0.521**	-0.019
Erect-ness	0.434**	-0.079	0.168*	0.176*	-0.013	-0.118	-0.085	0.097

**$P \leq 0.01$; $P \leq 0.05$.

Prediction of the February erectness from the seven ideotype traits in the ratoon crop revealed four of them contributed significantly in the multiple regression (Table 18). Only cane height was in common with the prediction determined in the plant crop. Overall, the prediction, as determined by the coefficient of multiple determination, was only moderate. Stalk diameter was the most import trait, relatively, and was followed by # stalks/ha (80%), cane height (77%), and cabbage length.

Table 18 Multiple linear regressions statistics for use of ideotype traits as predictors for erectness in the first-ratoon crop of the series 1 HF1 trial

Dependent	Independent	P	Relative b'
Erectness (February) (R = 0.422)	Cane height	0.001	77
	Stalk diameter	< 0.001	-100
	Cabbage length	0.017	56
	# stalks/ha	0.002	80

Clonal means for the July CCS determination and appearance grade evaluation in the first ratoon (Appendix 5) revealed a broad range of variation (summarized in Table 19). Mean clonal performance for CCS approached that of the standard cultivars used (12.9 vs 13.0), but there were clones present in the trial with CCS values above that of the maximum recorded for the cultivars (14.9 vs 13.9).

Table 19 Summary statistics of two pre-harvest season traits for 186 clones and three cultivars assessed in July in the first-ratoon crop of the series 1 HF1 trial

Class	Statistic	CCS[1]	AG[2]
Clones	Maximum	14.93	9.50
	Minimum	9.56	4.00
	$\bar{x}$	12.94	6.98
	S.D.	0.97	1.03
Cultivars	Maximum	13.93	9.50
	Minimum	12.01	6.50
	$\bar{x}$	13.02	8.03
	S.D.	0.66	0.70

[1]Commercial cane sugar; [2]Appearance grade.

Detailed clonal harvest data for the first ratoon in September also are presented in Appendix 5, with summary statistics detailed in Table 20. Average clean-stalk CCS values were high at this site for both clones (17.2) and cultivars (17.9). Average tonnages for these two groups also were high (132 vs 137 t/ha). Although mean NMGs for the clones was almost two units below the cultivars (8.2 vs 10), individual clones with high NMGs were present in this population.

Table 20 Summary statistics for six harvest season traits for 186 clones and three cultivars assessed in October in the first-ratoon crop of the series 1 HF1 trial

Class	Statistic	CCS[1]	TCH[2]	TSH[3]	RSY[4]	AAG[5]	NMG[6]
Clones	Maximum	20.37	232.00	42.20	1.73	13.24	16.76
	Minimum	11.89	43.43	7.46	0.28	2.65	0.91
	$\bar{x}$	17.23	132.10	22.79	0.91	9.05	8.22
	S.D.	1.74	30.54	5.91	0.27	1.85	3.00
Cultivars	Maximum	19.78	171.43	33.50	1.42	11.91	15.02
	Minimum	14.82	104.00	18.20	0.69	8.60	7.07
	$\bar{x}$	17.89	137.08	24.53	1.00	10.00	9.98
	S.D.	1.71	18.90	4.21	0.21	0.91	2.00

[1]Commercial cane sugar; [2]Tonnes cane per hectare; [3]Tonnes sugar per hectare; [4]Relative sugar yield; [5]Adjusted appearance grade; [6]Net merit grade.

Combined results for the pre-harvest and harvest determinations, averaged over plant and first-ratoon crops are given in Appendix 6. All of these data were not available when decisions were necessary regarding advancement of clones from the HF1 trial to the HF2 trial; the top 30 clones were advanced on the basis of plant-crop data only. Decisions were made on clonal rank within the trial summed over rankings for net merit grade (NMG), CCS, and adjusted appearance grade (AAG). This was done so that ideotype and CCS influenced the assessment more than is possible by their use in calculation of the traditional selection index, or NMG, alone, which is dominated by tonnage. S elections based on this assessment, using plant and ratoon crop data, are summarized in Table 21.

Of these 30 clones, 19 were planted in the HF2 trial. Selection of the other 11 clones planted to the HF2 on the basis of the plant-crop assessment was not sustained by additional consideration of the ratoon data. However, the top performers based on the (P + 1R)/2 were well represented in the selections based on plant-crop results alone, with 9, 15, and 19 selections, respectively, being represented in the top ranked 10, 20, and 30 selections (Table 21). Average performance for the 11 clones advanced on the basis of plant-crop data alone are detailed in Table 22. The total ranking of these ranges from 417 down to 250 (Table 22), whereas the lowest total ranking for the 30 clones selected on the basis of (P + 1R)/2 results was 434 (Table 21). Ratoon performance of all these clones obviously was deficient relative to other clones in the population, with several being markedly so.

Table 21 Top 30 clones ranked by mean plant and first-ratoon net merit grade (NMG), CCS and adjusted appearance grade (AAG) from the series 1 HF1 trial to confirm clones advanced to the series 1 HF2 trial

Clone	Total rank[1]	Mean NMG	NMG rank	Mean CCS	CCS rank	Mean AAG	AAG rank
91N2936*	546	13.07	174	18.50	186	12.48	186
91N2967*	515	13.32	176	18.16	184	10.55	155
91N3487*	504	14.22	182	17.41	147	11.18	175
91N3658*	502	14.35	184	17.43	148	11.15	170
93N1301*	501	13.60	179	18.12	183	10.21	139
93N83*	498	14.53	185	17.37	142	11.15	171
93N762*	490	13.07	173	17.89	174	10.22	143
93N521	482	12.29	164	17.50	158	10.84	160
93N310*	479	13.68	180	18.03	178	9.87	121
91N1306*	477	12.15	162	17.45	151	10.87	164
91N363	476	9.59	117	18.24	185	11.18	174
93N924*	474	13.48	177	17.10	121	11.18	176
93N921*	472	9.87	132	17.83	171	11.15	169
93N932	468	13.85	181	17.27	130	10.58	157
93N1234	462	10.75	145	17.70	166	10.54	151
91N3008	458	9.66	122	17.47	155	11.46	181
93N1005*	457	11.44	156	17.25	129	11.15	172
93N789*	457	12.73	168	17.62	161	9.89	128
93N1047*	454	13.14	175	17.05	118	10.84	161
93N1318*	454	9.95	133	17.35	139	11.48	182
93N925*	453	12.25	163	17.74	168	9.87	122
93N577*	448	14.27	183	17.55	159	9.56	106
91N3492	448	12.74	169	17.16	126	10.54	153
93N1004	447	11.10	152	17.57	160	9.92	135
93N630	447	11.77	160	17.09	120	10.88	167
93N578	446	12.76	170	16.76	99	11.18	177
91N1187*	442	14.73	186	17.09	119	10.18	137
91N2274*	438	10.86	149	17.02	116	11.15	173
93N640	436	10.32	140	17.38	144	10.54	152
93N1384	434	10.38	141	16.97	113	11.21	180

*Common to planted material in series 1 HF2 trial; [1]Total rank = sum of clonal ranks for NMG, CCS, and AAG.

Table 22 Remaining 11 clones advanced to the series 1 HF2 trial, but were not present in the 30 top-ranked clones ranked by mean plant and first-ratoon for net merit grade (NMG), CCS, and adjusted appearance grade (AAG) from the series 1 HF1 trial

Clone	Selection rank[1]	Total rank[2]	Mean NMG	NMG rank	Mean CCS	CCS rank	Mean AAG	AAG rank
93N957	36	417	10.85	148	17.71	167	9.54	102
91N2026	39	406	8.84	105	17.67	165	10.18	136
91N2976	40	405	11.65	158	17.13	123	9.87	124
93N811	44	395	9.36	113	17.34	135	10.52	147
93N1372	48	381	11.66	159	17.29	131	9.25	91
91N3252	68	338	8.33	91	16.56	89	10.82	158
93N1059	70	335	10.78	146	16.42	80	9.56	109
93N631	78	313	11.39	155	15.78	48	9.56	110
93N803	87	305	9.66	121	14.99	21	10.84	163
91N1406	97	280	9.61	118	16.29	69	9.25	93
93N519	111	250	9.45	114	16.13	58	8.93	78

[1]Selection rank = rank by descending order of 'total rank'; [2]Total rank = sum of clonal ranks for NMG, CCS, and AAG.

4.4 HF2 propagation

The HF1 propagation site was duplicated on Lyndon Maggs' farm near Martyville as a source for the HF2 trial. 10-stalk samples were cut from 186 plots of the HF1 propagation. Due to low stalk counts in some plots (because of a late plant in 1997), these were the only clones with adequate stalk numbers to provide a plant source for the HF2 trial.

4.5 HF2 trial

This trial was established in a three-replicate, six-row, 10-m format using 30 clones and six standard plots per replicate. It was planted in August 2000 on a high-fertility soil site (Blennerhasset, Mourilyan) using material from the HF2 propagation. Two clones from the original top 30 selections were replaced due to insufficient material in the propagation. The onset of bad weather immediately after the cutting of the plants prevented the expedient planting the trial. Consequently, plots of two clones showed poor germination. The trial was also heavily contaminated with weeds, particularly *Panicum* grass. Weather again played a role in not allowing optimum spraying of the block for weed control.

Trial means for clones (n = 30) and standard cultivars for pre-harvest (June) and harvest (September) traits in the plant crop are given in Appendix 7. Pre-harvest CCS ranged from 12.0 to 16.2, which is high for early-CCS sampling. However, pre-harvest appearance grades (AG) were low with a maximum of only 8.2. Pre-harvest summary statistics are given in Table 23.

Table 23 Summary statistics for two pre-harvest season traits for 30 replicated clones and three cultivars assessed in June in the plant crop of the series 1 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]
Clones	Maximum	16.15	8.17
	Minimum	11.98	6.33
	$\bar{x}$	14.16	7.26
	S.D.4	1.01	0.49
Cultivars	Maximum	14.57	7.00
	Minimum	13.33	6.50
	$\bar{x}$	13.98	6.70
	S.D.	0.44	0.19

[1]Commercial cane sugar; [2]Appearance grade.

Harvest results, summarized in Table 24, show the mean clonal CCS (17.3) and AG (7.4) in the plant crop marginally higher than the standards used (17.3 and 6.8). A similar trend is seen for tonnes cane and sugar per hectare (66.9 vs 64.5) and (11.5 vs 11.1), respectively.

Table 24 Summary statistics for six harvest-season traits for 30 replicated clones and three cultivars assessed in August in the plant crop of the series 1 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clones	Maximum	18.32	8.67	12.84	15.27	95.22	17.16	1.56
	Minimum	15.96	5.50	8.15	6.46	35.67	6.26	0.57
	$\bar{x}$	17.29	7.36	10.90	11.34	66.92	11.54	1.04
	S.D.	0.66	0.82	1.21	2.67	16.12	2.71	0.24
Cultivars	Maximum	18.44	7.17	10.62	12.75	79.11	13.87	1.25
	Minimum	16.19	6.33	9.38	7.18	43.78	8.12	0.75
	$\bar{x}$	17.27	6.75	10.00	10.08	64.48	11.13	1.00
	S.D.	0.85	0.31	0.46	2.10	13.56	2.27	0.20

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

The ranked means based on net merit grade (NMG), CCS and appearance grade (AG) for all 30 clones and three standards (Q120, Q135 and Q152) are given in Table 25.

Table 25 Ranked mean harvest results based on net merit grade (NMG), CCS and appearance grade (AG) for all 30 clones and three standards (Q120, Q135 and Q152) in the plant crop of the series 1 HF2 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
70	9	91N1187	14.86	35	17.04	14	7.33	21	10.86	88.89	15.14	1.36
56	19	91N1306	9.11	8	17.50	18	8.00	30	11.85	47.67	8.36	0.76
80	3	91N1406*	14.30	30	17.86	28	7.50	22	11.11	79.89	14.23	1.30
36	30	91N2026	9.16	9	17.65	25	6.00	2	8.89	65.22	11.54	1.04
38	29	91N2274	10.83	17	16.81	11	6.67	10	9.88	74.00	12.45	1.12
50	23	91N2936	6.52	2	17.54	20	7.83	28	11.60	35.67	6.26	0.57
101	1	91N2967*	15.27	36	17.98	31	8.67	34	12.84	71.78	12.91	1.19
47	25	91N2976	11.78	22	16.85	12	6.83	13	10.12	77.78	13.11	1.17
66	12	91N3252	10.85	18	17.24	16	8.33	32	12.34	56.11	9.71	0.87
79	4	91N3487*	14.39	31	17.27	17	8.00	31	11.85	78.56	13.56	1.22
51	20	91N3658	9.91	11	17.87	29	6.83	11	10.12	60.11	10.72	0.98
73	6	93N83*	14.24	29	16.61	8	8.67	36	12.84	75.78	12.58	1.12
21	35	93N310	10.23	13	15.96	1	6.50	7	9.63	75.66	12.07	1.05
63	14	93N519	14.20	28	18.00	32	6.17	3	9.14	95.22	17.16	1.56
75	5	93N577*	11.42	20	18.32	35	7.33	20	10.86	62.00	11.38	1.05
51	21	93N631	7.67	6	17.95	30	7.00	15	10.37	43.89	7.87	0.73
34	32	93N762	7.67	5	17.65	24	6.50	5	9.63	48.44	8.54	0.77
25	34	93N789	6.46	1	17.64	23	5.50	1	8.15	39.00	6.90	0.65
35	31	93N803	7.31	4	16.13	2	7.83	29	11.60	46.78	7.54	0.65
51	22	93N811	13.20	27	16.57	6	7.17	18	10.62	83.45	13.79	1.22
86	2	93N921*	11.99	24	17.74	27	8.67	35	12.84	59.45	10.55	0.97
68	11	93N924	14.42	32	16.74	10	7.67	26	11.36	85.78	14.37	1.27
72	8	93N925	11.32	19	17.66	26	7.83	27	11.60	59.89	10.56	0.96
69	10	93N957	9.36	10	18.23	34	7.67	25	11.36	49.00	8.93	0.83
72	7	93N1005	14.59	34	17.18	15	7.50	23	11.11	84.22	14.48	1.31
49	24	93N1047	10.62	16	16.70	9	7.50	24	11.11	65.33	10.95	0.96
62	15	93N1059	11.62	21	18.16	33	6.67	8	9.88	69.22	12.56	1.16
62	16	93N1301	14.46	33	16.96	13	7.00	16	10.37	91.89	15.61	1.41
65	13	93N1318	12.11	25	16.58	7	8.50	33	12.59	65.78	10.91	0.97
34	33	93N1372	10.34	14	16.17	3	7.00	17	10.37	71.22	11.46	0.99
57	18	Q120	8.03	7	18.44	36	7.00	14	10.37	43.78	8.12	0.77
13	36	Q120	7.18	3	16.19	4	6.50	6	9.63	53.33	8.63	0.75
57	17	Q135	12.75	26	17.53	19	6.83	12	10.12	79.11	13.87	1.25
47	26	Q135	11.86	23	16.35	5	7.17	19	10.62	76.11	12.58	1.09
45	27	Q174[(b)]	10.49	15	17.55	21	6.67	9	9.88	66.55	11.64	1.06
38	28	Q174[(b)]	10.16	12	17.56	22	6.33	4	9.38	68.00	11.94	1.08

[1]Total rank = NMG rank + CCS rank + AG rank; [2]Selection number, 1= best-ranked clone 36 = worst-ranked clone; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Best six clones which were advanced to maximum propagation in 2001.

Trial means for clones (n = 30) and standard cultivars for harvest (October) traits in the first-ratoon crop are given in Appendix 8. Harvest results showed the mean clonal performance for CCS (17.52) and appearance grade (6.81) were marginally higher than for the standard cultivars (17.43 and 6.58, respectively) (Table 26). This trend was not seen for cane (TCH) and sugar (TSH) yield and sugar per hectare, but the differences were minimal (121.87 vs 123.41 and 21.35 vs 21.49, respectively).

Table 26 Summary statistics for seven harvest-season traits for 30 replicated clones and three cultivars assessed in October in the ratoon crop of the series 1 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clones	Maximum	19.42	8.50	12.96	14.09	145.11	26.24	1.25
	Minimum	15.41	3.67	5.54	5.06	83.44	14.10	0.64
	$\bar{x}$	17.52	6.81	10.34	10.21	121.87	21.35	1.00
	S.D.	0.88	1.30	1.99	2.39	15.99	3.01	0.15
Cultivars	Maximum	18.82	6.83	10.39	11.27	144.00	24.99	1.15
	Minimum	16.22	6.17	9.36	7.56	112.33	18.13	0.81
	$\bar{x}$	17.43	6.58	10.00	10.00	123.41	21.49	1.00
	S.D.	1.10	0.27	0.42	1.33	11.83	2.22	0.12

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

4.6 Maximum propagation source

This propagation was planted in parallel with the series 1 HF2 trial in August 2000 on a Bundaberg sugar site in Mourilyan. It was designed to provide planting material for the maximum propagation in 2001 based on selections made with data collected from the series 1 HF2 trial. This propagation contained the best 30 clones in the HF2 trial, as well as standard cultivars.

4.7 Maximum propagation

Clones and standards were ranked according to mean NMG, CCS and AG over crops, with the best-ranked clone receiving the highest number (36). These ranks were summed to yield a total rank. Clones were sorted in descending order for total rank and given a selection number. The six highest rated clones were selected and advanced to this maximum propagation (Table 27). These clones were sourced from a Bundaberg Sugar Ltd site in Mourilyan and were cold-water soaked and long hot watered treated prior to planting.

Table 27 Ranked mean plant and first-ratoon harvest results based on net merit grades (NMG), CCS, and appearance grades (AG) from the series 1 HF2 trial to confirm clones advanced to maximum propagation and core selection propagation

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
70	11	91N1187	13.28	33	17.31	15	7.17	22	10.74	112.06	19.47	1.24
25	34	91N1306	7.08	1	17.19	13	6.58	11	9.84	65.56	11.23	0.70
70	10	*91N1406	11.98	29	17.70	27	6.75	14	10.09	106.56	18.84	1.20
42	26	91N2026	8.95	9	17.75	28	6.08	5	9.12	88.50	15.73	0.99
47	20	91N2274	11.27	19	16.79	5	7.25	23	10.88	101.06	16.96	1.05
69	12	91N2936	8.20	5	18.10	31	8.17	33	12.28	60.45	11.08	0.67
89	3	*91N2967#	13.37	34	17.63	24	8.00	31	11.99	100.11	17.55	1.11
46	24	91N2976	11.47	22	16.76	4	7.08	20	10.63	105.78	17.68	1.09
92	1	91N3252	12.09	30	17.70	26	8.42	36	12.63	87.72	15.70	0.95
89	4	*91N3487#	14.19	36	17.47	19	8.17	34	12.26	106.65	18.68	1.17
83	5	91N3658	11.92	28	18.27	34	7.17	21	10.75	98.22	18.09	1.10
71	9	*93N83	12.11	32	16.90	9	7.83	30	11.73	98.28	16.65	1.04
7	36	93N310	7.70	3	15.85	2	5.25	2	7.87	99.89	15.79	0.96
46	21	93N519	10.51	15	18.04	30	4.92	1	7.34	120.17	21.70	1.40
83	6	*93N577	11.73	25	18.25	33	7.42	25	11.13	92.55	16.87	1.06
41	28	93N631	7.92	4	17.45	18	7.08	19	10.63	69.89	12.07	0.74
61	17	93N762	9.54	11	18.13	32	7.00	18	10.51	79.11	14.49	0.88
39	30	93N789	7.66	2	17.55	22	6.75	15	10.15	65.00	11.40	0.69
38	31	93N803	8.56	7	16.34	3	7.67	28	11.50	83.06	13.63	0.77
45	25	93N811	10.95	18	17.62	23	5.92	4	8.84	106.83	18.97	1.20
76	7	*93N921	11.36	20	17.54	21	8.33	35	12.51	86.28	15.06	0.94
73	8	93N924	13.37	35	17.24	14	7.33	24	10.99	112.28	19.50	1.22
67	13	93N925	10.62	16	17.69	25	7.42	26	11.12	86.17	15.25	0.95
89	2	93N957	11.72	24	18.83	36	7.83	29	11.75	86.00	16.40	1.00
51	19	93N1005	11.80	26	17.08	12	6.67	13	10.02	108.33	18.49	1.17
67	14	93N1047	11.60	23	17.40	17	7.50	27	11.25	97.17	17.17	1.03
46	22	93N1059	10.31	14	18.02	29	5.92	3	8.85	102.72	18.44	1.16
46	23	93N1301	12.10	31	16.82	6	6.50	9	9.74	116.33	19.55	1.24
63	16	93N1318	11.46	21	16.93	10	8.00	32	11.99	92.83	15.80	0.96
13	35	93N1372	8.51	6	15.79	1	6.25	6	9.36	96.39	15.10	0.90
63	15	Q120	9.65	12	18.53	35	6.92	16	10.37	81.83	15.22	0.93
40	29	Q120	8.90	8	17.51	20	6.67	12	10.01	82.83	14.90	0.89
53	18	Q135	11.84	27	17.40	16	6.58	10	9.87	111.56	19.43	1.20
41	27	Q135	10.92	17	16.84	7	6.92	17	10.38	100.00	17.00	1.04
32	32	Q174$^{(b)}$	9.91	13	16.95	11	6.50	8	9.75	97.94	16.43	1.01
25	33	Q174$^{(b)}$	9.03	10	16.88	8	6.42	7	9.62	89.5	14.89	0.93

[1]Total rank = net merit grade rank + CCS rank + adjusted appearance grade rank; [2]Selection number = 1 best-ranked clone, 36 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Clones advanced (6) to maximum propagation; #Clones advanced (2) to core selection propagation.

Table 28 gives the selection history for these clones plus two additional clones for discussion, from plant and first-ratoon crops of the HF1 trial and plant crop of the HF2 trial. An overall contrast in performance was observed, with clones 91N1406, 93N577 and 93N1318 not performing well over both crops in the HF1 trial. Selection from the HF1 trial initially was based on plant-crop performance, for expediency. These clones performed well in the HF2 plant crop. With the exception of the HF1 plant crop results, 91N2967 performed consistently well. Likewise, 91N3487 and 93N83 were in the top 12 clones over years and sites. 91N2936 performed exceptionally in the HF1 trial but fell away in the HF 2 trial.

Table 28 Clonal ranking summary from the series 1 HF1 plant and first-ratoon crops and HF2 plant crop for clones advanced to core selection

Clone	HF1 plant selection #	HF1 ratoon selection #	HF1 mean selection #	HF2 plant selection #
91N1406*	32	114	97	3
91N2936	2	1	1	23
91N2967*	19	2	2	1
91N3487*	5	11	3	4
93N1318	1	73	20	13
93N577*	15	42	22	5
93N921*	18	23	13	2
93N83*	4	9	6	6

*Clones planted at maximum propagation in 2001 based on HF2 plant-crop results.

4.8 Advancement to core selection program

Two of the six clones propagated in the Maximum Propagation were advanced to the core propagation in 2002. The discarded clones were 91N1406 (severely rat damaged), 93N83 (severely rat damaged and significant flowering), and 93N577 and 93N921 (heavily suckered in the 2001 propagation). Their unsuitability was also reflected with all four clones ranking outside the top five based on mean performance (Table 27). These were not advanced to the core propagation. Clones 91N2967 and 91N3487, which demonstrated higher net merit and appearance grades than the standard average, had equal CCS, and had higher cane and sugar yields were the only two clones advanced. Clones 91N3252 and 93N957, which ranked number 1 and 2, respectively, over years, and showed promising net merit and appearance grades and CCS were not advanced when results of the HF1 as well as the HF2 were considered.

5.0 SERIES 2 TRIALS

5.1 Base material

Data were available from selection of the plant crops (1997) of the Stage 3 populations at BSES Meringa and BSES Tully. Two-stalk samples were removed from the first-ratoon crop of these populations for CCS determination for clones designated as tentative selections. For Meringa, tentative selections had a NMG ≥ 2 and at Tully a NMG ≥ 5.39. Such low NMG thresholds were used because both populations had been damaged by cyclone Justin, or floods associated with this, and the NMG distributions were skewed to the low end. Sampling at Tully was conducted from 29-30 June 1998 and at Meringa from 1-9 July 1998.

The Meringa population was planted as an augmented design contained in a single block, with a sub-block size of about 90 plots (one row x 10 m). The cultivars Q113, Q124 and Q138 were repeated over sub-blocks and sampled for CCS at the same time as the clones. An analysis of variance of the cultivar values was conducted over sub-blocks within each block and the sub-blocks term was not significant. The clonal CCS values from the block were expressed as a percentage of the mean block CCS value of the combined cultivars. Selections were then made, based on these values. 1284 samples were available, 1152 CCS samples were taken from 1026 clones and 126 standard cultivars and 145 clones (including 24 random clones) were propagated at Meringa.

The population at BSES Tully was planted over four blocks, with sub-block size being ≈60 plots (one row x 10 m) in each block. Cultivars used were Q117, Q127, and Q138. Procedures used at Tully closely followed those used at Meringa. The sub-blocks term was not significant in any of the Tully analyses. The individual clonal CCS values from each block were expressed as a percent of the mean block CCS values for the combined cultivars. Selections were made from these data from the individual blocks. Table 29 details number of clones, number sampled for CCS, and number propagated at Tully.

Table 29 Number clones available, number sampled for CCS, and number propagated at BSES Tully in 1998

Block	Available samples	No. of CCS samples	No. of clones propagated[1]
T19	430	267	48 (7)
1B	136	93	8 (1)
2B	196	134	10 (2)
3B	196	103	9 (2)
Total	958	597	75 (12)[2]

[1]The 597 samples came from 476 clones and 121 standard cultivars.
[2]This number includes an extra 10%, to cover poor germination, and the number in brackets indicates the number of random clones. Random selection may also be CCS selection.

Table 30 details the truncated values (a percentage of cultivar mean) used for routine selection to obtain the designated numbers (nominal 100 per site) for selection. The total

number was proportioned over sites (132 from Meringa and 68 from Tully) relative to the population size at each site. An additional 10% was selected at each site to allow for possible losses in the cws/lhwt of selections, or poor germination.

Table 30 Truncation values used for selection expressed as a percentage of the cultivar means

Station	Type	Cutoff CCS% value	No. clones
Meringa	Selections	≥ 108.63%	132
	Extra 10%	≥ 107.83% and <108.47%	13
Tully	Selections	≥ 108.14%	68
	Extra 10%	≥ 107.57% and <108.08%	7

Table 31 presents mean CCS values for each cultivar, and the combined block mean for the Stage 3 population at Meringa. Table 32 presents similar data for the Tully Stage 3 population planted over four blocks.

Table 31 Individual cultivar and combined block CCS means for the Meringa Stage 3 population contained in block M4

Block	Q113	Q124	Q138	Mean
M4	12.11	12.75	12.68	12.51

Table 32 Individual cultivar and combined block CCS means for the Tully Stage 3 population

Block	Q117	Q127	Q138	Mean
1B	13.84	12.97	14.03	13.61
2B	13.63	13.05	13.78	13.48
3B0	13.81	13.00	14.41	13.74
T19	12.36	12.36	12.41	12.38

The source populations contained a wide range of variation in CCS, with the Meringa population ranging from 4.12 to 16.83 units and the Tully population from 6.8 to 16.81 units (Table 33). Selection decreased these differentials dramatically (Table 33).

Table 33 Selection results in 1998 showing the mean CCS of the source populations and selected clones at BSES Meringa and BSES Tully

Location	Source population				Selected population			
	#	Mean CCS	Min.	Max.	#	Mean CCS	Min.	Max.
Meringa	1152	11.64	4.12	16.83	132	14.24	13.60	16.83
Tully	597	12.69	6.8	16.81	68	14.55	13.42	16.81

At Meringa, there was a differential of 2.6 units between the source population mean and the selection mean. For Tully, the differential was somewhat less at 1.86 units. The mean CCS for the Tully source population was 1.05 units higher than that for Meringa. This is perhaps attributable to severe lodging and crop damage in the Meringa population, among other factors.

5.2 HF1 propagation

The selections from both populations were cws/lhwt and planted in October 1998 to 20 m plots on Jeff Finlayson's farm in Kennedy. The treated material could not be planted to the field for 3 weeks after treatment due to excessive rainfall in the Innisfail region.

Individual plot-germination assessments were conducted on the 25 February 1999 (Table 34). 30 stalks are required from each plot; this allows, for 20 stalks to be used in the establishment of the HF1 trial and 10 stalks to be used to establish the HF2 propagation. There were only 99 clones with sufficient stalk numbers to accomplish this. This means that the HF1 trial established from this source was considerably smaller than initially proposed.

Table 34 Summary of plot germination assessments of the series 2 HF1 propagation stage taken in February 1999

No. of Stalks	No. of Plots
0	31
<10	53
10-19	49
20-29	45
>30	99

5.3 HF1 trial

The HF1 trial was planted in July 1999 at Finlayson's, Kennedy. This trial germinated well and grew well during the season. The whole trial was subjected to flooding during the severe monsoonal season experienced in 2000, but damage from this, in the form of lodging, was been limited to about 20 plots in a small area within the trial.

Data collected for the plant crop were identical to the traits sampled in the series 1 HF1 trial (described in section 4.3).

Efficacy of the sub-sampling strategy used again was tested using the ERT. All traits, including the # stalks/ha, had values > 3.0 (Table 35), the rule-of-thumb threshold for acceptable precision from sub-sampling. Again, variation among clones was highly significant relative to the variation due to sub-sampling.

Table 35 Efficacy of sub-sampling strategy used for seven ideotype traits measured in the plant crop of the series 2 HF1 trial as determined by the error ratio test (ERT)

Ideotype trait	Error ratio test[1]
Cane height (cm)	14.9
Stalk diameter (mm)	8.4
Cabbage length (mm)	31.2
No. leaves	9.0
Leaf length (mm)	22.5
Leaf width (mm)	20.7
No. stalks/ha	3.1

[1]ERT= $s\sigma_c^2 / \sigma_s^2$, = F - 1 from the analysis of variance.

Clonal means for the seven ideotype traits and the erectness grade (February) are presented in Appendix 9 for the 100 clones and the 12 plots of three cultivars. Summary statistics for clones assessed again show there was ample variation for all eight traits (Table 36).

Table 36 Summary statistics for seven ideotype traits for 100 clones assessed in the plant crop of the series 2 HF1 trial

Variable	Mean	Maximum	Minimum	SD
Cane height (cm)	2158.4	3038.0	1369.0	288.8
Stalk diameter (mm)	27.3	35.9	19.9	3.1
Cabbage length (mm)	405.4	677.0	235.0	100.8
# Leaves	8.3	11.0	7.0	0.8
Leaf length (cm)	154.6	190.0	125.0	14.8
Leaf width (mm)	54.6	72.0	44.0	5.9
#Stalks/ ha	82,755.9	133,333.0	37,778.0	20,108.5
Erectness estimate	3.1	9.0	0.0	3.0

Relationships among the seven ideotype traits and erectness generally were weak. A number were significantly different from zero (Table 37). The largest value was recorded for cabbage length vs number of leaves, although this was weaker than in the series 1 data sets. Consistent relationships commented on previously, cane height vs erectness and

stalk diameter vs leaf length were both moderate and positive. The other relationship of # stalks/ha vs stalk diameter was not significant although was again negative.

Table 37 Simple relationships (*r*) among seven ideotype traits and erectness determined in the plant crop of the series 2 HF1 trial

Variable	Stalk diameter	Cabbage length	# Leaves	Leaf length	Leaf width	# Stalks/ha	Erect-ness
Cane height	0.146	-0.015	0.015	0.056	0.077	0.360**	0.547**
Stalk diameter		0.099	0.258**	0.199**	0.458**	-0.130	0.141
Cabbage length			0.568**	0.189	0.221*	-0.320**	-0.305**
# Leaves				0.104	0.202**	-0.146	-0.048
Leaf length					0.185	0.154	0.025
Leaf width						-0.054	0.091
# Stalks/ha							0.519**

** $P \leq 0.01$; $P \leq 0.05$.

The prediction of the February estimate of plot erectness was again examined by multiple regression. Three ideotype traits contributed significantly to the prediction. The coefficient of multiple determination was stronger in this prediction exercise than in the two series 1 data sets (Table 38). Cane height, which was a significant predictor in the series 1 data sets, was relatively the most important predictor, followed by # stalk/ha (68%) and cabbage length (47%). The latter two predictors also were significant in the first-ratoon series 1 HF1 data set

Table 38 Multiple linear regressions statistics for use of ideotype traits as predictors for erectness in the plant crop of the series 2 HF1

Dependent	Independent	P	Relative b'
Erectness	Cane height	< 0.001	100
(February)	Cabbage length	0.013	-47
(R = 0.675)	# stalks/ha	< 0.001	68

Clonal means for pre-harvest (July) and harvest (September) data are summarized in Appendix 10, with summary statistics presented in Table 39 and 40. Again, the mean pre-harvest CCS of the clones in this population approached the mean for the standard cultivars used (14.8 vs 15.4), and the highest CCS of the clones exceed the maximum CCS recorded for the standard cultivars (Table 39). The mean pre-harvest appearance grade of the clones also approached the mean for the cultivars (7.6 vs 8.1), but the range of variation for the clones was, as expected, much greater.

Harvest data (Table 40) showed that the clonal population approached the cultivar means for CCS (13.9 vs 14.4), tonnes cane per hectare (71.6 vs 75.2), and tonnes sugar per hectare (9.9 vs 10.8) in all instances clones with values that exceeded the cultivars were present in the selection population.

Table 39 Summary statistics for two pre-harvest season traits for 100 clones and 3 cultivars assessed in July in the plant crop of the series 2 HF1 trial

Class	Statistic	CCS[1]	AG[2]
Clones	Maximum	17.02	9.50
	Minimum	10.32	4.00
	$\bar{x}$	14.80	7.57
	S.D.	1.18	1.12
Cultivars	Maximum	16.81	9.50
	Minimum	14.29	6.50
	$\bar{x}$	15.38	8.08
	S.D.	0.80	0.85

[1]Commercial cane sugar; [2]Appearance grade.

Table 40 Summary statistics for six harvest-season traits for 100 clones and three cultivars assessed in September in the plant crop of the series 2 HF1 trial

Class	Statistic	CCS[1]	TCH[2]	TSH[3]	RSY[4]	AAG[5]	NMG[6]
Clones	Maximum	16.33	118.00	17.31	1.63	12.81	16.09
	Minimum	11.15	12.00	1.67	0.14	1.35	0.41
	$\bar{x}$	13.86	71.58	9.92	0.90	9.13	8.21
	S.D.	1.23	17.77	2.64	0.26	2.97	3.00
Cultivars	Maximum	16.21	92.67	13.05	1.20	12.13	11.96
	Minimum	13.07	56.67	9.05	0.83	4.04	4.18
	$\bar{x}$	14.41	75.22	10.79	1.00	10.00	9.92
	S.D.	0.79	10.35	1.23	0.11	2.17	2.10

[1]Commercial cane sugar; [2]Tonnes cane per hectare; [3]Tonnes sugar per hectare; [4]Relative sugar yield; [5]Adjusted Appearance grade; [6]Net merit grade.

The 38 most favourable clones (Table 41) were selected from the plant-crop harvest data, using total rank summed over net merit grade, CCS, and adjusted appearance grade rankings. These selections were planted in the series 2 HF2 trial.

Early CCS determination and appearance grade evaluation of the first-ratoon crop (Appendix 11) shows a large range of variation within the 100 clones. The statistical summary (Table 42) shows differentials of 7 and 5 units between maximum and minimum CCS and appearance grades, respectively. Cultivars were not as variable and only demonstrated slightly higher early CCS and appearance grades compared to the clones.

Table 41 Top 38 clones ranked by mean plant-crop net merit grade (NMG), CCS and adjusted appearance grade (AAG) from the series 2 HF1 trial advanced to the series 2 HF2 trial

Clone	Total rank[1]	NMG	NMG rank	CCS	CCS rank	AAG	AAG rank
93N1328	284	13.08	91	16.01	98	12.81	95
94N105	275	16.09	100	14.96	78	12.81	97
92N176	270	13.76	94	15.01	80	12.81	96
92N157	270	13.27	93	16.33	100	11.46	77
91N1418	258	12.88	90	15.34	89	11.46	79
94N963	242	10.58	72	15.37	92	11.46	78
92N1194	240	13.77	95	15.52	93	10.11	52
88A1600	239	12.71	89	14.46	66	11.46	84
93N1150	238	11.54	83	14.38	65	12.13	90
92N1519	232	11.61	84	15.14	84	10.79	64
92N942	232	12.35	87	15.72	94	10.11	51
94N1012	231	11.73	85	15.93	96	10.11	50
93N1377	231	10.99	76	14.74	74	11.46	81
94N815	226	14.36	99	13.38	34	12.13	93
94N84	224	10.26	69	14.72	73	11.46	82
92N1983	223	9.98	64	14.96	79	11.46	80
88A861	221	12.42	88	13.73	42	12.13	91
93N288	218	13.95	96	15.33	88	9.44	34
93N1154	216	11.52	82	15.05	81	10.11	53
92N55	214	7.69	49	14.86	76	12.13	89
94N51	210	11.83	86	13.95	55	10.79	69
92N1317	210	14.21	98	15.27	85	8.76	27
94N592	208	11.04	77	14.88	77	10.11	54
86A700	208	8.91	58	14.48	67	11.46	83
94N28	203	11.06	79	14.52	69	10.11	55
94N512	201	10.10	66	14.50	68	10.79	67
93N137	199	9.75	62	13.93	52	11.46	85
87A577	199	10.92	74	16.27	99	8.76	26
94N131	198	11.13	80	15.08	83	9.44	35
92N1059	195	11.21	81	12.45	15	12.81	99
*94N844	193	10.21	68	13.02	27	12.81	98
92N230	187	7.54	47	14.80	75	10.79	65
94N465	184	10.96	75	12.78	22	11.46	87
93N1363	184	14.21	97	13.79	46	9.44	41
#94N1085	179	10.05	65	13.74	43	10.79	71
92N936	168	9.19	61	13.39	35	10.79	72
92N228	166	9.07	60	14.55	70	9.44	36
93N1043	165	5.36	19	15.94	97	10.11	49
#94N320	160	5.58	23	14.56	71	10.79	66
*92N2447	160	8.16	53	13.83	50	10.11	57

[1]Total rank = sum of clonal ranks for NMG, CCS, and AAG; #- Clone 94N1085 did not have enough quality material in the propagation for advancement so it was replaced by 94N320; *-Clone 94N844 did not have enough quality material in the propagation for advancement so it was replaced by 92N2447; Clones 94N963, and 92N1983 could only be planted in two replicates and clones 94N815, and 88A1600 provided enough plant material for a single replicate.

Table 42 Summary statistics for two pre-harvest season traits determined for 100 clones and three cultivars assessed in June in the first-ratoon crop of the series 2 HF1 trial

Plant type	Statistic	CCS[1]	AG[2]
Clone	Maximum	17.54	9.00
	Minimum	10.51	4.00
	$\bar{x}$	14.96	7.17
	S.D.	1.38	0.95
Cultivar	Maximum	17.46	8.00
	Minimum	13.52	7.00
	$\bar{x}$	15.35	7.67
	S.D.	1.02	0.44

[1]Commercial cane sugar; [2]Appearance grade.

Clonal harvest data (October) are presented in Appendix 11, with the summary statistics in Table 43. Although low mean appearance grades were recorded for both clones (6.7) and cultivars (7.3), the clean-stalk CCS was surprisingly high at this site (18.5, for clones, and 19.3, for cultivars). Average tonnages for these two groups were low. However, maximum results for each were favourable for clones (115.3) and cultivars (94.0).

Table 43 Summary statistics for six harvest-season traits determined for 100 clones and three cultivars assessed in October in the first-ratoon crop of the series 2 HF1 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clone	Maximum	21.08	8.50	11.72	20.72	115.33	22.51	2.06
	Minimum	15.73	2.00	2.76	0.00	8.67	1.48	0.07
	$\bar{x}$	18.53	6.74	9.29	7.97	50.90	9.43	0.84
	S.D.9	1.05	1.09	1.50	4.23	22.99	4.32	0.40
Cultivar	Maximum	20.33	8.00	11.03	17.13	94.00	17.29	1.55
	Minimum	17.93	6.50	8.97	5.08	28.67	5.70	0.54
	$\bar{x}$	19.33	7.25	10.00	10.10	57.22	10.96	1.00
	S.D.	0.74	0.50	0.69	3.32	18.92	3.28	0.28

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

Table 44 Top 38 ranked clones ranked by mean harvest plant and first-ratoon net merit grade (NMG), CCS and appearance grade (AG) from the series 2 HF1 trial to confirm clones advanced to the series 2 HF2 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
214	17	86A700	10.17	79	16.25	56	7.75	79	10.56	66.33	10.91	0.98
227	11	88A861	8.56	57	17.14	84	8.00	86	10.89	52.00	7.89	0.74
234	7	88A1600	11.28	84	16.86	77	7.75	73	10.56	71.33	11.73	1.08
213	18	94A6003*	9.87	74	16.95	78	7.50	61	10.23	63.34	10.61	0.98
188	32	92B2301*	8.02	49	16.41	63	7.75	76	10.56	54.00	8.87	0.80
208	22	91N1418	9.84	73	16.30	57	7.75	78	10.56	61.66	9.91	0.90
280	1	92N157	13.23	91	17.91	98	8.25	91	11.24	68.33	12.19	1.15
260	3	92N176	12.09	88	17.00	80	8.25	92	11.23	70.00	11.75	1.08
202	25	92N228	9.61	69	17.14	83	7.25	50	9.89	63.34	10.63	0.99
183	33	92N230	7.46	44	16.43	64	7.75	75	10.56	48.34	7.91	0.71
172	38	92N264*	5.57	24	17.25	88	7.50	60	10.22	35.00	6.03	0.56
239	5	92N942	13.52	92	18.04	100	7.25	47	9.88	80.67	14.54	1.37
199	29	92N1059	11.56	86	15.18	14	8.50	99	11.57	77.67	11.67	1.02
238	6	92N1194	16.02	99	17.28	90	7.25	49	9.88	101.00	17.60	1.63
208	21	92N1317	14.05	95	17.23	87	6.50	26	8.87	102.33	17.42	1.61
212	19	92N1519	8.67	60	17.41	93	7.50	59	10.22	54.66	9.05	0.85
204	24	92N1782*	13.61	93	17.46	94	5.50	17	7.53	105.33	18.59	1.72
201	26	92N1983	8.96	63	16.05	44	8.25	94	11.24	55.67	8.88	0.79
174	37	92N2439*	8.10	52	17.72	97	6.50	25	8.88	56.00	9.81	0.93
191	31	93N137	9.72	70	15.98	41	7.75	80	10.56	65.00	10.34	0.92
233	8	93N288	17.32	100	17.13	82	7.25	51	9.89	108.67	18.73	1.73
217	15	93N1150	10.00	77	16.18	52	8.00	88	10.89	63.33	10.10	0.91
244	4	93N1328	9.99	76	17.61	96	7.75	72	10.54	56.33	9.78	0.92
220	14	93N1377	8.55	56	16.56	71	8.25	93	11.24	52.00	8.29	0.76
199	28	94N28	10.60	82	16.22	54	7.50	63	10.22	73.00	11.69	1.06
205	23	94N51	12.14	89	15.78	34	7.75	82	10.56	83.33	13.07	1.17
232	9	94N84	11.43	85	16.09	50	8.50	97	11.59	69.33	11.20	1.01
279	2	94N105	13.88	94	17.16	85	9.00	100	12.27	73.00	12.16	1.13
180	35	94N131	9.78	71	16.23	55	7.25	54	9.89	69.33	11.09	1.00
214	16	94N592	11.74	87	16.71	74	7.25	53	9.88	78.67	13.16	1.20
194	30	94N796*	12.14	90	16.45	65	7.00	39	9.55	86.67	14.15	1.29
224	12	94N815	14.35	97	15.69	29	8.50	98	11.58	88.33	13.66	1.22
179	36	94N844*	9.88	75	15.11	9	8.25	95	11.23	68.33	10.29	0.89
181	34	94N928*	10.47	81	16.32	60	7.00	40	9.55	75.00	12.02	1.09
221	13	94N930*	15.81	98	16.39	61	7.50	62	10.24	101.67	16.67	1.52
212	20	94N963	8.02	50	16.74	75	8.00	87	10.90	49.66	8.12	0.74
199	27	94N1012	9.56	68	16.95	79	7.25	52	9.88	61.66	10.33	0.95
228	10	94N6006*	10.11	78	16.80	76	7.75	74	10.56	67.00	10.56	0.97

[1]Total rank = NMG rank + CCS rank + AG rank; [2]Selection number, 1= best-ranked clone 38 = worst ranked clone; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Not planted at the HF2.

Table 45 Remaining 10 clones advanced to the series 2 HF2, but not present in the 38 top-ranked results ranked be mean plant and first-ratoon crop net merit grade (NMG), CCS and appearance grade (AG) in the series 2 HF1 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
165	43	87A577	7.38	42	18.02	99	6.50	24	8.87	50.34	8.59	0.83
157	49	92N55	5.33	22	16.30	58	7.75	77	10.55	35.66	5.67	0.50
125	70	92N936	8.21	54	15.62	26	7.00	45	9.54	65.67	10.12	0.89
136	64	92N2447	5.92	28	16.55	70	7.00	38	9.54	42.34	6.46	0.59
163	46	93N1043	5.21	20	17.54	95	7.25	48	9.88	32.66	5.71	0.55
166	42	93N1154	8.61	58	16.21	53	7.25	55	9.88	62.33	9.88	0.89
168	41	93N1363	14.23	96	15.68	28	7.00	44	9.55	106.33	16.45	1.48
96	79	94N320	4.67	16	15.14	12	7.50	68	10.22	38.00	5.75	0.48
165	45	94N465	8.06	51	15.73	31	7.75	83	10.56	57.67	8.28	0.73
165	44	94N512	8.78	61	15.97	40	7.50	64	10.22	62.34	9.84	0.88

[1]Total rank = net merit grade rank + CCS rank + adjusted appearance grade rank; [2]Selection number = 1 best-ranked clone 100 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield.

5.4 HF2 propagation

This propagation, to provide planting material for the HF2 trial based on selections made with data collected from the HF1 trial, was planted at Finlayson's in August 1999. This propagation contained all clones in the HF1 trial.

Recovery of clones that had germinated in the HF1 propagation, but which had not produced sufficient material to be planted to the HF1 trial and the HF2 propagation was planned, but this was thwarted by the cooperator harvesting the initial propagation without any consultation.

5.5 HF2 trial

The HF2 trial was planted on a high fertility site (Angelino) in the Mulgrave area in September 2000. It was established in a three-replicate by six-row by 10 m format on the basis of plant-crop performance data at the HF1 trial. This trial did not germinate as well as desired, due to the sub-standard plant material available. This was confounded with an unavoidable delay in planting and effects from transporting the planting material from the propagation site in Kennedy. However, the trial was adequate for extensive early-season ideotype testing, and pre-harvest and harvest sampling. Due to the site dimensions, an increased number of clones per replicate could be planted compared to the original project proposal. As not all clones had sufficient sound planting material available to plant all replicates, 34 clones were represented in all three replicates, two clones were in two replicates, and two clones were in only one replicate (Appendix 13). Two standard cultivars occupied four plots in all replicates.

Pre-harvest (June) means for all clones and standard cultivars are presented in Appendix 13 and summary statistics are presented in Tables 46 and 47, respectively. June sampling showed a higher mean CCS (14.2) for the standard cultivars compared to the clones (13.3). The appearance grades were about equal (7.8). There was no difference between the mean harvest CCS of the standards and the clones (16.6). The mean appearance grade of the standards (7.8) was slightly lower than that of the clones (8.3). The standard cultivars had slightly higher values for mean tonnes cane and sugar per hectare compared to the clones. However, maximum values for the clones were greater than those recorded for the standard cultivars for both traits.

Table 46 **Summary statistics for two pre-harvest mean season traits for 34 clones replicated three times, two clones replicated twice, two clones occurring once and two cultivars assessed in June in the plant crop of the series 2 HF2 trial**

Plant type	Statistic	CCS[1]	AG[2]
Clone	Maximum	15.91	8.83
	Minimum	10.15	6.00
	$\bar{x}$	13.25	7.83
	S.D.	1.10	0.64
Cultivar	Maximum	14.92	8.00
	Minimum	13.26	7.50
	$\bar{x}$	14.22	7.75
	S.D.	0.80	0.21

[1]Commercial cane sugar; [2]Appearance grade.

Table 47 **Summary statistics for six harvest-season traits for 34 clones and two cultivars replicated three times, two clones replicated twice, and two clones occurring once assessed in August in the plant crop of the series 2 HF2 trial**

Plant type	Statistic	CCS[1]	AG [2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clone	Maximum	17.95	9.83	12.58	17.78	90.33	15.83	1.55
	Minimum	14.74	7.17	9.16	4.53	35.67	5.29	0.45
	$\bar{x}$	16.60	8.31	10.62	10.81	62.48	10.43	1.00
	S.D.	0.83	0.75	0.96	3.09	13.84	2.41	0.24
Cultivar	Maximum	17.79	8.50	10.88	14.12	85.89	13.60	1.29
	Minimum	15.59	7.17	9.13	6.50	39.11	6.96	0.70
	$\bar{x}$	16.62	7.83	10.00	10.25	63.86	10.45	1.00
	S.D.	1.10	0.68	0.90	3.90	24.37	3.39	0.30

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted Appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

Means for four harvest traits (CCS, appearance grades, raw and adjusted, and net merit grade) for all clones and standard cultivars in the first ratoon are presented in Appendix 14. The summary statistics for these and three additional traits (cane yield, and actual and relative sugar yield) are given in Table 48. Means for all harvest traits of the clones were slightly lower than that of the standards (eg 17.34 vs 17.60 for CCS; 8.16 vs 9.00 for appearance grade). Maximum values for cane and sugar yields of the clones were greater than those recorded for the standard cultivars for both traits.

Table 48 Summary statistics for seven harvest-season traits for 34 clones and two cultivars replicated three times, two clones replicated twice, and two clones occurring once assessed in August in the first-ratoon crop of the series 2 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clones	Maximum	19.00	9.50	10.58	12.06	132.39	23.21	1.18
	Minimum	14.10	5.67	6.30	5.31	72.61	12.10	0.59
	$\bar{x}$	17.34	8.16	9.08	7.99	100.35	17.41	0.88
	S.D.	0.96	0.96	1.07	1.89	14.76	2.58	0.14
Cultivars	Maximum	18.33	9.50	10.56	11.67	127.39	21.93	1.10
	Minimum	16.58	8.33	9.25	9.19	96.67	17.77	0.92
	$\bar{x}$	17.60	9.00	10.00	10.02	112.21	19.68	1.00
	S.D.	0.85	0.53	0.60	1.12	13.69	1.72	0.80

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted Appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

5.6 Maximum propagation source

This propagation was planted in parallel with the series 2 HF2 trial in September 2000 at Kurrimine Beach. This aimed to provide planting material for the maximum propagation of selections from the HF2 trial. The plant material for this propagation also was in a poor condition, but grew well enough to provide ample material for maximum propagation.

5.7 Maximum propagation

Table 49 gives the ranking and subsequent selection processes of the six clones that were advanced to maximum propagation. This site also was planted with selections from the series 1 HF2 trial in September 2001. These clones also were propagated into the core-breeding program into 40-m plots at Watters in Mulgrave for evaluation in the Final Assessment Trial (FAT) series.

Table 49 Ranked mean harvest results based on net merit grade (NMG), CCS, and appearance grade (AG) for all 38 clones and two standards (Q120 and Q152) in the plant crop of the series 2 HF2 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
90	8	86A700	13.46	35	16.36	17	9.17	38	11.74	72.89	11.83	1.13
59	25	87A577	9.52	14	17.91	41	7.33	4	9.37	56.67	10.15	1.01
93	7	88A861	12.36	32	16.74	27	9.00	34	11.54	67.11	11.23	1.08
84	12	88A1600	11.18	24	17.57	35	8.54	25	11.00	51.36	10.04	1.02
51	27	91N1418	6.76	5	17.18	31	7.83	15	10.02	38.67	6.62	0.65
78	16	92N55	10.55	20	16.72	26	8.83	32	11.28	59.67	9.99	0.96
62	22	92N157	11.44	27	17.08	28	7.33	7	9.39	71.00	12.18	1.17
94	5	92N176*	13.80	36	16.68	23	9.00	35	11.50	75.56	12.60	1.21
44	33	92N228	7.29	8	17.14	30	7.33	6	9.35	45.89	7.89	0.76
84	10	92N230	12.04	29	16.37	18	9.17	37	11.72	67.00	10.94	1.04
63	21	92N936	10.81	22	15.78	8	8.83	33	11.32	68.22	10.76	1.00
73	17	92N942	9.82	17	17.57	36	8.17	20	10.46	51.56	9.08	0.91
46	31	92N1059	9.41	13	15.80	10	8.50	23	10.90	58.33	9.22	0.86
99	4	92N1194*	14.94	38	16.58	20	9.50	41	12.18	78.56	13.02	1.24
108	2	92N1317*	17.00	41	16.72	25	9.83	42	12.58	84.11	14.06	1.35
37	37	92N1519	9.70	16	16.00	11	7.50	10	9.59	65.00	10.43	0.98
81	13	92N1983	11.28	26	17.14	29	8.62	26	11.03	58.28	9.98	0.98
106	3	92N2447*	15.92	39	17.82	40	8.67	27	11.09	79.94	14.23	1.4
28	39	93N137	6.85	6	15.76	6	7.83	16	10.02	45.89	7.25	0.67
115	1	93N288*	17.78	42	17.95	42	8.83	31	11.32	88.33	15.83	1.55
62	23	93N1043	10.44	19	17.19	32	7.67	11	9.85	61.22	10.54	1.03
49	29	93N1150	9.65	15	15.58	4	8.67	30	11.05	59.56	9.28	0.86
51	26	93N1154	8.65	11	16.67	22	8.00	18	10.17	53.89	8.99	0.86
39	36	93N1328	6.74	4	17.26	33	7.17	2	9.16	42.89	7.38	0.72
84	11	93N1363	16.69	40	16.34	16	8.67	28	11.05	90.33	15.43	1.48
80	15	93N1377	11.21	25	16.56	19	9.00	36	11.50	60.11	9.94	0.95
50	28	94N28	10.91	23	16.71	24	7.17	3	9.16	74.56	12.46	1.19
31	38	94N51	7.09	7	16.33	15	7.50	9	9.55	49.22	8.03	0.76
69	18	94N84	11.58	28	16.05	12	8.67	29	11.10	70.45	11.25	1.06
94	6	94N105*	13.05	33	16.62	21	9.50	40	12.16	66.67	11.07	1.06
44	32	94N131	8.28	10	16.30	13	8.17	21	10.41	51.45	8.37	0.79
24	41	94N320	6.04	2	16.32	14	7.33	8	9.39	38.89	6.30	0.59
15	42	94N465	4.53	1	14.74	1	7.67	13	9.75	35.67	5.29	0.45
26	40	94N512	9.05	12	14.92	2	7.67	12	9.77	70.11	10.45	0.95
41	35	94N592	10.72	21	14.94	3	7.83	17	10.00	79.56	11.85	1.09
66	20	94N815	10.16	18	15.78	9	9.30	39	11.83	53.26	8.70	0.83
88	9	94N963	12.18	31	17.77	38	8.14	19	10.46	65.11	11.60	1.14
81	14	94N1012	12.04	30	17.75	37	7.83	14	9.97	67.22	11.94	1.17
47	30	Q120	6.50	3	17.79	39	7.33	5	9.33	39.11	6.96	0.7
44	34	Q120	7.30	9	17.33	34	7.17	1	9.13	46.78	8.13	0.79
68	19	Q152	14.12	37	15.77	7	8.50	24	10.88	85.89	13.60	1.29
61	24	Q152	13.07	34	15.59	5	8.33	22	10.66	83.67	13.10	1.22

[1]Total rank = net merit grade rank + CCS rank + AAG; [2]Selection number = 1 best-ranked clone, 42 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Clones advanced (6) to maximum propagation.

Although the HF1 and HF2 trials were both on high fertility soil series, Table 50 shows a broad range in variation for clonal performance between trials. Low-ranked clones (92N1317 and 93N2447) at the HF1 proved to be the second and third selections from the HF2. Conversely, 92N157, which performed favorably in the HF1, did not in the HF2. This clone was not progressed to maximum propagation. While 92N1194 and 92N176 lacked ratoonability in the HF1, both clones demonstrated selection numbers within the top 10 in the plant crop at both sites as well as in the mean (plant + ratoon) ranking in the HF1. Despite its average performance in the plant crop, 93N288 showed consistency in both HF1 and HF2. Clone 94N105 shows the most promise of all clones with excellent selection results over years and sites.

Table 50 Clonal ranking summary from the series 2 HF1 plant and first-ratoon crops and the HF2 plant crop

Clone	HF1 plant selection #	HF1 ratoon selection #	HF1 mean selection #	HF2 plant selection #
92N1194	7	17	6	4
92N1317	22	39	21	2
92N157	4	2	1	22
92N176	3	37	3	6
93N2447	38	90	64	3
93N288	18	8	8	1
94N105	2	5	2	5

5.8 Advancement to core selection program

Three of the six clones selected on the plant-crop results (92N1317, 93N288 and 94N105) were advanced to five final assessment trials (FATs) in 2002. These clones were ranked 2, 1, and 13, respectively, on mean performance over the plant and first-ratoon crops (Table 51). Although two of clones, 92N1194 and 92N2447, ranked highly over crops, the first showed susceptibility to common rust and the latter showed side shooting in the propagation plot. Along with a poorer average plant plus ratoon rank, significant common rust infection also was noted in 92N176. These three clones were not planted to the FATs. Four of the FATs were planted in the coastal region in soil types and rainfall regimes ranging from a Virgil red alluvial in the Mulgrave mill area (Johnson) to a high fertility Tully series in the super-wet Tully region (BSES station). The fifth trial was located on a Leadingham, flood irrigated site on the Mareeba Tableland.

Table 51 Ranked mean plant and first-ratoon harvest net merit grades (NMG), CCS, and appearance grades (AG) from the series 2 HF2 trial to confirm clones advanced to the core selection propagation and FATs

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
89	8	86A700	12.05	36	16.57	13	9.17	40	10.97	98.83	16.37	1.08
51	30	87A577	7.41	8	18.45	42	6.50	1	7.84	69.58	12.88	0.92
93	7	88A861	10.84	32	17.18	27	9.00	34	10.77	86.39	14.91	1.01
88	9	88A1600	10.08	27	18.14	40	8.27	21	10.03	74.65	14.51	1.01
47	31	91N1418	6.61	4	17.81	32	7.75	11	9.29	57.36	10.33	0.69
60	24	92N55	8.02	12	16.71	18	8.91	30	10.64	66.14	11.04	0.77
79	15	92N157	10.54	29	17.87	35	7.92	15	9.43	87.00	15.70	1.09
75	17	*92N176	10.74	31	17.36	28	7.92	16	9.57	92.03	16.09	1.11
37	35	92N228	6.62	5	17.61	29	7.08	3	8.48	65.89	11.70	0.78
87	10	92N230	10.91	33	16.96	23	8.92	31	10.69	90.96	15.54	1.03
60	23	92N936	9.46	24	16.50	12	8.50	24	10.21	87.39	14.59	0.96
70	18	92N942	8.56	16	17.95	37	7.92	17	9.50	68.97	12.48	0.87
40	34	92N1059	8.25	14	15.99	4	8.33	22	10.00	80.67	12.95	0.83
103	4	*92N1194	12.36	37	17.04	24	9.33	42	11.18	95.33	16.32	1.12
107	2	*92N1317#	14.05	40	17.08	26	9.33	41	11.21	105.72	18.14	1.24
32	36	92N1519	8.59	17	16.30	8	7.50	7	8.96	86.50	14.28	0.93
86	12	92N1983	9.67	25	17.05	25	9.05	36	10.78	73.41	12.48	0.86
104	3	*92N2447	12.68	38	18.19	41	8.50	25	10.18	91.92	16.75	1.20
22	40	93N137	6.38	3	16.21	7	7.75	12	9.28	65.00	10.63	0.68
120	1	*93N288#	14.44	42	18.11	39	9.16	39	10.94	99.33	17.99	1.30
55	26	93N1043	8.59	18	17.70	31	7.42	6	8.92	74.67	13.30	0.93
95	6	93N1363	14.38	41	16.93	22	8.92	32	10.62	111.36	19.32	1.33
78	16	93N1328	8.79	19	17.87	36	8.34	23	9.86	74.36	13.45	0.87
55	27	93N1150	9.01	22	16.00	5	8.67	28	10.33	83.61	13.48	0.86
41	33	93N1154	7.06	7	16.62	15	8.17	19	9.72	65.06	10.81	0.74
58	25	93N1377	8.87	21	16.48	10	8.58	27	10.3	75.56	12.44	0.84
54	28	94N28	9.99	26	16.87	20	7.58	8	9.04	97.97	16.57	1.11
25	38	94N51	7.03	6	16.38	9	7.67	10	9.13	76.31	12.50	0.79
87	11	94N84	10.51	28	16.92	21	9.09	38	10.84	85.86	14.62	0.99
86	13	*94N105#	10.59	30	16.84	19	9.08	37	10.89	82.28	13.89	0.95
44	32	94N131	7.83	9	16.71	17	8.09	18	9.65	76.25	12.83	0.83
22	39	94N320	6.22	2	16.70	16	7.17	4	8.59	65.89	11.13	0.69
12	42	94N465	4.92	1	15.52	2	7.58	9	9.04	57.89	9.22	0.54
28	37	94N512	7.99	11	15.55	3	7.83	14	9.33	86.11	13.49	0.87
19	41	94N592	8.12	13	14.52	1	7.33	5	8.80	101.11	14.56	0.93
70	19	94N815	9.18	23	16.60	14	8.97	33	10.76	73.48	12.69	0.83
97	5	94N963	11.09	34	17.84	34	8.69	29	10.35	85.27	15.24	1.05
52	29	94N1012	8.85	20	17.64	30	7.00	2	8.37	77.58	13.69	0.98
68	20	Q120	8.48	15	17.83	33	8.25	20	9.76	71.72	12.95	0.86
61	22	Q120	7.85	10	18.02	38	7.83	13	9.29	72.39	13.12	0.85
85	14	Q152	12.89	39	16.50	11	9.00	35	10.72	106.64	17.77	1.20
67	21	Q152	11.31	35	16.08	6	8.58	26	10.23	101.39	16.41	1.10

[1]Total rank = net merit grade rank + CCS rank + AAG; [2]Selection number = 1 best-ranked clone, 42 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Clones advanced (6) to maximum propagation; .#Clones advanced (3) to five FAT trials in 2002.

6.0 SERIES 3 TRIALS

6.1 Base material

The selection program was restructured in the Northern region, and, as a consequence, there was a break in the continuity of the clonal evaluation trial (Stage 2) series for a year. Source material for this project was switched from early-season CCS evaluation in the first-ratoon crop of clones with high net merit grades from a plant-crop evaluation of Stage 2 at BSES Meringa and BSES Tully to selection of high-CCS clones from the plant crop of Stage2 at Meringa. The numbers of clones selected for propagation are summarized in Table 52. These clones were assessed early in the 1999 harvest season and they could be propagated in the same year because they were present in a first-ratoon Stage 2, Propagation 1 block that was used to supply these trials over a multi-environment assessment.

Table 52 Number of clones available, number sampled for CCS, and number at BSES Meringa in 1999

Block	Number of available samples	Number of actual CCS samples	Number of clones propagated
A3	365 clones 45 standards	309 clones 45 standards	21% of total 42 samples 8 randoms 4 extra 10% 54 total selections
M5	1120 clones 140 standards	809 clones 136 standards	56% of total 112 samples 20 randoms 11 extras 143 total selections
W2	390 clones 42 standards	339 clones 98 standards	23 % of total 46 samples 8 randoms 5 extras 59 total selections

Table 53 details the CCS truncation values for the selections detailed in Table 52. The CCS for clones in each block was expressed relative to the mean CCS of four cultivars used in the clonal evaluation trial. Selections were taken from the highest relative value until the required number was acquired from each block. A nominal target of 200 selections plus 36 random selections plus 20 extra selections to cover possible losses, a total of 256 clones, was sought from the population. T hese were taken in proportion to the numbers in each of the three blocks accommodating the clonal assessment trials (Table 52).

Table 53 Truncation values for selection expressed as a percentage of the cultivar means

Block	Type	Cut-off CCS% value	Number of clones
A3	Selection	≥ 103.24	42
	Extra 10%	≤ 102.81 ≥ 102.30	4
M5	Selection	≥ 107.21	112
	Extra 10%	≤ 107.21 ≥ 106.85	11
W2	Selection	≥ 103.99	46
	Extra 10%	≤ 103.85 ≥ 103.63	5

Details for the standard cultivars used in the three selection blocks are shown in Table 54. Differences for mean CCS values among cultivars were minimal, and given the early season harvest of these, the clean, mature-stalk CCS vales were excellent. The means across cultivars in each of the three blocks differed little.

Table 54 Cultivar and combined block CCS means for the Meringa clonal evaluation trial population

Block	Statistical measure	Standard				Mean
		Q113	Q124	Q138	Q158	
A3	Maximum	14.7	16.2	14.8	15.4	
	Minimum	12.5	8.9	11.9	12.0	
	$\bar{x}$	14.0	14.1	13.4	14.0	
	Number of standards	11.0	11.0	11.0	12.0	
	Total block $\bar{x}$					13.9
M5	Maximum	15.7	15.6	15.4	15.6	
	Minimum	12.3	7.8	8.7	11.3	
	$\bar{x}$	14.1	13.6	13.5	13.7	
	Number of standards	34.0	33.0	35.0	34.0	
	Total block $\bar{x}$					13.7
W2	Maximum	15.4	15.7	15.7	15.3	
	Minimum	11.1	11.9	11.9	10.9	
	$\bar{x}$	13.9	14.2	14.2	13.6	
	Number of standards	28.0	28.0	28.0	14.0	
	Total block $\bar{x}$					14.0

Differentials imposed by selection of the clones from the source population are detailed in terms of mean, maximum, and minimum values (Table 55). The mean differentials for CCS for all three trials used as the source population were similar (≈ 1.7-1.8). The low CCS values evident as minimum values did not belong to clones selected by the procedure described above, but rather to random clones selected as part of the propagated population.

Table 55 Selection results in 1999 showing the mean CCS of the source population and the selected clones for each block sampled at BSES Meringa

Block	Source population			
	# of clones	$\bar{x}$ CCS	Maximum	Minimum
A3	309	12.4	15.4	4.5
M5	809	13.2	16.6	6.5
W2	339	13.1	17.0	7.4
	Selected population			
A3	54	14.2	15.4	9.6
M5	143	15.0	16.6	11.1
W2	59	14.8	17.0	10.4

As indicated above, selection was based solely on relative CCS, although this was applied to a population truncated for unacceptable ideotype, eg clones with a high propensity for suckering and non-erect habit were not even considered in the selection process, remaining un-weighed and un-sampled for CCS. However, Table 56 details the results of the selection process in terms of the conventional selection criterion, net merit grade (NMG). There was broad variation in NMG in the source population, as expected, and differentials between the means of the propagated and source populations were similar for the three trials used (≈ 1.6-2.2).

Table 56 Selection results for 1999 showing the mean NMG of the source population and the selected clones for each block sampled at BSES Meringa

Block	Source population			
	# of clones	$\bar{x}$ NMG	Maximum	Minimum
A3	309	6.9	15.8	0.0
M5	809	8.6	17.4	0.2
W2	339	6.4	13.7	0.0
	Selected population			
A3	54	9.1	15.8	3.5
M5	143	10.6	17.4	5.3
W2	59	8.0	13.4	3.4

6.2 HF1 propagation

The selections were cws/lhwt and planted to a farm in the Mourilyan area (Bundaberg Sugar). 255 clones, including 11 plots of the standards Q117 and Q135 were established.

6.3 HF1 trial

Twenty-stalk bundles were cut from the HF1 propagation and planted on a high fertility site in Mulgrave (McGuigan) using a four-row by 10 m format in August 2000. Two standard cultivars were planted in 22 plots. Due to area of available land being reduced by the farmer, a total of 210 clones was selected on availability of adequate stalk numbers in the propagation and CCS differences, relative to standard cultivars, in Stage 2 plots at BSES Meringa, Babinda, and BSES Tully.

In the plant crop, early CCS and appearance grades were assessed in June, and all 232 plots were again sampled at harvest (August). Results from pre-harvest and harvest are detailed in Appendix 15. Cultivar CCS in both June (14.2) and August (16.7) was slightly higher than that of the clones (13.6 and 16.4). However, maximum values for the clones exceeded those for the standard cultivars in both cases (Tables 57 and 58). Mean clonal appearance grades were marginally higher compared to the cultivars early in the season and also at harvest (8.0 vs 7.6). Higher cane yields were recorded for clones (59.0) compared to the standard cultivars (55.0).

Table 57 Summary statistics for pre-harvest mean season traits for 210 clones and two cultivars assessed in June in the plant crop of the series 3 HF1 trial

Plant type	Statistic	CCS[1]	AG[2]
Clone	Maximum	17.28	9.50
	Minimum	6.20	4.00
	$\bar{x}$	13.61	7.77
	S.D.4	1.43	0.76
Cultivar	Maximum	15.39	9.00
	Minimum	12.02	7.00
	$\bar{x}$	14.18	7.75
	S.D.	0.70	0.59

[1]Commercial cane sugar; [2]Appearance grade.

In the first-ratoon crop, the clones again showed a large range of variation for harvest CCS, and appearance and net merit grades (Appendix 16). The summary statistics (Table 59) show CCS values had a range of nearly 5.5 units and appearance grade a range of 8. As expected, the standard cultivars (Q120 and Q152) were not as variable and demonstrated higher mean CCS (18.39 vs 17.80) and appearance grades (8.30 vs 7.90) than the clones. Average tonnages for these two groups were low, but maximum results for each were favourable (clones 126.7 t; cultivars 109.3 t). The mean appearance grade for clones (6.70) in the plant crop was lower than the ratoon crop mean (7.90). However, higher mean clonal CCS (18.50) was seen in the plant cropl. A similar trend was noted for the cultivars.

Table 58 Summary statistics for six harvest mean season traits for 210 clones and two cultivars assessed in August in the plant crop of the series 3 HF1 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clone	Maximum	18.60	10.00	13.10	21.46	102.67	16.49	1.81
	Minimum	13.56	2.00	2.62	0.32	11.33	1.80	0.15
	$\bar{x}$	16.41	7.96	10.42	11.20	58.98	9.67	1.05
	S.D.	0.99	1.36	1.79	3.74	15.03	2.51	0.28
Cultivar	Maximum	17.87	9.00	11.79	14.74	82.00	14.23	1.58
	Minimum	16.03	6.50	8.51	3.62	24.00	4.04	0.45
	$\bar{x}$	16.66	7.64	10.00	10.07	54.97	9.15	1.00
	S.D.	0.46	0.82	1.07	3.00	15.62	2.59	0.28

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

Table 59 Summary statistics for seven harvest-season traits assessed in September in the first-ratoon crop of the series 3 HF1 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clone	Maximum	19.83	10.00	12.05	17.84	126.67	23.13	1.48
	Minimum	14.36	2.00	2.41	0.80	28.67	4.76	0.25
	$\bar{x}$	17.80	7.90	9.52	8.51	79.26	14.10	0.89
	S.D.	0.99	1.65	1.99	2.99	18.41	3.32	0.22
Cultivar	Maximum	19.70	9.50	11.45	13.93	109.33	20.14	1.29
	Minimum	17.12	5.50	6.63	5.55	65.33	11.77	0.74
	$\bar{x}$	18.39	8.30	10.00	10.06	84.73	15.58	1.00
	S.D.	0.73	1.09	1.31	2.44	13.84	2.59	0.17

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

Averaged plant and ratoon harvest data are given in Appendix 17. Rank data for the 30 highest performing clones, summed over crops, are presented in Table 60. These can be compared with results for the 30 clones planted in the HF2 trial, which were selected on plant results only. Of the best 30 clones, based on (P+1R)/2 assessment, 12 differed from those planted in the HF2 trial. In particular, four clones within the top 10, based on (P + 1R)/2, 95N220, 95N801, 95N1260 and 95N1812, were not included. After examining the history of these four clones excluded from the replicated HF2 (Russo), we planned to recover them and advance them to the core propagation in 2003. This decision was based on their consistent and high performance over both plant and ratoon (Table 61). Although such omissions based on plant grade alone is expected, a number of promising clones were advanced. Clones 95N1083, 95N289, 95N1806, 95N1116, and 95N681 ranked 1 and 3-6, respectively, were planted in the HF2 trial.

Table 60 Top 30 clones ranked by mean plant and first-ratoon net merit grade (NMG), CCS and appearance grade (AG) from the series 3 HF1 to confirm clones advanced to the series 3 HF2 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
491	14	95N77	13.57	191	18.21	188	8.25	112	10.39	90.67	16.57	1.33
515	9	95N79	14.45	207	17.95	178	8.50	130	10.69	88.67	15.97	1.35
486	15	95N91	14.11	199	17.47	140	8.75	147	11.02	86.67	15.15	1.28
557	2	*95N220	16.35	210	17.53	146	9.75	201	12.25	95.67	17.00	1.34
484	16	95N234#	12.59	172	18.69	204	8.25	108	10.39	71.34	13.33	1.19
462	26	*95N288	12.99	183	18.15	184	8.00	95	9.98	85.34	15.59	1.31
556	3	95N289#	13.88	194	18.24	189	9.25	173	11.65	72.34	13.19	1.16
480	18	*95N507	10.99	135	17.50	143	9.75	202	12.25	62.34	11.02	0.91
462	27	95N545	13.33	188	17.92	177	8.00	97	10.06	86.67	15.56	1.32
533	6	95N681#	13.90	195	17.39	134	9.75	204	12.25	81.00	14.27	1.15
471	21	95N686	13.64	192	17.70	164	8.25	115	10.42	88.34	15.65	1.31
466	23	*95N794	12.36	167	17.34	125	9.25	174	11.65	76.67	13.52	1.08
517	7	*95N801	14.34	204	17.62	155	9.00	158	11.29	88.67	15.78	1.26
460	28	*95N964	12.22	158	18.24	191	8.25	111	10.39	76.00	14.01	1.17
456	30	*95N1000	14.37	206	16.84	72	9.25	178	11.65	88.67	15.01	1.23
466	24	95N1015	13.43	190	16.98	83	9.50	193	11.95	84.67	14.49	1.14
503	12	*95N1071	10.38	123	18.96	209	9.25	171	11.59	56.00	10.69	0.89
573	1	95N1083	14.24	201	18.51	200	9.25	172	11.65	79.00	14.68	1.23
537	5	95N1116	14.07	198	17.40	136	9.75	203	12.25	84.67	14.93	1.17
473	19	95N1198	13.33	189	17.81	170	8.25	114	10.37	83.67	14.93	1.27
508	10	*95N1260	13.10	186	17.96	179	8.75	143	10.99	76.67	13.79	1.18
471	20	95N1413	12.23	159	18.72	205	8.25	107	10.39	69.00	12.92	1.16
467	22	95N1483#	12.06	156	18.59	201	8.25	110	10.42	70.00	13.02	1.15
505	11	*95N1714	12.36	166	18.09	183	9.00	156	11.32	72.33	13.21	1.01
456	29	*95N1793	12.32	164	18.41	199	8.00	93	10.06	79.00	14.68	1.23
538	4	95N1806	14.28	203	17.36	130	9.75	205	12.25	78.67	13.71	1.14
481	17	95N1807	15.44	209	16.74	66	9.75	206	12.25	92.67	15.56	1.26
516	8	*95N1812	14.36	205	18.63	202	8.25	109	10.34	88.34	16.60	1.37
500	13	95N1820#	13.03	184	19.08	210	8.25	106	10.37	78.00	14.96	1.27
465	25	95N1829	12.84	178	17.47	141	8.75	146	10.99	76.67	13.40	1.16

[1]Total rank = net merit grade rank + CCS rank + AAG; [2]Selection number = 1 best-ranked clone, 210 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Not plantd in the HF2 trial; .#Clones advanced (5) to core selection program.

Table 61 Commercial cane sugar (CCS), appearance grade (AG), net merit grade (NMG), tonnes cane per hectare (TCH) and rank results from the series 3 HF1 plant, first-ratoon and mean plant + ratoon trials for the four clones that will be recovered and advanced in 2003

Trial	CCS	AG	NMG	TCH
	95N220			
HF1 plant	16.79	9.50	14.86	64.67
Plant-rank	10			
HF1-ratoon	18.26	10.0	17.84	126.67
Ratoon-rank	6			
Mean P+R	17.53	9.75	16.35	95.67
P+R-rank	2			
	95N801			
HF1 plant	17.04	8.50	13.27	62.67
Plant-rank	45			
HF1-ratoon	18.20	9.50	15.40	114.67
Ratoon-rank	18			
Mean P+R	17.62	9.0	14.34	88.67
P+R-rank	7			
	95N1260			
HF1 plant	17.50	8.50	15.81	72.67
Plant-rank	18			
HF1-ratoon	18.42	9.0	10.38	80.67
Ratoon-rank	39			
Mean P+R	17.96	8.75	13.10	76.67
P+R-rank	10			
	95N1812			
HF1 plant	17.99	7.50	13.44	66.00
Plant-rank	50			
HF1-ratoon	19.27	9.0	15.28	110.67
Ratoon-rank	8			
Mean P+R	18.63	8.25	14.36	88.34
P+R-rank	8			

Results for the 12 clones that were planted at the HF2 and not included in the (P+1R)/2 ranked list (Table 60) are detailed in Table 62. Of these, only one clone was ranked less than position 40. Closer examination of their results (Table 62) shows net merit and appearance grades were average, but their CCS values quite high.

Table 62 Remaining 12 clones advanced to the series 3 HF2 trial, but were not present in the 30 top-ranked results ranked by mean plant and first-ratoon net merit grade (NMG), CCS and appearance grade (AG) from the series 3 HF1 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
314	111	95N25	10.02	112	16.31	35	9.00	167	11.35	59.67	9.75	0.84
421	50	95N280	12.85	179	16.54	46	9.50	196	11.95	82.34	13.67	1.10
420	51	95N347	12.88	181	17.63	156	7.75	83	9.79	86.00	15.19	1.29
411	55	95N485	12.36	165	16.99	85	9.00	161	11.35	72.33	12.27	1.05
420	52	95N670	13.22	187	16.58	51	9.25	182	11.65	81.34	13.51	1.12
391	66	95N1086	13.73	193	15.54	12	9.25	186	11.65	89.67	13.94	1.13
342	99	95N1239	12.75	176	17.31	123	7.00	43	8.88	94.34	16.36	1.37
393	63	95N1303	12.43	168	17.11	102	8.25	123	10.44	79.00	13.54	1.14
416	54	95N1336	10.79	134	18.78	206	7.75	76	9.82	64.00	12.03	1.06
358	90	95N1417	13.08	185	17.15	106	7.50	67	9.49	95.67	16.39	1.35
447	36	95N1700#	11.75	149	18.15	185	8.25	113	10.39	72.67	13.23	1.12
370	84	95N1865	11.26	142	17.35	128	8.00	100	10.12	78.34	13.69	1.12

[1]Total rank = net merit grade rank + CCS rank + AAG; [2]Selection number = 1 best-ranked clone, 210 = worst ranked clones over plant and ratoon crops; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; .#Clone advanced (1) to core selection program.

6.4 HF2 propagation

The 210 clones in the third HF1 Trial were duplicated as a propagation site in Mourilyan (Marano farm) in September 2000 using 10-stalk samples cut from the serie 3 HF1 propagation.

6.5 HF2 trial

This trial planted on a high-fertility site on Frank Russo's farm, Mourilyan, in a three-replicate by six-row by 10 m format. On the farmer's request cultivars Q152, Q174$^{\phi}$, Q186$^{\phi}$, and Q187$^{\phi}$ also were planted. Due to a lack of quality plant material at the propagation, 95N220 and 95N1250 were not planted. Considering their significance, these two clones were included in the newly planted propagation in 2001. To make use of all the land assigned replacement clones outside the 30 were substituted. The majority of clones germinated and grew well. However, a number did not.

Early season CCS and appearance grades were not collected due to time constraints. Summary statistics for seven harvest traits for clones and standard cultivars collected from the plant crop are presented in Table 63 and Appendix 17. Harvest CCS ranged from 13.72 to 18.76, with a mean of 15.98 for clones, and 17.41 to 15.30, with a mean of 16.19 for standard cultivars. Maxima for harvest appearance grades for both were 10.00, with averages of 8.77 (clones) and 9.17(cultivars).

Table 63 Summary statistics for seven harvest-season traits for 30 clones and five cultivars assessed in September in the plant crop of the series 3 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]	AAG[3]	NMG[4]	TCH[5]	TSH[6]	RSY[7]
Clones	Maximum	18.76	10.00	10.91	10.05	125.56	19.81	1.15
	Minimum	13.72	7.00	7.64	5.73	60.67	10.86	0.60
	$\bar{x}$	15.98	8.77	9.56	7.97	91.08	14.48	0.85
	S.D.	1.00	0.75	0.82	1.25	15.80	2.25	0.13
Cultivars	Maximum	17.41	10.00	10.91	11.28	112.48	18.91	1.15
	Minimum	15.30	8.50	9.27	7.33	85.44	13.72	0.79
	$\bar{x}$	16.19	9.17	10.00	10.01	105.32	17.05	1.00
	S.D.	0.77	0.65	0.71	1.58	11.21	1.97	0.13

[1]Commercial cane sugar; [2]Appearance grade; [3]Adjusted appearance grade; [4]Net merit grade; [5]Tonnes cane per hectare; [6]Tonnes sugar per hectare; [7]Relative sugar yield.

Table 64 Summary statistics for six harvest-season traits for 30 clones and four cultivars assessed in September in the first-ratoon crop of the series 3 HF2 trial

Plant type	Statistic	CCS[1]	TCH[2]	TSH[3]	RSY[4]	AAG[5]	NMG[6]
Clones	Maximum	18.73	181.00	31.24	1.51	12.66	14.04
	Minimum	12.22	52.33	8.68	0.28	5.70	3.51
	$\bar{x}$	16.19	121.17	19.49	0.84	9.31	7.74
	S.D.	1.24	22.63	3.29	0.19	1.67	2.15
Cultivars	Maximum	17.02	167.67	26.99	1.19	12.03	14.11
	Minimum	15.65	105.67	16.76	0.70	7.59	6.10
	$\bar{x}$	16.24	141.07	22.89	1.00	10.00	9.96
	S.D.	0.49	21.55	3.37	0.15	1.44	1.94

[1]Commercial cane sugar; [2]Tonnes cane per hectare; 3Tonnes sugar per hectare; [4]Relative sugar yield; [5]Adjusted appearance grade; [6]Net merit grade.

In the first ratoon, there were high CCS and tonnage means for clones and cultivars alike (16.2 and 121.2, and 16.2 and 141.1, respectively (Table 64; Appendix 17). Clonal means from analyses of variance of six harves-season traits are given for the 30 clones assessed in this trial, and the four cultivars use as standards in Table 65. The three clones advanced to FAT propagation based on P-crop results, and then to the 2003 FAT plantings,95N1700, 95N1820, and 98N289, ranked 3, 1, and 2 in this trial in terms of NMG. Another three clones advanced to the 2003 FAT propagation, again based only on P-crop results, 95N234, 95N681, and 95N1483, were not planted to the 2003 FATs based on additional observations. They suffered from severe pokkah boeng, open habit and slight pokkah boeng, and rust, untidy habit, and signs of stool tipping, respectively. These had NMG values of 6.1, 8.9, and 6.7, respectively, in the ratoon crop assessment. Interestingly, the clones that advanced to the 2003 FAT series all showed excellent to

good ratings for the erectness grade (EG) in the large ratoon crop. Values for the three were 1.7, 1.7, and 3.3, respectively (Table 65).

Table 65 Clonal means for six harvest-season traits for 30 clones and four cultivars assessed in September in the first-ratoon crop of the series 3 HF2 trial

Clone	CCS[1]	AG[2]	TCH[3]	TSH[4]	RSY[5]	AAG[6]	NMG[7]
95N25	16.60	8.50	77.11	12.80	0.59	10.24	6.15
95N77	15.66	8.17	148.00	23.16	0.95	9.82	9.04
95N79	16.77	9.00	115.33	19.34	0.90	10.87	9.78
95N91	16.46	7.83	116.67	19.19	0.86	9.48	7.96
*95N234	17.00	5.83	109.44	18.56	0.89	6.99	6.12
95N280	14.93	9.00	127.89	19.12	0.70	10.89	7.28
**95N289	17.61	8.33	120.78	21.27	1.08	10.09	11.17
95N347	16.71	5.83	110.11	18.40	0.86	7.00	5.96
95N485	16.78	7.33	119.67	20.05	0.94	8.90	8.15
95N545	15.73	7.67	130.93	20.61	0.84	9.22	7.67
95N670	15.87	6.67	125.95	19.97	0.83	8.03	6.54
*95N681	17.10	9.50	93.55	16.01	0.79	11.47	8.92
95N686	15.76	7.00	140.00	22.06	0.91	8.46	7.36
95N1015	15.61	7.50	130.00	20.29	0.82	8.99	7.35
95N1083	15.39	6.33	129.78	20.06	0.78	7.60	5.97
95N1086	12.84	9.00	136.89	17.55	0.39	10.81	4.54
95N1116	15.37	8.67	121.67	18.66	0.72	10.45	7.18
95N1198	15.33	6.17	150.22	22.95	0.90	7.42	6.53
95N1239	16.93	6.67	159.00	26.96	1.25	8.06	10.00
95N1303	14.70	7.50	129.78	19.06	0.66	9.03	6.18
95N1336	17.51	7.50	103.00	18.07	0.93	9.05	8.14
95N1413	17.13	6.67	105.11	18.03	0.88	7.99	6.89
95N1417	15.74	7.33	122.56	19.07	0.78	8.83	6.81
*95N1483	17.97	6.33	89.45	16.08	0.89	7.62	6.69
**95N1700	16.82	9.50	117.00	19.74	0.93	11.45	10.45
95N1806	15.30	9.00	122.78	18.78	0.72	10.83	7.89
95N1807	14.61	8.17	154.44	22.51	0.80	9.80	7.91
**95N1820	17.58	8.83	122.55	21.52	1.08	10.69	11.42
95N1829	17.37	8.50	99.89	17.34	0.88	10.26	9.00
95N1865	16.61	7.50	105.56	17.52	0.80	9.07	7.03
Q152	16.11	7.17	159.44	25.62	1.10	8.61	9.45
Q152	16.54	8.33	147.78	24.44	1.10	10.11	10.96
Q174[ф]	16.01	7.67	136.04	21.82	0.93	9.20	8.72
Q186[ф]	16.79	9.00	123.89	20.78	0.97	10.83	10.52
Q187[ф]	15.78	9.33	138.22	21.81	0.90	11.25	10.13

[1]Commercial cane sugar; [2]Tonnes cane per hectare; 3Tonnes sugar per hectare; [4]Relative sugar yield; [5]Adjusted appearance grade; [6]Net merit grade; [*]Clones (3) advanced to core-selection propagation in 2002 but not advanced to FATs in 2003; [**]Clones (3) advanced to FATs in 2003 from core-selection propagation

Summary statistics for the clones and standard cultivars in this trial, on a plot basis, averaged over the plant and ratoon crops, are presented in Table 66. Averages for CCS and tonnes cane per hectare were 16.1 and 106.1, and 16.2 and 123.2, respectively. In both cases, the plant-crop results reduced the excellent performance recorded in the ratoon crop. Mean performance data for the individual clones and cultivars over the two crops (Table 67) show that the three clones advanced to the 2003 FAT plantings (95N1700, 95N1820, and 98N289) had NMGs rankings of 4, 1, and 2, respectively, over crops. Their mean erectness gradings were 1.2, 1.8, and 3.3, respectively, over crops. The clones 95N77 was ranked third with a NMG of 9.5 (Table 4). The three other clones advanced to the FAT propagation, but not to the FATs themselves, showed only average NMG.

Table 66 Summary statistics (plant + ratoon)/2 for seven harvest traits for 30 replicated clones and four cultivars assessed in the plant and first-ratoon crops of the series 3 HF2 trial

Plant type	Statistic	CCS[1]	AG[2]	TCH[3]	TSH[4]	RSY[5]	AAG[6]	NMG[7]
Clones	Maximum	18.45	10.00	158.50	27.01	1.37	11.77	11.98
	Minimum	12.74	5.50	63.17	10.25	0.55	6.39	4.75
	$\bar{x}$	16.09	8.25	106.13	16.98	0.85	9.44	7.85
	S.D.	1.09	1.02	18.53	2.59	0.15	1.18	1.44
Cultivars	Maximum	16.86	10.00	145.00	23.06	1.14	11.45	11.86
	Minimum	15.30	7.25	110.39	17.53	0.89	8.42	7.86
	$\bar{x}$	16.22	8.73	123.20	19.97	1.00	10.00	9.99
	S.D.	0.51	0.82	11.57	1.67	0.08	0.94	1.04

[1]Commercial cane sugar; [2]Appearance grade; [3]Tonnes cane per hectare; [4]Tonnes sugar per hectare; [5]Relative sugar yield; [6]Adjusted appearance grade; [7]Net merit grade.

6.6 Maximum propagation

This propagation was planted in August 2001 on the sandy soils of Joesph Marano's farm in Mourilyan. It contained the best 30 clones in the HF2 trial, standard cultivars, and the two promising clones 95N220 and 95N1250 not in the trial. This crop established well.

6.7 Advancement to core selection program

Harvest results for individual clones in the plant crop of the series 3 HF2 trial are detailed in Table 68. Each clone was ranked by the sum of the individual ranks for net merit grade, CCS value, and appearance grade. Six clones were advanced to the 2002 core propagation. Only clones within the top 10 were considered for advancement, four of these (ranked 3, 7, 8, and 9) were not accepted due to their high suckering propensity at the propagation site. Interestingly, only two of the six clones advanced showed some consistency over trials and years (Table 69). Clone 95N289, although it fell away in the HF1 ratoon crop, and 95N681, whose plant results were lower ranked, are perhaps the most promising. Clones advanced to the core program were based primarily on plant

results from the replicated HF2 trial and ratoon results collected in 2003 will confirm these selections.

Table 67 Clonal means (plant + ratoon)/2 for seven harvest-season traits collected for 30 clones and four standards assessed in the plant and first-ratoon crops of the series 3 HF2 trial

Clone	CCS[1]	AG[2]	TCH[3]	TSH[4]	RSY[5]	AAG[6]	NMG[7]
95N25	16.19	9.17	72.92	11.83	0.61	10.49	6.43
95N77	15.57	8.75	129.28	20.14	0.97	10.00	9.44
95N79	16.40	8.92	98.59	16.23	0.83	10.25	8.50
95N91	16.26	8.25	105.78	17.20	0.88	9.47	8.10
*95N234	17.27	7.42	100.72	17.30	0.94	8.41	7.92
95N280	15.13	9.34	112.17	16.95	0.77	10.72	8.03
**95N289	17.27	8.50	104.12	18.03	0.99	9.77	9.89
95N347	16.10	6.75	97.47	15.79	0.81	7.69	6.06
95N485	16.50	8.33	107.75	17.80	0.93	9.54	8.76
95N545	15.83	8.42	111.97	17.71	0.85	9.61	8.11
95N670	15.23	7.67	100.85	15.51	0.72	8.74	6.14
*95N681	16.89	9.67	89.50	15.08	0.82	11.10	8.84
95N686	15.78	7.34	132.78	20.94	1.03	8.41	8.38
95N1015	15.81	8.17	112.81	17.80	0.86	9.31	7.90
95N1083	15.65	7.42	108.48	16.97	0.80	8.44	6.62
95N1086	13.28	9.50	128.75	17.02	0.65	10.86	7.30
95N1116	14.99	8.25	109.39	16.40	0.76	9.50	6.82
95N1198	15.18	7.09	135.56	20.53	0.97	8.08	7.81
95N1239	16.70	6.84	132.17	22.17	1.14	7.85	8.84
95N1303	15.30	7.59	107.03	16.27	0.72	8.70	6.41
95N1336	16.86	8.25	87.39	14.87	0.81	9.44	7.36
95N1413	17.06	7.59	104.03	17.72	0.97	8.63	8.24
95N1417	15.67	7.75	109.87	17.12	0.83	8.87	7.27
*95N1483	18.37	7.92	75.06	13.73	0.82	8.99	7.16
**95N1700	16.87	9.50	94.76	16.01	0.84	10.91	9.03
95N1806	15.34	9.09	99.92	15.31	0.70	10.42	7.35
95N1807	14.77	8.50	128.83	18.97	0.83	9.72	8.14
**95N1820	17.50	8.83	105.72	18.51	1.02	10.17	10.19
95N1829	16.94	8.92	85.73	14.56	0.79	10.22	8.03
95N1865	15.91	7.75	94.43	15.14	0.77	8.90	6.55
Q152	16.15	7.92	135.06	21.74	1.08	9.03	9.70
Q152	16.26	8.42	116.61	19.08	0.95	9.69	9.15
Q174[ф]	16.71	8.34	122.33	20.37	1.04	9.51	10.00
Q186[ф]	16.43	9.34	116.64	19.17	1.00	10.69	10.62
Q187[ф]	15.54	9.67	125.35	19.52	0.95	11.08	10.47

[1]Commercial cane sugar; [2]Appearance grade; [3]Tonnes cane per hectare; [4]Tonnes sugar per hectare; [5]Relative sugar yield; [6]Adjusted appearance grade; [7]Net merit grade; [*]Clones (3) advanced to core-selection propagation in 2002 but not advanced to FATs in 2003; [**]Clones (3) advanced to FATs in 2003.

Table 68 Ranked mean harvest results based on net merit grade (NMG), CCS, and appearance grade (AG) for all 30 clones and four standards in the plant crop of the series 3 HF2 trial

Total rank[1]	Selection #[2]	Clone	NMG	NMG rank	CCS	CCS rank	AG	AG rank	AAG[3]	TCH[4]	TSH[5]	RSY[6]
48	15	95N25	6.71	7	15.78	12	9.83	29	10.73	68.72	10.86	0.62
62	8	95N77	9.84	29	15.48	9	9.33	24	10.18	110.56	17.11	0.98
43	18	95N79	7.21	10	16.02	18	8.83	15	9.63	81.85	13.11	0.76
47	16	95N91	8.24	16	16.06	19	8.67	12	9.45	94.89	15.20	0.89
75	1	*95N234	9.71	28	17.53	29	9.00	18	9.82	92.00	16.04	0.98
56	11	95N280	8.77	22	15.33	7	9.67	27	10.54	96.44	14.78	0.84
56	10	*95N289	8.60	20	16.92	25	8.67	11	9.45	87.46	14.78	0.90
17	27	95N347	6.15	3	15.49	10	7.67	4	8.37	84.83	13.18	0.76
69	3	95N485	9.36	25	16.22	21	9.33	23	10.18	95.83	15.54	0.91
55	12	95N545	8.55	19	15.93	16	9.17	20	10.00	93.00	14.80	0.86
16	28	95N670	5.73	1	14.59	2	8.67	13	9.45	75.74	11.05	0.60
73	2	*95N681	8.76	21	16.68	24	9.83	28	10.73	85.44	14.15	0.85
42	19	95N686	9.40	26	15.79	13	7.67	3	8.36	125.56	19.81	1.15
51	14	95N1015	8.44	18	16.01	17	8.83	16	9.63	95.61	15.31	0.90
35	24	95N1083	7.27	11	15.90	14	8.5	10	9.27	87.17	13.88	0.81
61	9	95N1086	10.05	30	13.72	1	10.00	30	10.91	120.61	16.48	0.9
12	30	95N1116	6.46	4	14.61	3	7.83	5	8.55	97.11	14.13	0.79
36	23	95N1198	9.08	24	15.03	5	8.00	7	8.73	120.89	18.11	1.04
37	21	95N1239	7.67	14	16.47	22	7.00	1	7.64	105.33	17.38	1.02
23	26	95N1303	6.63	6	15.90	15	7.67	2	8.36	84.28	13.47	0.78
44	17	95N1336	6.58	5	16.21	20	9.00	19	9.82	71.78	11.66	0.69
63	7	95N1413	9.59	27	16.98	27	8.50	9	9.27	102.95	17.41	1.05
34	25	95N1417	7.72	15	15.60	11	8.17	8	8.91	97.17	15.16	0.88
68	4	*95N1483	7.63	13	18.76	30	9.50	25	10.36	60.67	11.38	0.75
64	6	*95N1700	7.61	12	16.92	26	9.50	26	10.36	72.52	12.27	0.75
37	22	95N1806	6.81	8	15.37	8	9.17	21	10.00	77.05	11.83	0.67
38	20	95N1807	8.37	17	14.92	4	8.83	17	9.64	103.22	15.42	0.86
65	5	*95N1820	8.95	23	17.41	28	8.83	14	9.64	88.89	15.49	0.95
54	13	95N1829	7.06	9	16.50	23	9.33	22	10.18	71.56	11.77	0.70
14	29	95N1865	6.06	2	15.20	6	8.00	6	8.73	83.30	12.76	0.73

[1]Total rank = NMG rank + CCS rank + AG rank; [2]Selection number, 1= best-ranked clone 36 = worst ranked clone; [3]Adjusted appearance grade; [4]Tonnes cane per hectare; [5]Tonnes sugar per hectare; [6]Relative sugar yield; *Clones (6) which were advanced to core propagation.

Table 69 Clonal ranking summary from the series 3 HF1 plant and first-ratoon crops and combined over years and the HF2 plant crop for the six clones advanced to core propagation

Clone	HF1			HF2
	Plant crop	Ratoon crop	Mean (plant + ratoon)	Plant crop
95N234	8	91	18	1
95N289	1	52	2	10
95N681	40	3	6	2
95N1483	5	124	25	4
95N1700	20	76	39	6
95N1820	26	21	14	5

Eight clones were propagated for inclusion in the 2003 FAT series. In the current FAT series (2003), planted over five sites, the three clones discussed above are included in addition to 91N2967 and 91N3488, clones taken from the HF2 trial in the second selection series after consideration of the plant and ratoon data together.

7.0 STALK STRENGTH TESTS

After the assessment of seven simplistic ideotype traits determined early in the growth period (February) proved variable and generally poor as predictors for harvest habit, extensive data were collected in 2001 for two new physiological traits from the plant crops of the series 1 and series 2 HF2 trials and the series 3 HF1 trial, and in 2002 from the first-ratoon crops of the series 1 and 2 HF2 and the series 3 HF1 trials, and from the plant crop of the series 3 HF2 trial.

7.1 2001 Charpy impact tests

The first trait, a Charpy impact test, involved removing 10 random stalks from the two outside guard rows of each plot. The stalks were cut as close to the base as possible and topped in the field. A basal sett of 12-15 cm was cut from each stalk. The sett's diameter was measured at the internodal midpoint, near the middle of the sett, and recorded. The basal sett was placed against the anvil and held in place by two metal fingers. The measured section was positioned in the middle of the jaws and the sett was oriented with the eye positioned upward and the bottom end of the sett faced away. Once the sett was in place, the weighted cutting pendulum (2.5 m in length, and with 10 kg head weight) was raised to a horizontal position, where it was locked, and then released.

The shear strength of the sett was determined as the resistance to being cut by the 14 mm tool steel insert protruding from the weighted pendulum head. The result was measured as degrees swing by the pendulum post-contact, a tab on the pendulum moving a concentric slave indicator from the vertical impact line over a 90° scale. A maximum reading of 90° would indicate a very a tough inter-node, and 0° a weak sett. Internodes with sugarcane weevil borer damage and or growth splits were noted, and were replaced if the damage was considered excessive.

Non-impact pendulum swings were conducted regularly to ensure the basal force required to move the slave indicator was consistent. Samples were cut periodically from the field, so they did not dry out and affect the end result.

Appendices 18, 19 and 20 detail the clonal means for culm diameter, cross-sectional area {$cm^2 = \pi(d/2)^2$, Charpy °, and Charpy ° per square centimeter (CD cm^{-2}), for the three trials.

A comparison of the summary statistics for standard cultivars and clones in the series 1 trial (Table 70) shows that the cultivars have higher mean values for all Charpy-related traits. This is especially marked for Charpy °. However, when the measure is standardized for cross-sectional area this difference is reduced. However, the maximum values for Charpy ° and CD cm^{-2} for clones exceeded those of the standard cultivars.

The coefficient of variation values were moderate for culm diameter and rather high for traits such as displacement force, erectness grade, and Charpy-related measures (Table 70). Broad-sense heritabilities were highest for Charpy °, and lowest for displacement force. Despite these data being measured on a single-site basis, these values indicate all traits are usable for selection screening. Values for the genetic coefficient of variation

(GCV%) suggest variation for stalk diameter is restricted, but that adequate variation exists for all the Charpy-related and displacement force measures. The values for the error ratio test (ERT, Table 70) indicate that the sub-sampling strategy is deficient, with values for this statistic falling below the preferred threshold of 3.0. This occurred despite the trial having three replicates, and 10 stalks being measured per plot. The sub-sampling variation, therefore, is simply excessive. More replicates were not available for measurement, and resources did not permit a larger number of stalks per plot to be measured. These approaches are the only possible solution to overcome the large stalk-to stalk variation existing for these traits.

Table 70 Summary statistics for six stalk measurements taken from the plant crop of the series 1 HF2 trial

Sub-set	Statistic	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy° [3]	CD cm^{-2} [4]	Force (N) [5]	Erectness [6]
Clones	$\bar{x}$	2.72	5.93	26.95	4.64	41.17	2.81
n= 30	Minimum	2.26	4.07	16.72	2.77	27.03	0.47
	Maximum	3.04	7.34	48.75	7.26	60.49	7.33
Cultivars	$\bar{x}$	2.80	6.22	29.09	4.74	44.87	6.21
n= 2 x 3 [7]	Minimum	2.64	5.52	21.45	3.91	35.12	2.80
	Maximum	3.07	7.46	35.85	5.27	54.14	8.33
All	C.V.% [8]	14.94	27.85	34.79	38.60	53.53	48.40
n= 36	g^2 [9]	0.872	0.882	0.943	0.900	0.748	-
	G.C.V.% [10]	7.125	13.88	25.76	21.11	16.83	-
	E.R.T [11]	1.26	1.02	0.78	2.10	1.04	-

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0 - 90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)} / 100; [7]Two plots of each of three cultivars: Q120, Q135 and Q174[ф]; [8]Coefficient of variation = 100. $\sqrt{\sigma_E^2} / \bar{x}$; [9]Degree of genetic determination = $\sigma_C^2 /(\sigma_C^2 + \sigma_E^2 /rs)$, where $\sigma_E^2 + rs\sigma_C^2$ = expectation of mean squares for clones in a trial, of r replicates and s samples, and σ_E^2 and σ_C^2 are the estimates of error (R x C) and genetic (clonal) variances respectively; [10]Genetic Coefficient of variation = 100. $\sqrt{\sigma_C^2} / \bar{x}$; [11]Error ratio test = (σ_E^2 / σ_S^2)-1, where σ_E^2 and σ_S^2 are the estimates of error (R x C) and sampling variances, respectively; Force measures clone (n= 28) cultivars (n= 4) clones 93N762 and 93N789 demonstrated poor germination in at least one replicate, as did one plot each of Q120 and Q135.

Table 71 Summary statistics for six stalk measurements taken from the plant crop of the series 2 HF2 trial

Sub-set	Statistic	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy° [3]	CD cm^{-2} [4]	Force (N) [5]	Erectness [6]
Clones n= 38	$\bar{x}$	2.60	5.44	28.54	5.47	55.86	0.87
	Minimum	2.09	3.46	17.23	2.84	34.46	0.00
	Maximum	3.19	8.03	41.58	7.61	89.68	5.67
Cultivars n= 2 x 2 [7]	$\bar{x}$	2.43	4.69	24.30	5.38	50.63	1.02
	Minimum	2.27	4.08	23.13	4.54	47.72	0.10
	Maximum	2.58	5.29	26.42	6.32	53.69	1.93
All n= 38	C.V.% [8]	15.49	30.68	42.50	34.49	46.92	65.04
	g^2 [9]	0.923	0.927	0.844	0.889	0.876	-
	G.C.V.% [10]	9.82	19.99	18.05	17.86	22.75	-
	E.R.T [11]	1.12	1.05	2.07	1.98	1.35	-

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0 - 90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)} / 100; [7]Two plots of each of two cultivars Q120 and Q152; [8]Coefficient of variation = 100. $\sqrt{\sigma_E^2} / \bar{x}$; [9]Degree of genetic determination = $\sigma_C^2 / (\sigma_C^2 + \sigma_E^2 / rs)$, where $\sigma_E^2 + rs\sigma_C^2$ = expectation of mean squares for clones in a trial, of r replicates and s samples, and σ_E^2 and σ_C^2 are the estimates of error (R x C) and genetic (clonal) variances respectively; [10]Genetic Coefficient of variation = 100. $\sqrt{\sigma_C^2} / \bar{x}$; [11]Error ratio test = $(\sigma_E^2 / \sigma_S^2)$-1, where σ_E^2 and σ_S^2 are the estimates of error (R x C) and sampling variances, respectively.

Table 72 Summary statistics for six stalk measurements taken from the plant crop of the series 2 HF2 trial

Sub-set	Statistic	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy° [3]	CD cm^{-2} [4]	Force (N) [5]	Erectness [6]
Clones n= 210	$\bar{x}$	2.63	5.52	28.06	5.24	46.72	1.90
	Minimum	2.06	3.38	15.60	3.01	24.52	0.10
	Maximum	3.39	9.09	54.45	8.37	87.16	9.00
Cultivars n= 11 x 2 [7]	$\bar{x}$	2.55	5.15	26.83	5.31	45.42	2.05
	Minimum	2.31	4.26	20.25	4.08	32.43	0.20
	Maximum	2.85	6.43	33.85	6.50	57.31	7.00
All n= 232	C.V.% [8]	9.43	18.88	22.51	18.04	29.15	-
	g^2 [9]	0.516	0.519	0.495	0.564	0.45	-
	G.C.V.% [10]	9.74	19.61	22.29	20.52	26.32	-
	E.R.T [11]	2.63	5.52	28.06	5.24	46.72	1.90

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0 - 90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)} / 100; [7]11 plots of each of two cultivars: Q120 and Q152; [8]Coefficient of variation = 100. $\sqrt{\sigma_E^2} / \bar{x}$; [9]Degree of genetic determination, estimated on an un-replicated plot basis; [10]Genetic coefficient of variation = 100. $\sqrt{\sigma_C^2} / \bar{x}$.

In the series 2 HF2 trial, however, the above trend was reversed. Table 71 shows higher means for clones in all instances compared to the cultivars. Of particular interest is the marked difference between the maximum Charpy ° (41.58) for clones and cultivars (26.42). The statistics coefficient of variation, broad-sense heritability, genetic coefficient of variation, and error ratio test for these stalk traits are very similar to those above (Table 70). As previously mentioned, this trial is complicated in design with some clones not located in all three replicates. These were not included in the analyses but their means were calculated manually, and are documented in Table 71. There were 210 clones and 11 plots of Q120 and Q152 in the series 3 HF1 trial. These clones were unreplicated, unlike like the HF2 trials. Mean culm diameter, cross-sectional area and Charpy ° all were greater for clones (Table 72). The Charpy ° cm^{-2}, however was slightly less (5.24 vs 5.31) for clones and cultivars respectively. Estimates of coefficient of variation, broad-sense heritability, and genetic coefficient of variation are presented in Table 72. Values for broad-sense heritability (g^2) are depressed, relative to those from the HF2 estimates, but this is expected as these are based on use of unreplicated plots, ie the statistic is expressed on an unreplicated-plot basis.

Table 73 summarizes the analyses of variance for both force and Charpy related traits over replicates and amongst clones. With the exception of CD cm^{-2} at the series 2 HF2 trial, both HF2 trials displayed no significant differences among replicates. However, as expected, all five traits showed significant effect amongst clones at both sites. Likewise all Charpy related and displacement force measures showed significance differences among clones at the series 3 HF1 trial.

Table 73 Mean squares and their significance from analyses of variance from the plant crops of the series 1 and 2 HF2 and the series 3 HF1 trials

Trial	Source of variation	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy° [3]	CD cm^{-2} [4]	Force (N) [5]	Erectness [6]
Series 1 HF2	Replicates (R)	0.18	3.25	4.34	6.92	220.85	3.81
	Clones (C)	1.31**	23.40**	1,574.25**	32.22**	2,225.03**	15.30**
	Error (R x C)	0.17**	2.77**	90.22**	3.23**	561.11**	2.66
	Sampling (S)	0.07	1.37	50.56	1.04	274.53	-
Series 2 HF2	(R)	0.17	2.28	102.20	13.74*	576.87	0.85
	(C)	2.02**	34.72**	871.59**	32.67**	5,189.75**	4.03**
	(R x C)	0.16**	2.53**	135.96**	3.61**	644.34	0.38
	(S)	0.07	1.23	44.34	1.21	274.24	-
Series 3 HF1	(C)	0.71**	12.63**	427.39**	12.49**	1,687.77**	
	(S)	0.061	1.071	39.564	0.896	184.38	

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; ** = $P \leq 0.01$ * = $P \leq 0.05$.

Although broad variation and significant differences were expressed among clones, the critical test for their utility was to assess their prediction of harvest habit. Plot erectness, on a scale of 0 (perfectly erect) to 10 (fully lodged), was obtained by: - [percent of the plot

not erect (0 - 100%)] x [severity of the displacement (0 = perfectly erect to 10 = fully lodged] / 100. In all trials, Tables 70-72 show that, on average, clones are more erect (lower erectness grades) than the cultivars. Comparing trials, the series 2 HF2 was the most erect and the series 1 HF2 the least erect.

7.2 2001 displacement force tests

A displacement force measure was the second test that was conducted. This involved carrying a constructed frame with an electronic force gauge through the field. Again, 10 random stalks from the two outside guard rows of each plot were measured. Each stalk was displaced 20° from its resting position, by applying a force 1 m from the stalk's base. The resistance to this displacement force was recorded in Newtons. Obviously, all stalks are not in a perfectly erect position. Minor adjustments to the attachment height were necessary and badly lodged plots were excluded from the testing.

Badly lodged plots were especially marked in the series 3 HF1 trial, with 35 clones and 2 standard plots discarded. This was counteracted in 2002 by going into the field earlier.

One of the reasons for the relatively delayed assessment of the measure of displacement force in 2001 was concern as to the impact on the assessments of excessively wet soil conditions. Ideally, this culm measurement would best have been conducted at a time similar to the simplistic ideotypic traits explored earlier in the project – early in the growth period, or February. However, conditions were judged to be simply too wet at this time and the assessment was delayed until soil moisture was perceived to have declined. Soils sampling for moisture determination and penetrometer testing of soil strength, both in the 0-300 mm range, were undertaken in the series 1 HF2 trial.

Table 74 Summary of significance of two main factors (replicates and clones) from analyses of variance of data for displacement force (Newtons), penetrometer soil strength (kg), and soil moisture (%) in the plant crops of the series 1 and 2 HF2 trials

Trait	Source of variation	Series 1 HF2	Series 2 HF2
Displacement force	Replicates	n.s.	n.s.
	Clones	**	**
Soil strength	Replicates	**	**
	Clones	n.s.	n.s.
Soil moisture	Replicates	n.s.	Not measured
	Clones	n.s.	Not measured

n.s. = non-significant; ** = $P \leq 0.01$.

There were no significant effects for clones for soil strength or moisture in the series 1 HF2 trial (Table 74). Co-variate analyses (Table 75) confirmed this, with no significant contribution being made by the soil measures to displacement force. Because of this, soil moisture was not determined in the series 2 HF2 trial, but penetrometer data were still

collected. Again, no significant clonal effect for penetrometer readings (Table 20) was detected, and no significant co-variate contribution of penetrometer reading to displacement force was detected at this site. These results gave us confidence to proceed with the series 3 HF1 trial without either of these measures.

Table 75 Summary of covariate analyses between displacement force (DF), soil strength (SS) and soil moisture (SM) in the plant crops of the series 1 and 2 HF2 trials

Trait	Series 1 HF2		Series 2 HF2
	DF	SS	DF
SS	n.s.	-	n.s.
SM	n.s.	n.s.	not measured

n.s. = non-significant.

7.3 2001 correlations

All data (pre-harvest, harvest, erectness and appearance grades) collected in 2001 for common clones between the series 1 HF1 plant and first-ratoon crops and the series 1 HF2 plant crop were tested for correlations with Charpy test and displacement force data. Extensive correlations and multiple regressions were conducted for all possible and practical combinations, but no consistent or significant trends resulted.

The same procedure was followed for all matching clones at the series 2 HF1 plant and first-ratoon crops and HF2 plant crop for all pre-harvest and harvest grades. Disappointingly, few correlations proved significant for this series. Charpy ° and displacement force from the HF2 were highly correlated, respectively, with harvest erectness and appearance grades in the plant HF1. Culm diameter (recorded in combination with the Charpy test) demonstrated the most consistent trends. Pre-harvest and harvest appearance grades from the HF1 2000 crop as well as the erectness grade in 2001 were all highly significant correlations. In the replicated trial, culm diameter again proved to be correlated with both appearance grades (pre-harvest and harvest) but not with the erectness grade. Despite this, the multiple regression analyses displayed no significances for this series. Promisingly, most clones that were advanced to the maximum propagation from both first and second series HF2 trials demonstrated Charpy, CD cm^{-2} and displacement force results greater than the means, and in general, showed more erectness than the mean values. This was also the case for the 30 clones advanced to the series 3 HF2 trial.

7.4 2002 Charpy impact tests and displacement tests

Summary statistics for clones and standard cultivars in the ratoon crop of the series 1 HF2 trial show that the cultivars had only slightly higher means for three of the four Charpy-related traits, displacement force, and erectness grade in the ratoon crop (Table 76). Full data for all five stalk measures and the estimate of plot erectness for all clones and cultivars in the ratoon crop of this trial are given in Appendix 21 and mean data over

crops are given in Appendix 22. When the Charpy measure is standardized for cross-sectional area the trend, although slight, is reversed, eg 4.59 clones vs 4.29 cultivars. A difference is apparent in the displacement force maxima, with the clones exceeding the cultivars (74.99 vs 62.63). The coefficient of variation values were high for all traits except culm diameter (Table 76). Broad-sense heritabilities (g^2) for all four Charpy related traits were high, and similar. The g^2 value for displacement force was moderate (0.676) and that for erectness was high (0.827). Values for the genetic coefficient of variation (G.C.V.%) suggest variation for stalk diameter is restricted, but that adequate variation exists for all the Charpy-related and displacement force measures. Genetic variation for erectness was very high, with a G.C.V.% value of 75.9 (Table 76).

Table 76 Summary statistics for five stalk measurements and an estimate of plot erectness determined on clones and cultivars in first-ratoon crop of the series 1 HF2 trial and partial summary statistics for the combined data from the plant and first-ratoon crops

Sub-set	Statistic	Culm-d (cm)[1]	CSA (cm^2)[2]	Charpy° [3]	CD cm^{-2} [4]	Force (N)[5]	Erectness[6]
Ratoon							
Clones n= 30	$\bar{x}$	2.75	6.07	27.49	4.59	54.25	1.92
	Minimum	2.21	3.86	18.00	3.10	37.23	0.08
	Maximum	3.31	8.69	38.80	6.46	74.99	5.80
Cultivars n= 2 x 3[7]	$\bar{x}$	2.89	6.62	28.27	4.29	55.92	2.90
	Minimum	2.80	6.23	21.35	3.39	49.66	1.80
	Maximum	3.00	7.13	39.77	5.83	62.63	4.07
All n= 36	C.V.%[8]	13.04	25.32	38.83	28.17	54.99	60.07
	g^2 [9]	0.911	0.912	0.905	0.940	0.676	0.827
	G.C.V.%[10]	7.64	14.93	21.870	20.45	14.50	75.92
	E.R.T[11]	0.284	0.494	0.224	0.488	1.454	-
Mean (Plant + ratoon)							
Clones n = 30	$\bar{x}$	2.74	6.00	27.22	4.62	49.64	2.36
	Minimum	2.23	3.96	17.36	2.94	32.71	0.45
	Maximum	3.13	7.85	43.77	6.62	65.25	6.38
Cultivars n = 2 x 3	$\bar{x}$	2.84	6.42	28.68	4.51	51.08	4.55
	Minimum	2.72	5.88	21.40	3.73	42.39	2.40
	Maximum	3.04	7.29	34.61	5.54	55.08	6.13

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)}/100; [7]Two plots of each three cultivars: Q120, Q135 and Q174[◊]per replicate; [8]Coefficient of variation = 100. $\sqrt{\sigma_E^2}$ / $\bar{x}$; [9]Degree of genetic determination = $\sigma_C^2/(\sigma_C^2+\sigma_E^2/rs)$, where $\sigma_E^2 + rs\sigma_C^2$ = expectation of mean squares for clones in a trial, of r replicates and s samples, and σ_E^2 and σ_C^2 are the estimates of error (R x C) and genetic (clonal) variances, respectively; [10]Genetic Coefficient of variation = 100. $\sqrt{\sigma_C^2}$ / $\bar{x}$; [11]Error ratio test (ERT) = ($s\sigma_e^2/\sigma_s^2$), where σ_E^2 , is the estimate of plot-to-plot (R x C) error and equals $s\sigma_e^2 + \sigma_s^2$, and σ_s^2 is the estimate of the sampling variance. The ERT = $(\sigma_E^2/\sigma_s^2)-1$, or the error test 'F' value – 1.

The values for the error ratio test (ERT, Table 76) indicate that the subsampling strategy was deficient, with values for this statistic falling well below the preferred threshold of 3.0. Previous sampling strategies were followed where 10 stalks per plot were measured in all three replicates. More replication and use of a greater number of stalks per plot are obviously essential if the large stalk-to-stalk variation evident for these traits, relative to the replicate x clone error, is to be controlled to achieve acceptable ERT values. In this project, these resources were not available.

Summary statistics for combined plant and ratoon data again show slightly higher mean results for cultivars compared to the clones for all traits except Charpy° cm^{-2} (Table 76). The difference is particularly marked when the erectness grades are examined (4.55 cultivars, 2.36 clones). Maxima, however, were higher in all instances for clones.

The series 2 HF2 trial showed a different trend (Table 77). Clones showed higher means for all traits compared to the cultivars in the ratoon data and in the combined plant and ratoon data. Of particular interest is the marked difference between clones and cultivars for mean Charpy° and displacement force with differentials of 4.1 and 5.4, respectively, for mean data over years. The statistics coefficient of variation, broad-sense heritability, genetic coefficient of variation, and error ratio test for these stalk traits are very similar to those presented for the series 1 HF2 trial above (Table 77). This trial design was complicated, as some clones were not located in all three replicates. Such clones were not included in the analyses, but their means were calculated manually, and are included in Appendices 23 (first-ratoon crop) and 24 (plant and first-ratoon means).

Comparison of means from these HF2 trials showed that both clones and cultivars (except clones averaged over years for displacement force) in the series 1 HF2 trial were thicker, stronger, and harder to displace, than were those in the series 2 HF2 trial. The clones and cultivars were more erect in the series 2 HF2 trial. These results are confounded with location, as the trials were conducted in the same year but were located in different environments.

Only 53 unreplicated clones (30 of the clones advanced to the HF2 + six additional selections + 17 random clones) and the 22 standard plots (11 of Q120 and 11 Q152) were sampled and analyzed from first-ratoon crop of the series 3 HF1 trial. A subset of the full population in the trial was used because of the large number of clones (210), the lack of available time, combined with a consideration of results from the plant crop which showed little relationship between the stalk traits measured and harvest erectness. Clonal means for the ratoon crop are given in Appendix 25 and combined plant and ratoon for all 75 entries are given in Appendix 26.

Charpy°, Charpy° cm^{-2}, displacement force, and erectness grade for clones were greater than the cultivars in the ratoon crop (Table 78). Culm diameter and cross-sectional area were slightly lower. Comparison of mean results over years for clones and cultivars revealed a similar trend, except the erectness grade was higher for the standard cultivars.

Table 77 Summary statistics for five stalk measurements and an estimate of plot erectness determined on clones and cultivars in the first-ratoon crop of the series 2 HF2 trial and partial summary statistics for the combined data from the plant and first-ratoon crops

Sub-set	Statistic	Culm-d (cm)[1]	CSA (cm^2)[2]	Charpy° [3]	CD cm^{-2} [4]	Force (N)[5]	Erectness[6]
Ratoon							
Clones n= 38[7]	$\bar{x}$	2.65	5.66	19.65	3.60	49.38	1.38
	Minimum	2.22	3.91	12.92	2.10	32.23	0.08
	Maximum	3.20	8.14	29.80	6.30	70.88	5.10
Cultivars n= 2 x 2[8]	$\bar{x}$	2.63	5.52	15.72	2.89	43.88	0.57
	Minimum	2.56	5.21	14.97	2.66	42.01	0.07
	Maximum	2.69	5.79	16.78	3.05	45.36	0.88
All n= 42	C.V.% [9]	14.07	27.45	31.60	28.52	38.89	79.93
	g^2 [10]	0.911	0.918	0.932	0.956	0.862	0.717
	G.C.V.% [11]	8.21	16.77	21.41	24.26	17.72	73.42
	E.R.T [12]	0.257	0.004	0.214	0.324	0.145	-
Mean (Plant + ratoon)							
Clones n = 38	$\bar{x}$	2.63	5.55	24.09	4.54	52.62	1.13
	Minimum	2.17	3.74	15.65	2.53	34.18	0.06
	Maximum	3.17	8.02	34.62	6.54	74.97	5.38
Cultivars n = 2 x 2	$\bar{x}$	2.53	5.10	20.00	4.13	47.25	0.80
	Minimum	2.42	4.64	19.06	3.62	45.00	0.08
	Maximum	2.62	5.46	21.60	4.68	48.94	1.34

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)}/100; [7]38 clones but 4 do not occur in all three replicates; [8] Two plots of each of the two cultivars: Q120 and Q152 per replicate; [9]Coefficient of variation = 100. $\sqrt{\sigma_E^2}$ / $\bar{x}$; [9]Degree of genetic determination = σ_C^2 /($\sigma_C^2 + \sigma_E^2$ /rs), where $\sigma_E^2 + rs\sigma_C^2$ = expectation of mean squares for clones in a trial, of r replicates and s samples, and σ_E^2 and σ_C^2 are the estimates of error (R x C) and genetic (clonal) variances, respectively; [10]Genetic Coefficient of variation = 100. $\sqrt{\sigma_C^2}$ / $\bar{x}$; [11]Error ratio test (ERT) = ($s\sigma_e^2 / \sigma_s^2$), where σ_E^2 , is the estimate of plot-to-plot (R x C) error and equals $s\sigma_e^2 + \sigma_s^2$, and σ_s^2 is the estimate of the sampling variance. The ERT = $(\sigma_E^2 / \sigma_s^2) - 1$, or the error test 'F' value – 1.

Table 78 Summary statistics for five stalk measurements and an estimate of plot erectness taken on a sub-set of 75 clones and cultivars in the first-ratoon crop of the series 3 HF1 trial and partial summary statistics for the combined data from the plant and first-ratoon crops

Sub-set	Statistic	Culm-d (cm)[1]	CSA (cm2)[2]	Charpy° [3]	CD cm^{-2} [4]	Force (N)[5]	Erectness[6]
Ratoon							
Clones	$\bar{x}$	2.64	5.60	22.21	4.12	41.06	1.39
n= 53	Minimum	1.99	3.16	14.70	2.30	26.24	0.05
	Maximum	3.32	8.73	43.20	8.20	76.74	4.80
Cultivars	$\bar{x}$	2.76	6.08	19.58	3.32	39.48	0.36
n= 11x2 [7]	Minimum	2.49	4.98	16.60	2.37	30.75	0.05
	Maximum	3.00	7.16	23.35	4.35	56.61	1.60
Mean (Plant + ratoon)							
Clones	$\bar{x}$	2.61	5.47	25.36	4.82	43.32	0.74
n = 53	Minimum	2.06	3.38	16.45	2.81	14.09	0.05
	Maximum	3.25	8.38	39.58	7.49	75.52	2.50
Cultivars	$\bar{x}$	2.65	5.62	23.21	4.32	40.39	1.02
n = 11 x 2	Minimum	2.46	4.80	20.39	3.42	17.47	0.10
	Maximum	2.83	6.36	27.30	5.37	52.65	3.50

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; [7]11 plots of each two cultivars: Q120, Q152.

Results for five stalk traits and estimated plot erectness for all 30 clones and five standard cultivar plots in the third series HF2 plant trial (Russo) are given in Appendix 27 and summary statistics are given in Table 79. Inconsistent trends for the comparison between clones and standard cultivars were seen (Table 79). The Charpy°, Charpy° cm^{-2}, and erectness grades were higher for clones than for the standard cultivars, but were lower for culm diameter, culm cross-sectional area and displacement force. Coefficient of variation, broad-sense heritability, genetic coefficient of variation, and error ratio test for all six traits showed very similar trends (Table 79) to the results from the two ratoon HF2 trials discussed above.

Table 79 Summary statistics for five stalk measurements and an estimate of plot erectness taken from clones and cultivars in the plant crop of the series 3 HF2 trial

Sub-set	Statistic	Culm-d (cm)[1]	CSA (cm^2) [2]	Charpy° [3]	CD cm^{-2} [4]	Force (N)[5]	Erectness[6]
Clones n= 30	$\bar{x}$	2.68	5.74	29.35	5.23	59.97	1.58
	Minimum	2.31	4.22	19.47	3.02	43.11	0.05
	Maximum	3.42	9.23	49.33	7.05	82.90	6.47
Cultivars n= 2 x 1, 1 x 3[7]	$\bar{x}$	2.75	6.01	28.37	4.80	69.84	0.87
	Minimum	2.61	5.39	24.80	3.96	59.18	0.10
	Maximum	2.96	6.93	30.02	5.45	80.00	1.67
All n= 35	C.V.% [8]	11.69	23.45	23.26	23.68	35.72	68.02
	g^2 [9]	0.948	0.951	0.966	0.955	0.881	0.854
	G.C.V.% [10]	9.10	18.85	22.59	19.98	17.74	95.09
	E.R.T [11]	0.868	0.860	0.186	0.830	0.838	-

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy determination – 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; [7]2 plots of cultivar: Q152, 1 plot of each Q174$^{\Phi}$,Q186$^{\Phi}$ and Q187$^{\Phi}$.per replicate; [8]Coefficient of variation = 100. $\sqrt{\sigma_E^2} / \bar{x}$; [9]Degree of genetic determination = $\sigma_C^2 /(\sigma_C^2 + \sigma_E^2 /rs)$, where $\sigma_E^2 + rs\sigma_C^2$ = expectation of mean squares for clones in a trial, of r replicates and s samples, and σ_E^2 and σ_C^2 are the estimates of error (R x C) and genetic (clonal) variances, respectively; [10]Genetic Coefficient of variation = 100. $\sqrt{\sigma_C^2} / \bar{x}$; [11]Error ratio test (ERT) = ($s\sigma_e^2 / \sigma_s^2$), where σ_E^2 , is the estimate of plot-to-plot (R x C) error and equals $s\sigma_e^2 + \sigma_s^2$, and σ_s^2 is the estimate of the sampling variance. The ERT = $(\sigma_E^2 / \sigma_s^2) - 1$, or the error test 'F' value – 1.

Mean squares for the analyses of variance of data for all six traits for the three replicated trials harvested in 2002 are summarized in Table 80. Displacement force was the only trait for which there was a highly significant replicates effect (Table 80). This occurred in all three trials. Erectness was significant only in the series 3 HF2 trial. The clones term was highly significant for all traits in all trials except for Charpy° cm^{-2} in the series 3 HF2 trial.

Table 80 Mean squares and their significance from analyses of variance for five stalk measurements and an estimate of plot erectness from the first-ratoon crop and combined plant and first-ratoon crops from the series 1 and 2 HF2 trials and the plant crop of the series 3 HF2 trial

Trait	Culm-d(cm)[1]	Charpy° [2]	CSA (cm2)[3]	Charpy° /(cm2)[4]	Force (N)[5]	Erectness[6]
Series 1 HF2 – first-ratoon						
Replicate (R)	0.23	356.75	3.78	2.69	4,789.71**	0.89
Clone (C)	1.48**	1,209.16**	27.84**	27.53**	2,777.67**	9.08**
Error (R x C)	0.13	115.01	2.44	1.64	899.19	1.57
Sampling	0.10	76.99	1.99	1.10	366.41	-
Series 2 HF2 – first-ratoon						
Replicate (R)	0.06	92.37	1.28	1.44	4,478.95**	1.39
Clone (C)	1.54**	527.27**	28.38**	22.93**	2,585.77**	3.84**
Error (R x C)	0.14	35.71	2.33	1.01	357.67	1.09
Sampling	0.11	35.56	1.92	0.76	312.51	-
Series 3 HF2 – plant crop						
Replicate (R)	0.01	69.74	0.15	2.69	9,586.13**	3.35*
Clone (C)	1.90**	1,352.61**	37.47**	33.50	4,037.93**	6.95**
Error (R x C)	0.01	46.15	1.84	1.50	480.64	1.01
Sampling	0.05	38.91	0.99	0.82	261.48	-

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)} / 100; ** = $P \leq 0.01$*, = $P \leq 0.05$.

No consistent or significant trends were evident from extensive correlation and multiple regression analyses conducted between pre-harvest stalk traits and harvest traits for all trials in 2001. Similar data were collected in 2002 to verify these preliminary conclusions. Of particular interest was the value of the Charpy related traits and displacement force as predictors of harvest erectness. Results of the correlation analyses conducted between selected pairs of traits are summarized in Table 81. As for the 2001 results, culm diameter and cross-sectional area correlated highly significantly with Charpy° for all three HF2 trials. Culm diameter was not significantly correlated with Charpy° in the series 3 HF1 trial. All these correlations, except that between Charpy° and cross-sectional area from the series 1 HF2 trial, were significant for the combined data sets over plant and ratoon crops. Culm-diameter, Charpyº and cross-sectional area were all significantly correlated with displacement force in all four trials harvested in 2002. These correlations were not significant for the mean plant and first-ratoon data from the series 1 HF2 trial. Culm diameter and cross-sectional area were significantly correlated with erectness only in the series 1 and 2 HF2 trials (Table 81). However, the series 2 trial had correlations of the opposite sign to those in the series 1 trial. The standardized Charpy° measure and erectness were highly significantly correlated only for the series 2

HF2 trial. Correlations were significant, and negative, only for the combined data from the series 2 HF2 and the series 3 HF1 trials. In these trials, the standardized Charpy° also was significant. Results from 2001 and 2002 for these data suggest there is no point in collecting further similar data.

Table 81 Pearson correlation coefficients and their significance between pairs of selected stalk measurements, and between all of these and estimated plot erectness taken from the first-ratoon crop and mean plant and first-ratoon crops of the series 1 and 2 HF2 trials and the series 3 HF1 trial, and the plant crop of the series 3 HF2 trial

Trait	Culm-d (cm)[1]	Charpy°[2]	CSA (cm^2)[3]	Charpy°/(cm^2)[4]	Force (N)[5]
Series 1 HF2 – first-ratoon crop					
Charpy°	0.429**	–	–	–	–
Cross sectional area (cm^2)	–	0.418*	–	–	–
Force	0.369*	0.538**	0.368*	0.303	–
Erectness	0.326*	0.262	0.328*	0.026	-0.041
Series 1 HF2 - plant and ratoon crops					
Charpy°	0.466*	–	–	–	–
Cross sectional area (cm^2)	–	0.464**	–	–	–
Force	0.207	0.182	0.071	0.303	–
Erectness	0.291	0.145	0.292	-0.075	0.070
Series 2 HF2 – first-ratoon crop					
Charpy°	0.349*	–	–	–	–
Cross sectional area (cm^2)	–	0.362*	–	–	–
Force	0.580**	0.541**	0.582**	0.082	–
Erectness	-0.42**	0.09	-0.417**	0.415**	-0.160
Series 2 HF2 - plant and ratoon crops					
Charpy°	0.439**	–	–	–	–
Cross sectional area (cm^2)	–	0.440*	–	–	–
Force	0.653**	0.695**	0.650**	0.062	–
Erectness	-0.400**	0.01	-0.400**	0.389*	-0.085
Series 3 HF1 – first-ratoon crop					
Charpy°	0.179	–	–	–	–
Cross sectional area (cm^2)	–	0.180	–	–	–
Force	0.433**	0.504**	0.441**	0.088	–
Erectness	-0.203	0.153	-0.209	0.255*	0.056
Series 3 HF1 - plant and ratoon crops					
Charpy°	0.336**	–	–	–	–
Cross sectional area (cm^2)	–	0.347**	–	–	–

Trait	Culm-d (cm)[1]	Charpy°[2]	CSA (cm^2)[3]	Charpy°/(cm^2)[4]	Force (N)[5]
Force	0.513**	0.426**	0.526**	-0.091	–
Erectness	-0.305**	0.061	-0.308**	0.318**	-0.356**
Series 3 HF2 – plant crop					
Charpy°	0.488**	–	–	–	–
Cross sectional area (cm^2)	–	0.486**	–	–	–
Force	0.441**	0.660**	0.443**	0.328	–
Erectness	-0.169	0.063	-0.164	0.204	-0.012

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newtons; [6]Erectness grade = {% lodged (0-100) x degree lodged (1-10)} / 100; ** = $P \leq 0.01$*, = $P \leq 0.05$.

8.0 OUTPUTS

- There were significant correlations between crop habit and cane height (0.434**), cabbage length (0.168*), and number of leaves (0.176*) in the plant crop evaluation of the series 1 HF1 trial

- In the first-ratoon crop of the same trial, there were again significant correlations between crop habit and cane height (0.258**), and cabbage length (0.195**), as well as stalk diameter (-0.229**).

- There were highly significant correlations between determinations for the same trait in each of the crops for all except crop habit, which was uncorrelated. The significant correlation ranged from moderate (0.312) to high (0.883). The zero correlation between the habits in the two crops (P and 1R) at the one location typifies the difficulty in studying this important crop trait.

- In the plant crop of series 2 HF1 trial, significant correlations between crop habit and cane height (0.547**), and crop habit and cabbage length (-0.305**) again were found, but crop habit also was significantly associated with stalk number (0.519**).

- In regression analyses, there was no consistent or strong predictive ability for any of the traits determined, e.g., in the plant crop of the series 1 HF1, cane height has a $b' = 100$ as predictor for February habit; the number of leaves had $b' = 100$ as a predictor of July crop habit; and the July appearance grade had a $b' = 100$ for the September appearance grade.

- This variation in the trait chosen as the most important predictor, and the lack of apparent logic as to the role the trait may play, with some exceptions, typified these analyses with the early season, above-ground predictive traits over trials. Consequently, the focus shifted to assessing the apparent role of the two structural stalk traits, the Charpy impact test and the displacement force test.

- Analyses of data for the Charpy related traits (Charpy °, and Charpy ° cm^{-2}) and displacement force revealed these were acceptable traits for selection screening. However, extensive correlation and regression analyses using these data and data from pre-harvest and harvest erectness and appearance grades revealed no consistent or significant trends.

- Four, five, and three clones from the series 1, 2 and 3 HF2 trials, respectively, were planted in the core FAT series in the program based at BSES Meringa after appropriated propagation. Acceptable performance of any of these clones in one of these multi-environment trial series could result in pre-cultivar status and subsequent release to the industry.

9.0 OUTCOMES

- A clear outcome is that this project did not yield any trait of the seven phenotypic plant descriptors and three structural stalk traits assessed that has any firm or consistent value as a predictor of crop harvest habit.

- Twelve clones that emerged from the three selection series assessed in this project currently are undergoing evaluation in the core program based at BSES Meringa. Acceptable performance in this assessment would mean designation of pre-cultivar status for any clone successful in this regard.

10.0 FUTURE RESEARCH NEEDS AND RECOMMENDATIONS

A below-ground component(s), or its interaction with an above-ground component is presumably critical. This deserves testing to determine its usefulness as a predictor.

11.0 PUBLICATIONS

The following manuscript is in the final stages of review for acceptance for a special issue of *Field Crops Research* arising from the SRDC-sponsored workshop held in September 2003 on contemporary research into sugarcane crop physiology. This paper, in part, draws on research conducted in this project BSS179, in addition to data collected in a companion project BSS220.

Berding N & Hurney AP. 2005. Flowering and lodging, physiological-based traits affecting cane and sugar yield. What do we know of their control mechanisms and how do we manage them? *Field Crops Research*

APPENDIX 1 Clonal means for seven ideotypic traits and erectness determined in the plant crop of the series 1 HF1 trial

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
BJ7451	1635	32	441	7	176.15	57	60952	0.60
84C252	1610	21	579	7	165.60	35	91429	0.05
84C275	2238	29	525	7	146.74	46	62857	1.20
84C621	1931	23	708	8	166.47	45	139048	2.40
89C6015	1970	27	474	7	164.98	44	70476	5.40
MY5514	1770	31	357	7	148.34	61	60952	0.00
91N363	1524	19	501	7	137.15	38	91429	0.05
91N1187	1952	28	694	8	168.64	53	87619	4.20
91N1193	1928	21	418	6	147.31	47	74286	1.20
91N1198	1323	23	347	7	171.35	42	93333	0.00
91N1218	1585	25	337	5	173.89	42	87619	0.00
91N1225	1916	23	366	6	152.84	48	83810	2.40
91N1232	2199	23	716	8	168.26	38	112381	1.50
91N1237	1584	30	319	6	169.06	45	57143	0.00
91N1257	1454	28	301	6	143.57	41	34286	0.00
91N1266	1952	22	709	8	186.68	45	89524	4.00
91N1271	1757	24	321	6	167.10	36	91429	4.20
91N1279	2116	21	880	8	153.07	47	97143	0.40
91N1280	1692	26	788	8	163.39	47	106667	0.00
91N1306	1530	25	472	6	166.12	52	89524	0.05
91N1325	2042	27	586	8	139.32	47	62857	1.60
91N1362	1818	25	501	7	149.62	43	91429	0.80
91N1386	2152	25	567	8	143.07	40	81905	9.00
91N1406	2113	27	529	7	160.19	52	85714	0.05
91N1422	1832	26	512	7	151.78	45	81905	0.05
91N1435	2035	30	693	8	150.27	45	68571	2.10
91N2026	1669	28	334	6	141.83	56	43810	0.05
91N2030	1758	25	575	7	150.17	45	78095	6.30
91N2054	2012	26	468	7	180.86	48	74286	1.20
91N2179	1928	22	607	8	158.86	40	91429	0.00
91N2249	2006	28	684	8	164.82	43	80000	4.20
91N2250	1809	23	632	8	169.60	41	85714	5.60
91N2274	1653	25	369	6	159.80	46	76190	0.90
91N2279	1922	27	409	7	139.48	46	68571	0.40
91N2388	1486	22	432	7	127.95	38	104762	0.00
91N2453	1816	26	424	7	145.64	48	64762	3.60
91N2795	1479	30	342	6	127.69	48	36190	0.05
91N2813	1613	27	503	7	174.19	47	74286	0.05
91N2862	1590	23	673	8	145.26	42	83810	0.00
91N2862	1646	21	640	8	165.51	41	95238	0.00
91N2904	1693	22	469	7	144.62	31	78095	4.80
91N2904	1790	22	461	8	144.00	32	81905	5.40
91N2936	1482	28	351	7	154.30	41	78095	0.00
91N2967	2038	29	701	8	172.76	50	68571	0.00
91N2971	2209	26	898	9	155.04	47	64762	0.10
91N2976	2206	28	529	7	143.34	41	68571	0.10
91N2988	2010	22	604	7	153.87	57	76190	7.20
91N2997	2089	27	853	9	153.71	40	66667	3.60
91N2998	2406	27	609	8	165.04	40	57143	4.80
91N3008	1560	28	394	6	152.36	56	62857	0.00
91N3020	1971	24	663	8	144.03	41	81905	0.10
91N3021	1643	24	444	7	149.89	47	97143	3.50
91N3029	1810	29	427	7	149.78	53	80000	0.40
91N3053	1564	30	372	6	171.34	44	85714	0.00
91N3073	2103	27	683	7	155.85	50	87619	0.00
91N3101	1943	25	610	8	158.43	37	116190	0.10
91N3129	2091	24	456	7	181.82	45	118095	0.20
91N3147	1645	24	372	7	171.32	46	99048	1.80
91N3252	1636	28	377	7	133.11	35	68571	0.00
91N3285	2049	26	364	7	168.96	43	62857	7.20
91N3288	1376	25	676	7	155.27	45	100952	0.20
91N3307	1631	29	345	7	154.32	41	74286	0.80
91N3336	1823	28	405	7	155.42	54	72381	2.00
91N3378	1578	28	398	6	158.67	46	87619	0.20
91N3393	2124	23	457	6	161.64	40	60952	3.00
91N3440	1891	27	773	8	175.95	48	80000	4.80

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
91N3447	1879	23	435	6	166.39	45	70476	4.90
91N3459	2343	20	616	8	123.70	38	62857	8.00
91N3460	1795	22	344	6	173.64	35	106667	0.50
91N3487	1778	28	411	6	143.99	46	64762	0.05
91N3492	1543	21	325	6	164.29	42	87619	0.05
91N3504	1478	22	651	8	122.90	59	85714	0.05
91N3518	1983	25	852	8	169.53	41	83810	3.20
91N3563	2053	27	504	7	175.33	49	80000	2.00
91N3620	1301	28	256	6	155.24	48	55238	0.00
91N3620	1666	28	342	6	167.83	47	66667	0.00
91N3647	2366	29	439	7	165.91	42	70476	0.30
91N3658	1622	27	528	7	148.57	40	85714	0.05
91N3661	1917	27	324	6	149.25	37	76190	1.20
91N3666	1775	26	413	7	162.71	49	78095	1.50
91N3725	2137	25	644	8	161.53	45	80000	0.20
91N3745	2011	26	729	9	154.75	42	81905	0.72
91N3760	2909	24	485	7	148.79	46	59048	5.60
91N3767	2305	27	505	7	150.78	49	55238	5.40
91N3770	1704	25	281	7	150.13	40	64762	0.05
91N3789	2270	24	506	7	146.69	41	64762	4.80
91N3854	2308	25	767	8	162.57	41	76190	1.50
91N3877	2094	28	509	6	127.14	42	64762	0.05
91N3916	1507	24	327	6	141.27	50	70476	0.80
91N6010	1778	24	335	7	153.69	42	45714	2.80
93N35	1976	24	593	7	156.57	40	81905	0.40
93N64	1871	18	645	8	148.38	37	110476	4.90
93N65	2045	25	308	6	159.75	35	76190	7.20
93N68	1850	28	604	8	170.33	44	83810	2.40
93N77	2127	25	569	7	179.08	43	80000	1.20
93N78	1693	27	448	7	176.08	50	62857	0.05
93N83	1506	29	368	7	162.55	46	85714	0.05
93N87	1613	29	322	6	157.50	55	57143	0.10
93N89	1456	25	706	8	154.30	45	72381	0.40
93N95	1620	29	464	7	175.82	52	57143	0.10
93N125	1972	26	586	7	173.18	41	93333	6.40
93N157	1975	34	836	9	153.47	48	55238	1.60
93N227	1892	27	424	7	170.21	46	78095	3.50
93N240	2192	25	384	6	159.45	41	106667	0.05
93N291	2157	25	609	8	162.50	45	76190	1.00
93N297	2232	31	637	8	150.13	51	66667	6.30
93N310	1858	30	581	8	179.00	56	64762	3.00
93N328	2159	25	466	7	150.08	41	60952	7.20
93N338	2072	24	680	8	174.32	50	87619	0.05
93N360	2009	23	484	7	126.37	36	83810	2.50
93N361	1706	26	549	7	173.41	44	102857	0.05
93N387	2091	28	777	9	158.64	61	70476	5.60
93N392	1694	25	335	6	160.25	49	99048	0.20
93N408	1842	24	559	6	150.86	50	55238	0.40
93N412	1742	26	787	9	145.05	42	89524	7.20
93N455	2167	30	432	7	158.78	44	80000	9.00
93N465	1971	29	501	8	169.21	40	59048	8.10
93N519	2297	29	652	7	132.23	55	72381	2.50
93N521	1571	26	576	7	150.62	53	81905	0.40
93N531	1815	25	299	6	153.61	37	74286	0.00
93N575	1722	31	422	7	154.41	47	64762	1.20
93N577	1851	30	536	7	157.74	54	83810	0.20
93N578	1488	25	501	7	161.42	40	135238	0.00
93N580	1878	28	711	8	149.45	48	91429	7.20
93N630	1679	27	542	8	123.79	48	68571	1.60
93N631	1924	30	335	6	148.62	48	66667	5.60
93N640	1671	25	534	7	154.18	47	78095	0.60
93N644	1821	28	704	9	164.72	48	80000	2.40
93N738	1716	24	581	8	153.70	38	80000	0.40
93N742	1688	26	405	7	132.09	41	74286	0.30
93N745	1578	26	347	6	169.34	53	72381	0.00
93N762	1878	24	840	8	164.92	51	76190	0.05
93N785	1934	28	497	7	157.66	51	76190	3.60
93N789	1924	23	470	6	151.23	36	74286	0.60
93N803	1370	22	602	7	169.20	41	108571	0.10
93N811	1507	25	460	7	145.33	42	91429	0.05
93N816	2032	26	516	8	166.46	49	85714	0.60

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
93N819	2061	23	695	7	172.40	38	118095	1.80
93N820	1886	25	490	7	166.51	38	85714	1.80
93N825	1700	23	464	8	163.94	38	72381	0.00
93N826	1853	26	548	7	157.95	46	102857	0.00
93N830	1645	31	375	7	137.25	43	70476	0.10
93N852	1827	24	711	8	142.61	43	93333	9.00
93N893	1899	26	772	9	166.35	40	76190	0.00
93N914	1340	26	225	6	142.26	37	118095	0.00
93N921	1813	20	557	7	145.90	46	80000	0.00
93N924	1574	24	419	7	158.24	40	85714	0.00
93N925	1726	27	583	8	174.10	57	74286	0.00
93N926	2175	24	592	7	163.54	49	100952	6.30
93N932	1991	23	810	9	162.46	47	91429	0.05
93N955	1993	23	478	6	150.40	41	102857	6.30
93N957	1630	23	330	6	158.66	36	93333	1.20
93N960	2065	20	409	6	139.82	32	108571	6.30
93N973	1962	28	688	8	191.65	50	97143	3.00
93N983	2014	30	498	7	166.49	43	78095	2.00
93N984	1552	26	536	7	156.82	41	93333	0.10
93N1004	1469	23	285	6	165.47	46	97143	0.05
93N1005	1792	26	472	7	160.11	53	74286	0.05
93N1045	1687	29	273	6	161.52	46	78095	7.20
93N1047	1524	28	410	7	156.71	48	89524	0.00
93N1049	1837	26	689	8	141.28	51	78095	0.80
93N1057	1795	27	605	8	172.18	45	68571	0.60
93N1059	2096	31	487	6	150.70	48	74286	0.05
93N1073	1891	22	449	7	138.85	38	81905	0.40
93N1102	1843	29	546	8	163.50	45	91429	1.50
93N1141	1812	26	507	7	163.06	37	97143	0.00
93N1154	2218	27	622	8	184.53	46	68571	6.40
93N1160	1675	28	445	7	169.33	50	72381	0.40
93N1178	1764	29	660	9	165.09	47	91429	0.00
93N1217	1363	20	516	6	139.63	37	95238	0.10
93N1234	1860	27	821	9	151.97	49	68571	2.40
93N1239	1665	26	729	7	182.84	40	91429	0.40
93N1258	1574	26	461	7	164.00	48	81905	0.00
93N1262	1524	29	357	6	165.84	45	74286	0.60
93N1264	1801	22	796	8	154.64	43	68571	7.20
93N1301	2094	26	346	6	149.16	47	87619	0.10
93N1303	2135	26	587	7	172.26	48	76190	1.80
93N1318	1849	29	704	8	114.86	46	66667	0.00
93N1330	2177	22	858	9	166.20	40	81905	5.40
93N1343	2268	25	634	7	151.57	43	78095	6.40
93N1350	2070	24	569	7	165.67	49	99048	0.05
93N1356	1785	26	469	8	155.14	50	83810	0.50
93N1372	2503	22	511	8	149.69	42	78095	0.80
93N1384	1669	26	663	8	163.68	43	95238	0.00
Q117	1716	31	417	7	161.91	45	59048	0.05
Q117	1704	28	368	7	157.00	46	57143	0.00
Q117	1757	28	477	7	163.40	45	53333	0.60
Q117	1938	30	430	7	154.32	45	55238	0.05
Q117	1840	30	408	7	149.18	46	66667	0.00
Q117	1610	31	432	7	159.38	45	57143	0.00
Q120	1733	28	349	6	159.22	42	59048	2.00
Q120	1770	29	325	6	165.04	43	78095	0.05
Q120	1605	29	269	5	157.39	42	68571	1.00
Q120	1891	28	437	6	145.37	44	76190	1.20
Q120	1761	27	285	5	149.45	41	70476	0.60
Q120	1614	28	302	5	156.00	41	66667	0.60
Q135	1853	26	805	8	167.59	39	83810	1.20
Q135	1612	25	468	7	157.88	37	95238	2.00
Q135	1520	28	632	8	158.36	37	85714	0.10
Q135	1614	27	694	8	165.32	38	95238	0.05
Q135	1702	26	486	7	167.86	38	93333	4.80
Q135	1699	26	680	7	149.13	39	89524	0.05
85S1185	1825	25	544	8	165.60	48	85714	0.20
87S7148	1813	25	475	7	171.05	46	100952	3.00

APPENDIX 2 Clonal means for pre-harvest CCS and appearance grade (July), and harvest data (September) determined in the plant crop of the series 1 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
BJ7451	13.21	5.0	14.76	9.0	11.10	12.97
84C252	12.25	8.0	15.99	9.5	11.71	9.34
84C275	14.60	2.0	16.41	7.0	8.63	11.16
84C621	16.27	0.0	17.38	7.0	8.63	7.95
89C6015	13.13	1.0	16.86	5.0	6.16	3.84
MY5514	12.06	9.0	15.09	9.5	11.71	7.61
91N363	12.84	8.0	16.77	9.0	11.10	7.59
91N1187	12.21	5.0	16.08	9.0	11.10	17.65
91N1193	12.83	6.0	15.14	7.5	9.25	8.86
91N1198	13.25	6.0	13.83	7.5	9.25	6.16
91N1218	12.74	7.0	16.03	8.0	9.86	10.19
91N1225	12.80	2.5	13.79	8.0	9.86	6.08
91N1232	13.06	6.0	15.24	5.0	6.16	7.23
91N1237	12.39	7.5	16.15	8.0	9.86	8.78
91N1257	13.42	8.5	15.76	8.0	9.86	4.74
91N1266	11.20	0.5	14.55	2.0	2.47	1.99
91N1271	12.38	8.0	15.27	6.5	8.01	7.66
91N1279	12.35	3.0	14.89	8.0	9.86	8.27
91N1280	12.98	7.0	15.84	8.5	10.48	11.23
91N1306	13.32	8.0	17.14	8.5	10.48	11.73
91N1325	12.28	6.0	14.54	5.0	6.16	4.81
91N1362	13.60	5.0	16.67	7.0	8.63	6.71
91N1386	12.57	0.0	15.22	3.0	3.70	2.41
91N1406	14.00	9.0	16.88	7.5	9.25	11.35
91N1422	14.12	5.0	16.40	7.0	8.63	7.74
91N1435	11.68	7.0	15.46	6.5	8.01	7.36
91N2026	13.85	8.0	16.43	9.0	11.10	9.33
91N2030	13.66	6.0	15.78	7.5	9.25	6.22
91N2054	16.62	5.0	15.47	7.5	9.25	12.83
91N2179	11.60	3.0	13.36	7.5	9.25	6.89
91N2249	13.23	1.0	14.75	2.0	2.47	1.62
91N2250	12.37	0.0	12.73	7.0	8.63	4.25
91N2274	13.93	6.0	16.32	9.5	11.71	11.29
91N2279	14.19	7.0	15.78	8.5	10.48	10.24
91N2388	13.52	1.0	15.45	5.0	6.16	4.57
91N2453	14.00	3.0	15.44	7.5	9.25	8.28
91N2795	13.82	7.5	16.49	8.5	10.48	7.06
91N2813	12.99	5.0	16.09	9.0	11.10	8.33
91N2862	12.55	9.0	14.57	9.0	11.10	10.45
91N2862	13.86	5.0	15.77	8.0	9.86	9.39
91N2904	13.72	6.0	15.60	7.0	8.63	7.76
91N2904	13.64	6.0	14.89	6.0	7.40	6.78
91N2936	13.86	7.0	16.63	9.5	11.71	13.20
91N2967	12.97	7.5	16.77	8.0	9.86	12.87
91N2971	12.27	0.0	14.31	6.0	7.40	6.53
91N2976	14.08	4.0	16.00	8.5	10.48	12.95
91N2988	11.89	0.5	14.68	3.0	3.70	2.86
91N2997	11.55	1.0	14.73	7.0	8.63	7.00
91N2998	12.62	4.0	14.05	3.0	3.70	2.86
91N3008	11.85	8.0	15.97	10.0	12.33	11.09
91N3020	15.36	0.0	15.82	4.0	4.93	4.13
91N3021	13.56	0.0	16.65	7.0	8.63	4.18
91N3029	12.26	9.0	14.37	9.0	11.10	11.95
91N3053	12.70	9.0	14.57	9.5	11.71	12.51
91N3073	13.15	6.0	15.04	8.5	10.48	9.82
91N3101	13.21	1.0	16.31	7.5	9.25	8.87
91N3129	13.87	1.0	15.96	4.0	4.93	5.26
91N3147	12.70	4.0	16.40	7.0	8.63	7.80
91N3252	13.33	10.0	17.15	9.5	11.71	11.22
91N3285	14.13	4.0	15.86	5.0	6.16	4.00
91N3288	13.47	5.5	15.99	8.5	10.48	8.26
91N3307	13.72	4.0	16.89	6.5	8.01	9.66
91N3336	12.91	5.5	14.43	8.0	9.86	10.89
91N3378	13.31	6.0	15.95	9.0	11.10	10.75

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
91N3393	13.62	6.0	16.42	6.5	8.01	7.55
91N3440	12.36	7.0	15.41	9.0	11.10	10.00
91N3447	14.28	2.0	15.88	5.0	6.16	3.49
91N3459	12.90	5.0	13.36	6.0	7.40	4.36
91N3460	14.30	7.0	16.40	7.0	8.63	9.92
91N3487	13.02	9.0	16.48	9.0	11.10	13.95
91N3492	13.33	9.0	15.27	8.5	10.48	9.85
91N3504	13.41	6.0	15.56	7.5	9.25	7.94
91N3518	13.75	2.0	15.85	7.5	9.25	8.29
91N3563	12.09	7.0	15.50	4.0	4.93	5.77
91N3620	13.84	3.0	17.03	7.5	9.25	7.50
91N3620	12.28	5.5	15.97	7.0	8.63	8.14
91N3647	12.79	3.5	15.80	7.0	8.63	10.89
91N3658	13.09	8.0	15.87	9.5	11.71	14.64
91N3661	13.86	7.0	16.39	6.5	8.01	8.91
91N3666	14.22	0.0	16.80	7.0	8.63	9.63
91N3725	13.80	7.0	15.26	7.5	9.25	11.00
91N3745	14.06	3.0	16.21	8.0	9.86	8.99
91N3760	10.99	6.0	15.06	7.0	8.63	10.95
91N3767	12.54	7.0	15.41	6.5	8.01	10.80
91N3770	14.12	6.0	15.91	9.0	11.10	9.05
91N3789	10.75	3.5	15.08	6.0	7.40	6.72
91N3854	12.03	5.0	15.61	7.0	8.63	11.40
91N3877	12.50	9.0	15.25	7.5	9.25	8.16
91N3916	13.28	7.0	15.53	8.0	9.86	9.18
91N6010	14.48	5.0	16.52	5.0	6.16	5.16
93N35	15.43	6.0	16.03	6.5	8.01	9.33
93N64	13.28	7.0	15.43	6.0	7.40	6.51
93N65	11.31	7.0	15.37	6.5	8.01	7.51
93N68	13.77	5.0	15.48	7.0	8.63	8.79
93N77	12.65	7.0	16.01	7.0	8.63	9.95
93N78	15.58	0.0	16.10	6.0	7.40	7.06
93N83	13.68	10.0	16.16	9.5	11.71	15.21
93N87	12.55	5.0	15.95	7.0	8.63	7.17
93N89	13.42	6.0	16.46	8.0	9.86	10.65
93N95	13.76	3.0	15.64	6.0	7.40	5.85
93N125	9.25	7.0	14.38	6.5	8.01	7.28
93N157	11.35	0.0	15.75	1.0	1.23	0.90
93N227	14.47	6.0	16.20	5.0	6.16	6.88
93N240	11.37	5.0	15.45	6.0	7.40	10.40
93N291	12.60	1.0	14.84	8.0	9.86	9.98
93N297	10.14	3.5	11.55	3.0	3.70	1.99
93N310	11.66	3.0	16.28	8.5	10.48	14.06
93N328	13.96	4.0	16.24	6.5	8.01	11.50
93N338	13.55	8.0	15.82	7.5	9.25	10.04
93N360	12.69	7.0	15.42	8.5	10.48	9.92
93N361	14.73	8.0	16.32	8.5	10.48	10.13
93N387	12.99	7.0	14.84	7.0	8.63	9.91
93N392	10.28	4.0	12.89	6.5	8.01	8.27
93N408	14.39	6.0	17.12	8.0	9.86	9.56
93N412	11.56	7.0	11.62	7.0	8.63	5.76
93N455	11.59	4.0	13.82	6.5	8.01	7.28
93N465	13.73	3.0	15.82	4.0	4.93	2.93
93N519	13.81	1.0	17.03	7.5	9.25	11.38
93N521	13.49	9.0	16.22	9.0	11.10	12.62
93N531	13.13	9.0	15.45	9.5	11.71	9.96
93N575	12.75	7.0	16.22	8.0	9.86	11.58
93N577	12.67	2.0	16.54	8.0	9.86	15.7
93N578	11.85	9.0	15.24	9.0	11.10	12.32
93N580	15.25	6.0	18.07	7.0	8.63	12.44
93N630	11.78	5.0	15.72	8.0	9.86	10.75
93N631	12.70	7.0	16.61	8.0	9.86	13.35
93N640	13.58	8.0	16.27	8.5	10.48	10.01
93N644	13.84	4.0	16.19	4.5	5.55	5.85
93N738	13.24	6.0	15.44	8.0	9.86	8.92
93N742	13.24	8.0	15.37	9.0	11.10	12.37
93N745	14.43	0.0	16.84	3.0	3.70	3.48
93N762	12.29	7.0	16.71	8.0	9.86	14.71
93N785	12.62	2.0	15.62	5.0	6.16	6.25
93N789	13.12	7.5	16.32	8.0	9.86	13.82

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
93N803	13.40	8.0	16.13	9.0	11.10	12.16
93N811	14.99	6.0	16.48	9.0	11.10	10.07
93N816	13.25	6.0	14.73	7.5	9.25	11.26
93N819	13.14	3.0	15.18	8.5	10.48	12.61
93N820	12.09	0.5	15.53	7.0	8.63	8.97
93N825	12.19	4.0	14.79	7.0	8.63	5.59
93N826	11.07	6.0	15.79	8.0	9.86	10.56
93N830	11.82	3.0	16.73	8.0	9.86	6.68
93N852	10.41	6.0	14.55	4.0	4.93	4.55
93N893	11.43	3.0	15.25	7.0	8.63	6.87
93N914	14.25	8.0	15.14	8.5	10.48	10.48
93N921	13.92	9.0	16.58	9.5	11.71	10.04
93N924	12.71	8.0	16.04	9.0	11.10	14.26
93N925	13.83	5.0	16.13	8.5	10.48	12.33
93N926	12.94	5.0	15.67	4.0	4.93	6.17
93N932	13.25	4.0	16.00	7.5	9.25	10.94
93N955	12.88	7.0	16.36	4.0	4.93	5.96
93N957	15.02	9.0	16.60	8.5	10.48	12.33
93N960	14.46	7.0	16.88	8.0	9.86	11.28
93N973	12.83	4.0	15.50	8.5	10.48	18.52
93N983	12.64	5.0	15.80	7.5	9.25	10.46
93N984	14.12	4.0	14.16	8.5	10.48	7.13
93N1004	12.84	9.0	16.36	7.5	9.25	10.63
93N1005	13.49	6.0	16.43	9.5	11.71	11.80
93N1045	14.21	0.0	15.94	7.5	9.25	7.69
93N1047	14.19	10.0	15.93	9.0	11.10	13.79
93N1049	13.33	3.0	15.97	4.0	4.93	4.88
93N1057	14.55	0.0	16.70	4.0	4.93	5.08
93N1059	12.36	8.0	16.79	8.0	9.86	12.67
93N1073	14.68	7.5	16.95	8.0	9.86	8.97
93N1102	12.39	7.0	16.72	8.5	10.48	7.29
93N1141	13.79	0.0	15.56	7.0	8.63	9.00
93N1154	12.15	2.0	15.05	2.0	2.47	2.34
93N1160	12.55	9.0	15.22	7.0	8.63	9.65
93N1178	13.25	2.0	15.59	6.5	8.01	8.56
93N1217	11.79	7.0	15.26	8.5	10.48	6.12
93N1234	13.97	7.0	16.68	8.5	10.48	9.69
93N1239	13.29	5.0	16.28	7.5	9.25	10.52
93N1258	13.95	1.0	17.66	7.0	8.63	10.52
93N1262	13.77	7.0	16.48	7.5	9.25	9.12
93N1264	12.23	4.0	16.18	6.0	7.40	5.45
93N1301	12.73	7.0	16.69	8.5	10.48	14.23
93N1303	13.32	7.0	16.06	7.5	9.25	12.01
93N1318	11.76	7.0	17.08	9.5	11.71	12.75
93N1330	12.00	6.0	14.64	4.0	4.93	4.02
93N1343	12.34	0.0	16.59	4.0	4.93	5.18
93N1350	10.91	7.5	15.05	4.5	5.55	6.68
93N1356	12.97	7.0	14.64	9.0	11.10	7.04
93N1372	12.84	6.0	16.82	7.5	9.25	13.12
93N1384	13.60	4.0	15.50	8.0	9.86	7.99
Q117*	15.28	8.0	16.60	8.5	10.48	11.93
Q117*	15.47	2.0	16.93	7.5	9.25	8.01
Q117*	13.18	5.0	16.49	6.0	7.40	7.21
Q117*	14.38	9.0	16.66	8.5	10.48	12.58
Q117*	13.90	9.0	16.49	9.0	11.10	10.94
Q117*	15.18	6.0	15.69	9.0	11.10	11.19
Q120*	13.48	5.0	15.32	6.5	8.01	5.52
Q120*	13.11	6.0	14.43	7.0	8.63	7.99
Q120*	13.25	0.0	16.56	7.5	9.25	7.32
Q120*	13.19	6.0	15.44	7.0	8.63	8.91
Q120*	13.93	7.0	16.24	9.0	11.10	9.64
Q120*	13.81	7.0	16.64	8.5	10.48	11.26
Q135*	12.82	5.0	17.09	8.0	9.86	13.36
Q135*	13.24	5.0	16.57	8.0	9.86	10.57
Q135*	11.95	7.0	15.38	8.5	10.48	8.26
Q135*	13.29	5.0	17.05	9.0	11.10	12.14
Q135*	13.60	7.0	16.12	9.0	11.10	11.63
Q135*	14.16	8.0	16.86	9.5	11.71	12.78
85S1185	12.69	2.0	13.81	7.0	8.63	7.45
87S7148	13.67	6.0	14.64	7.0	8.63	7.48

APPENDIX 3 Summary of plant-crop clonal evaluation for the series 1 HF1 entries

Clones were assessed relative to the standard cultivars, but raked among themselves for adjusted appearance grade (AAG), CCS, and net merit grade (NMG), with these being summed and ranked. The 30 clones with the highest total rank are nominated for advancement to the HF2 trial in 2000.

Clone	AAG[1]	AAG rank	CCS[2]	CCS rank	NMG[3]	NMG rank	Total rank	TCH[4]	TSH[5]
93N1318	11.71	175	17.08	180	12.75	167	522	64.57	11.03
91N2936	11.71	176	16.63	158	13.20	173	507	69.43	11.55
91N3252	11.71	174	17.15	183	11.22	143	500	55.43	9.51
93N83	11.71	180	16.16	122	15.21	183	485	82.29	13.30
91N3487	11.10	157	16.48	148	13.95	177	482	78.57	12.95
93N1005	11.71	178	16.43	145	11.80	154	477	62.86	10.33
93N1301	10.48	135	16.69	162	14.23	179	476	83.14	13.88
91N1306	10.48	133	17.14	182	11.73	153	468	64.86	11.12
91N1187	11.10	162	16.08	116	17.65	185	463	102.86	16.54
91N2274	11.71	179	16.32	134	11.29	147	460	60.57	9.89
93N762	9.86	113	16.71	164	14.71	182	459	90.86	15.18
91N3658	11.71	182	15.87	96	14.64	181	459	81.43	12.92
93N924	11.10	163	16.04	114	14.26	180	457	82.86	13.29
93N577	9.86	115	16.54	153	15.70	184	452	98.29	16.26
93N957	10.48	137	16.60	156	12.33	159	452	73.43	12.19
93N521	11.10	159	16.22	127	12.62	165	451	72.86	11.82
93N310	10.48	140	16.28	131	14.06	178	449	85.14	13.86
93N921	11.71	177	16.58	154	10.04	118	449	55.14	9.14
91N2967	9.86	111	16.77	168	12.87	169	448	78.86	13.22
93N1059	9.86	110	16.79	169	12.67	166	445	77.43	13.00
93N631	9.86	114	16.61	157	13.35	174	445	82.00	13.62
93N1047	11.10	165	15.93	99	13.79	175	439	81.43	12.97
93N803	11.10	160	16.13	119	12.16	157	436	71.71	11.57
91N3008	12.33	186	15.97	104	11.09	141	431	58.00	9.26
93N1372	9.25	86	16.82	171	13.12	172	429	85.71	14.42
93N960	9.86	109	16.88	174	11.28	146	429	70.00	11.82
93N789	9.86	117	16.32	136	13.82	176	429	88.00	14.36
93N811	11.10	156	16.48	149	10.07	120	425	56.29	9.28
93N925	10.48	142	16.13	120	12.33	160	422	76.00	12.26
91N2976	10.48	143	16.00	109	12.95	170	422	80.29	12.85
93N519	9.25	84	17.03	178	11.38	149	411	73.43	12.50
91N1406	9.25	85	16.88	175	11.35	148	408	73.43	12.39
93N1234	10.48	136	16.68	161	9.69	107	404	57.71	9.63
91N2026	11.10	158	16.43	146	9.33	99	403	51.71	8.50
93N580	8.63	54	18.07	186	12.44	162	402	78.29	14.15
93N973	10.48	147	15.50	68	18.52	186	401	118.29	18.33
93N575	9.86	118	16.22	128	11.58	152	398	73.43	11.91
91N3378	11.10	164	15.95	101	10.75	133	398	62.57	9.98
93N89	9.86	116	16.46	147	10.65	132	395	66.57	10.96
93N361	10.48	139	16.32	135	10.13	121	395	60.29	9.84
93N408	9.86	107	17.12	181	9.56	103	391	58.00	9.93
91N363	11.10	155	16.77	167	7.59	67	389	42.57	7.14
84C252	11.71	181	15.99	107	9.34	101	389	52.57	8.41
93N640	10.48	141	16.27	130	10.01	117	388	62.00	10.09
93N742	11.10	168	15.37	54	12.37	161	383	76.29	11.73
91N1280	10.48	145	15.84	93	11.23	144	382	69.43	11.00
93N1073	9.86	108	16.95	177	8.97	92	377	54.57	9.25
93N578	11.10	169	15.24	46	12.32	158	373	76.00	11.58
BJ7451	11.10	170	14.76	29	12.97	171	370	85.14	12.57
93N1258	8.63	55	17.66	185	10.52	128	368	68.57	12.11
91N3053	11.71	185	14.57	20	12.51	163	368	78.57	11.45
93N1303	9.25	91	16.06	115	12.01	156	362	85.43	13.72
91N2813	11.10	161	16.09	117	8.33	84	362	47.14	7.59
91N3770	11.10	166	15.91	98	9.05	96	360	53.71	8.55
93N1102	10.48	134	16.72	165	7.29	60	359	41.14	6.88
93N531	11.71	183	15.45	62	9.96	114	359	59.14	9.14
93N819	10.48	151	15.18	43	12.61	164	358	84.29	12.79
93N1004	9.25	88	16.36	137	10.63	131	356	73.43	12.01
91N1218	9.86	121	16.03	112	10.19	122	355	68.00	10.90
91N2279	10.48	146	15.78	85	10.24	123	354	63.71	10.05

Clone	AAG[1]	AAG rank	CCS[2]	CCS rank	NMG[3]	NMG rank	Total rank	TCH[4]	TSH[5]
93N1239	9.25	90	16.28	132	10.52	129	351	70.86	11.54
84C275	8.63	60	16.41	143	11.16	142	345	80.00	13.13
91N2795	10.48	138	16.49	151	7.06	53	342	40.86	6.74
91N3029	11.10	173	14.37	14	11.95	155	342	80.86	11.62
93N932	9.25	92	16.00	110	10.94	138	340	79.14	12.66
93N630	9.86	125	15.72	81	10.75	134	340	74.29	11.68
91N3745	9.86	119	16.21	126	8.99	94	339	60.29	9.77
93N826	9.86	122	15.79	87	10.56	130	339	71.71	11.32
91N3440	11.10	167	15.41	56	10.00	116	339	62.86	9.69
93N1262	9.25	87	16.48	150	9.12	97	334	62.29	10.26
91N2054	9.25	99	15.47	66	12.83	168	333	93.71	14.50
91N3666	8.63	57	16.80	170	9.63	104	331	68.00	11.42
91N3288	10.48	144	15.99	108	8.26	79	331	51.43	8.22
91N1237	9.86	120	16.15	121	8.78	86	327	55.43	8.95
91N3620	9.25	83	17.03	179	7.50	64	326	46.57	7.93
93N328	8.01	44	16.24	129	11.50	151	324	90.29	14.66
91N3307	8.01	41	16.89	176	9.66	106	323	70.86	11.97
93N830	9.86	112	16.73	166	6.68	43	321	40.29	6.74
93N914	10.48	152	15.14	41	10.48	127	320	69.71	10.55
91N2862	11.10	172	14.57	21	10.45	125	318	70.29	10.24
93N360	10.48	148	15.42	58	9.92	111	317	65.43	10.09
84C621	8.63	56	17.38	184	7.95	75	315	53.43	9.29
91N3460	8.63	63	16.40	140	9.92	112	315	73.14	12.00
91N3101	9.25	89	16.31	133	8.87	89	311	61.43	10.02
93N983	9.25	96	15.80	88	10.46	126	310	74.29	11.74
91N3492	10.48	149	15.27	52	9.85	109	310	67.14	10.25
91N2862	9.86	123	15.77	84	9.39	102	309	63.71	10.05
93N338	9.25	95	15.82	90	10.04	119	304	72.00	11.39
91N3073	10.48	153	15.04	35	9.82	108	296	68.86	10.36
91N3854	8.63	68	15.61	77	11.40	150	295	90.29	14.09
91N3916	9.86	126	15.53	71	9.18	98	295	62.86	9.76
91N3647	8.63	67	15.80	89	10.89	136	292	82.00	12.96
91N3725	9.25	101	15.26	51	11.00	140	292	83.43	12.73
MY5514	11.71	184	15.09	40	7.61	68	292	46.86	7.07
93N77	8.63	64	16.01	111	9.95	113	288	78.00	12.49
91N3336	9.86	131	14.43	16	10.89	137	284	82.29	11.87
93N738	9.86	128	15.44	60	8.92	91	279	63.43	9.79
91N3147	8.63	62	16.40	141	7.80	73	276	56.29	9.23
93N291	9.86	130	14.84	31	9.98	115	276	76.00	11.28
93N816	9.25	104	14.73	26	11.26	145	275	90.29	13.30
91N1422	8.63	61	16.40	142	7.74	71	274	56.00	9.18
91N3661	8.01	43	16.39	139	8.91	90	272	69.14	11.33
93N1384	9.86	127	15.50	69	7.99	76	272	56.57	8.77
91N3518	9.25	94	15.85	94	8.29	83	271	61.43	9.74
91N1362	8.63	58	16.67	160	6.71	45	263	47.43	7.91
93N1045	9.25	93	15.94	100	7.69	70	263	52.29	8.33
93N35	8.01	45	16.03	113	9.33	100	258	74.86	12.00
91N3393	8.01	42	16.42	144	7.55	66	252	59.43	9.76
91N3760	8.63	75	15.06	38	10.95	139	252	90.86	13.68
91N3620	8.63	65	15.97	105	8.14	77	247	60.00	9.58
91N3504	9.25	98	15.56	73	7.94	74	245	59.71	9.29
93N1356	11.10	171	14.64	22	7.04	52	245	48.00	7.03
91N2453	9.25	100	15.44	61	8.28	82	243	62.86	9.71
91N1279	9.86	129	14.89	33	8.27	80	242	62.86	9.36
91N3767	8.01	48	15.41	57	10.80	135	240	94.00	14.49
93N1141	8.63	70	15.56	74	9.00	95	239	71.14	11.07
93N820	8.63	71	15.53	72	8.97	93	236	70.86	11.00
93N1217	10.48	150	15.26	50	6.12	36	236	43.43	6.63
91N3021	8.63	59	16.65	159	4.18	16	234	29.71	4.95
91N1193	9.25	103	15.14	42	8.86	88	233	68.00	10.30
91N3877	9.25	102	15.25	48	8.16	78	228	61.43	9.37
91N1257	9.86	124	15.76	83	4.74	21	228	31.71	5.00
93N68	8.63	72	15.48	67	8.79	87	226	68.29	10.57
93N87	8.63	66	15.95	102	7.17	56	224	53.43	8.52
93N1160	8.63	74	15.22	44	9.65	105	223	78.57	11.96
93N240	7.40	35	15.45	63	10.40	124	222	97.14	15.01
91N2030	9.25	97	15.78	86	6.22	39	222	44.57	7.03
93N984	10.48	154	14.16	12	7.13	55	221	55.14	7.81
93N387	8.63	76	14.84	32	9.91	110	218	82.00	12.17
91N2904	8.63	69	15.60	76	7.76	72	217	62.29	9.72
89C6015	6.16	23	16.86	173	3.84	12	208	36.57	6.17
93N1178	8.01	46	15.59	75	8.56	85	206	71.71	11.18

Clone	AAG[1]	AAG rank	CCS[2]	CCS rank	NMG[3]	NMG rank	Total rank	TCH[4]	TSH[5]
93N78	7.40	33	16.10	118	7.06	54	205	60.57	9.75
91N6010	6.16	24	16.52	152	5.16	25	201	52.00	8.59
93N227	6.16	25	16.20	125	6.88	49	199	69.14	11.20
93N1057	4.93	10	16.70	163	5.08	24	197	61.71	10.31
93N1343	4.93	11	16.59	155	5.18	26	192	67.71	11.23
93N745	3.70	5	16.84	172	3.48	10	187	56.57	9.53
93N955	4.93	12	16.36	138	5.96	34	184	76.00	12.43
93N1264	7.40	32	16.18	123	5.45	28	183	47.14	7.63
93N644	5.55	21	16.19	124	5.85	32	177	68.86	11.15
91N1225	9.86	132	13.79	7	6.08	35	174	53.14	7.33
91N1435	8.01	47	15.46	65	7.36	61	173	61.43	9.50
91N1271	8.01	50	15.27	53	7.66	69	172	68.86	10.51
93N893	8.63	73	15.25	49	6.87	48	170	56.86	8.67
93N65	8.01	49	15.37	55	7.51	65	169	64.86	9.97
87S7148	8.63	79	14.64	23	7.48	63	165	64.57	9.45
91N2179	9.25	106	13.36	5	6.89	50	161	68.00	9.08
91N2997	8.63	78	14.73	27	7.00	51	156	59.14	8.71
91N1198	9.25	105	13.83	10	6.16	37	152	55.14	7.63
85S1185	8.63	80	13.81	8	7.45	62	150	68.00	9.39
93N785	6.16	28	15.62	78	6.25	40	146	71.14	11.11
93N95	7.40	34	15.64	79	5.85	33	146	53.71	8.40
91N3129	4.93	14	15.96	103	5.26	27	144	70.57	11.26
93N1049	4.93	13	15.97	106	4.88	23	142	64.86	10.36
93N392	8.01	53	12.89	4	8.27	81	138	91.43	11.79
93N64	7.40	36	15.43	59	6.51	41	136	60.86	9.39
93N825	8.63	77	14.79	30	5.59	29	136	48.00	7.10
93N926	4.93	17	15.67	80	6.17	38	135	86.29	13.52
91N3285	6.16	27	15.86	95	4.00	13	135	44.57	7.07
91N3447	6.16	26	15.88	97	3.49	11	134	41.43	6.58
91N1232	6.16	30	15.24	47	7.23	57	134	81.43	12.41
93N125	8.01	51	14.38	15	7.28	58	124	71.14	10.23
91N3020	4.93	16	15.82	91	4.13	15	122	56.00	8.86
91N3789	7.40	37	15.08	39	6.72	46	122	68.29	10.30
93N455	8.01	52	13.82	9	7.28	59	120	73.71	10.19
91N3563	4.93	18	15.50	70	5.77	31	119	80.86	12.53
91N2904	7.40	38	14.89	34	6.78	47	119	68.00	10.13
93N465	4.93	15	15.82	92	2.93	9	116	37.14	5.88
93N412	8.63	82	11.62	2	5.76	30	114	74.29	8.63
91N2388	6.16	29	15.45	64	4.57	20	113	54.00	8.34
93N1350	5.55	22	15.05	36	6.68	44	102	84.00	12.64
91N2250	8.63	81	12.73	3	4.25	17	101	51.71	6.58
91N2971	7.40	39	14.31	13	6.53	42	94	70.29	10.06
93N157	1.23	1	15.75	82	0.90	1	84	38.57	6.07
91N1325	6.16	31	14.54	17	4.81	22	70	61.14	8.89
91N3459	7.40	40	13.36	6	4.36	18	64	55.71	7.44
91N1386	3.70	6	15.22	45	2.41	6	57	48.57	7.39
93N1330	4.93	19	14.64	24	4.02	14	57	62.57	9.16
93N852	4.93	20	14.55	18	4.55	19	57	70.00	10.19
93N1154	2.47	2	15.05	37	2.34	5	44	72.29	10.88
91N2988	3.70	7	14.68	25	2.86	7	39	57.43	8.43
91N2249	2.47	3	14.75	28	1.62	2	33	51.43	7.59
91N2998	3.70	8	14.05	11	2.86	8	27	61.43	8.63
91N1266	2.47	4	14.55	19	1.99	3	26	63.14	9.19
93N297	3.70	9	11.55	1	1.99	4	14	56.86	6.57

APPENDIX 4 Clonal means for seven ideotypic traits and erectness determined in the first-ratoon crop of the series 1 HF1 trial

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
BJ7451	1143.0	33.09	472	8	168	78	62738.0	0.60
84C252	973.0	22.10	467	8	153	47	119772.0	0.05
84C275	1322.0	25.81	490	8	148	52	76046.0	1.20
84C621	1171.0	23.67	501	7	154	55	102662.0	2.40
89C6015	916.0	20.55	486	8	157	52	34221.0	5.40
MY5514	933.0	32.20	367	8	143	69	45628.0	0.00
91N363	1213.0	23.30	464	9	134	53	108365.0	0.05
91N1187	1326.0	29.61	529	8	160	64	91255.0	4.20
91N1193	1479.0	21.70	369	7	143	55	85552.0	1.20
91N1198	951.0	26.12	408	8	170	52	125475.0	0.00
91N1218	1164.0	23.48	375	7	168	53	98860.0	0.00
91N1225	1288.0	21.54	451	8	153	58	87453.0	2.40
91N1232	1378.0	20.78	521	8	153	47	81749.0	1.50
91N1237	1047.0	34.36	329	7	174	54	58936.0	0.00
91N1257	1373.0	27.07	369	7	161	50	72244.0	0.00
91N1266	1252.0	22.20	439	8	176	56	102662.0	4.00
91N1271	1202.0	21.69	485	9	154	48	98859.0	4.20
91N1279	1281.0	22.70	476	8	148	58	133080.0	0.40
91N1280	1144.0	25.40	530	8	148	59	108365.0	0.00
91N1306	1395.0	25.70	500	8	158	63	817490.0	0.05
91N1325	1343.0	24.66	453	8	136	54	665400.0	1.60
91N1362	1354.0	22.25	409	7	142	51	76046.0	0.80
91N1386	1314.0	21.90	477	8	134	49	68441.0	9.00
91N1406	1331.0	23.80	507	7	157	64	93156.0	0.05
91N1422	1132.0	28.10	540	9	145	57	89354.0	0.05
91N1435	1509.0	31.40	511	9	138	60	72244.0	2.10
91N2026	1162.0	29.92	459	7	153	66	74145.0	0.05
91N2030	1210.0	20.95	537	7	149	55	119772.0	6.30
91N2054	1308.0	25.68	405	7	169	57	91255.0	1.20
91N2179	1330.0	21.48	414	8	143	49	110266.0	0.00
91N2249	1441.0	25.23	516	8	160	51	96958.0	4.20
91N2250	1003.0	17.95	393	7	152	48	110267.0	5.60
91N2274	1421.0	23.66	425	8	148	59	76046.0	0.90
91N2279	1336.0	29.50	397	8	129	59	60837.0	0.40
91N2388	969.0	18.61	430	9	126	42	110266.0	0.00
91N2453	1090.0	24.62	496	8	139	58	77947.0	3.60
91N2795	1163.0	29.28	325	7	131	59	74145.0	0.05
91N2813	606.0	21.70	313	7	150	54	85552.0	0.05
91N2862	1282.0	23.36	437	8	155	51	114069.0	0.00
91N2862	950.0	25.43	399	7	158	53	83651.0	0.00
91N2904	1159.0	20.94	470	8	139	41	70342.0	4.80
91N2904	1325.0	24.26	491	9	140	41	100761.0	5.40
91N2936	1090.0	28.03	434	9	152	51	83650.0	0.00
91N2967	1176.0	24.40	471	8	155	60	95057.0	0.00
91N2971	1425.0	21.80	563	8	135	56	96958.0	0.10
91N2976	1474.0	24.93	351	7	131	50	108365.0	0.10
91N2988	1153.0	23.81	478	9	136	67	70343.0	7.20
91N2997	1493.0	23.80	485	7	162	50	68442.0	3.60
91N2998	1553.0	21.00	435	8	152	46	70342.0	4.80
91N3008	1216.0	30.14	395	8	145	62	55133.0	0.00
91N3020	1059.0	24.70	579	8	139	51	62738.0	0.10
91N3021	1013.0	26.38	520	8	148	57	95057.0	3.50
91N3029	1227.0	33.08	389	8	156	65	74145.0	0.40
91N3053	1097.0	34.65	378	7	152	57	60837.0	0.00
91N3073	1603.0	29.00	455	8	139	66	102662.0	0.00
91N3101	1387.0	23.18	539	8	154	50	104563.0	0.10
91N3129	1229.0	22.70	404	8	165	55	125476.0	0.20
91N3147	1217.0	20.40	427	7	155	56	100761.0	1.80
91N3252	970.0	27.24	374	8	132	45	70342.0	0.00
91N3285	1269.0	23.92	381	8	158	52	68441.0	7.20
91N3288	1094.0	21.60	479	7	162	60	121673.0	0.20
91N3307	959.0	28.17	376	8	154	50	57034.0	0.80
91N3336	1251.0	31.44	494	8	145	64	68441.0	2.00
91N3378	1244.0	26.70	473	8	151	60	68442.0	0.20
91N3393	1372.0	20.30	419	7	153	50	95057.0	3.00
91N3440	1320.0	25.69	549	8	162	65	77947.0	4.80
91N3447	1222.0	25.20	488	8	156	57	72243.0	4.90

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
91N3459	1770.0	19.72	547	8	108	45	81749.0	8.00
91N3460	1268.0	21.36	480	7	161	44	95057.0	0.50
91N3487	1411.0	29.90	506	8	147	57	70343.0	0.05
91N3492	1205.0	21.52	523	8	162	52	112168.0	0.05
91N3504	1181.0	24.50	428	8	118	72	95057.0	0.05
91N3518	1374.0	20.50	493	8	160	54	104563.0	3.20
91N3563	1310.0	26.63	463	8	163	63	96958.0	2.00
91N3620	856.0	27.70	333	7	158	55	93156.0	0.00
91N3620	880.0	28.00	346	7	157	57	87453.0	0.00
91N3647	1276.0	26.09	518	7	161	53	68441.0	0.30
91N3658	1363.0	27.40	541	8	149	53	83650.0	0.05
91N3661	1378.0	28.18	424	8	142	49	96958.0	1.20
91N3666	1133.0	27.61	614	9	149	60	74145.0	1.50
91N3725	1343.0	22.50	505	8	153	54	127377.0	0.20
91N3745	1098.0	21.79	597	9	144	51	100761.0	0.72
91N3760	1710.0	23.31	455	7	149	53	83650.0	5.60
91N3767	1636.0	26.61	540	9	143	57	70343.0	5.40
91N3770	1423.0	28.13	389	9	139	51	58936.0	0.05
91N3789	1634.0	19.88	472	9	148	51	79848.0	4.80
91N3854	1688.0	26.00	615	8	160	53	68441.0	1.50
91N3877	1790.0	23.83	433	7	132	51	68442.0	0.05
91N3916	1306.0	24.80	448	8	148	56	70343.0	0.80
91N6010	1039.0	25.92	584	10	147	55	106464.0	2.80
93N35	1270.0	19.90	512	7	165	53	138783.0	0.40
93N64	1214.0	20.64	641	8	141	52	136882.0	4.90
93N65	1594.0	23.70	337	7	159	47	83650.0	7.20
93N68	1327.0	30.26	445	7	158	54	87452.0	2.40
93N77	1505.0	23.10	547	8	175	54	87453.0	1.20
93N78	1205.0	26.94	457	8	167	59	70342.0	0.05
93N83	1353.0	29.70	444	8	155	62	76046.0	0.05
93N87	1242.0	30.58	378	8	147	69	68441.0	0.10
93N89	1246.0	27.10	380	7	146	59	108365.0	0.40
93N95	1192.0	28.39	554	9	166	63	87453.0	0.10
93N125	1199.0	19.41	508	8	172	52	115970.0	6.40
93N157	1203.0	33.21	455	8	155	53	57034.0	1.60
93N227	1498.0	27.00	432	7	161	57	91255.0	3.50
93N240	1604.0	24.00	491	7	151	51	140685.0	0.05
93N291	1294.0	21.90	472	8	149	53	100761.0	1.00
93N297	1214.0	27.13	503	8	136	60	62738.0	6.30
93N310	1268.0	28.50	551	9	164	62	64639.0	3.00
93N328	1493.0	20.84	540	9	136	49	87453.0	7.20
93N338	1390.0	22.90	521	8	151	57	102662.0	0.05
93N360	1141.0	22.35	460	8	147	52	83650.0	2.50
93N361	974.0	28.26	657	9	159	54	79848.0	0.05
93N387	1181.0	28.71	533	10	145	70	68441.0	5.60
93N392	1201.0	23.21	464	8	157	63	142586.0	0.20
93N408	1358.0	27.50	412	7	145	60	98859.0	0.40
93N412	1166.0	25.82	534	8	149	57	87453.0	7.20
93N455	1525.0	30.50	489	8	151	58	81749.0	9.00
93N465	1127.0	27.79	717	9	160	54	49430.0	8.10
93N519	1719.0	29.01	513	8	136	63	64639.0	2.50
93N521	1407.0	27.90	511	8	143	68	85552.0	0.40
93N531	1159.0	26.04	491	8	157	48	112168.0	0.00
93N575	1328.0	29.07	496	9	146	58	76046.0	1.20
93N577	1392.0	28.28	512	8	151	70	125475.0	0.20
93N578	837.0	25.37	335	7	154	49	123575.0	0.00
93N580	1257.0	23.90	537	8	142	62	55134.0	7.20
93N630	1071.0	30.36	511	9	144	59	77947.0	1.60
93N631	1381.0	31.40	497	8	154	61	74145.0	5.60
93N640	1327.0	25.50	533	9	139	65	77947.0	0.60
93N644	1100.0	33.44	513	9	153	60	79848.0	2.40
93N738	1184.0	26.50	587	9	148	50	87453.0	0.40
93N742	1404.0	29.10	369	7	129	53	114069.0	0.30
93N745	993.0	27.09	312	7	164	67	32320.0	0.00
93N762	1543.0	28.40	405	7	140	69	93156.0	0.05
93N785	1115.0	25.50	524	8	147	61	93156.0	3.60
93N789	1302.0	20.80	457	7	152	47	96958.0	0.60
93N803	1232.0	22.83	549	8	161	53	117871.0	0.10
93N811	1091.0	27.50	424	8	138	57	89354.0	0.05
93N816	1285.0	26.21	544	8	166	59	70342.0	0.60
93N819	1389.0	22.20	466	8	161	48	152092.0	1.80

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	#Stalks/ha	Erectness estimate
93N820	1120.0	24.92	470	8	147	52	81749.0	1.80
93N825	1222.0	24.82	606	8	155	48	66540.0	0.00
93N826	1380.0	26.13	452	9	147	60	100761.0	0.00
93N830	1025.0	28.61	406	7	144	47	58936.0	0.10
93N852	1310.0	25.50	470	7	133	50	125476.0	9.00
93N893	1086.0	27.27	756	10	158	57	95057.0	0.00
93N914	1066.0	26.02	298	8	139	51	96958.0	0.00
93N921	1229.0	23.30	415	7	134	60	100761.0	0.00
93N924	1196.0	28.25	426	8	142	53	66540.0	0.00
93N925	981.0	28.67	624	9	161	72	74145.0	0.00
93N926	1436.0	26.37	569	8	147	64	100761.0	6.30
93N932	1121.0	22.20	499	7	157	61	129278.0	0.05
93N955	1493.0	24.96	431	7	145	54	112167.0	6.30
93N957	1204.0	26.64	489	8	165	52	123574.0	1.20
93N960	1593.0	21.20	461	8	141	44	136883.0	6.30
93N973	1174.0	29.79	517	9	167	59	66540.0	3.00
93N983	1424.0	27.30	455	8	160	58	102662.0	2.00
93N984	842.0	25.77	510	9	147	52	91255.0	0.10
93N1004	1341.0	22.74	290	7	156	59	79848.0	0.05
93N1005	1211.0	27.10	396	8	156	62	93156.0	0.05
93N1045	1251.0	28.40	366	7	155	55	104563.0	7.20
93N1047	1155.0	28.12	475	8	150	61	77947.0	0.00
93N1049	1107.0	25.97	450	8	130	63	91255.0	0.80
93N1057	922.0	28.07	412	8	158	53	83650.0	0.6
93N1059	1530.0	30.55	497	7	152	56	72244.0	0.05
93N1073	1302.0	21.68	494	8	143	48	85552.0	0.40
93N1102	1269.0	26.39	390	7	158	52	104563.0	1.50
93N1141	1056.0	28.45	488	8	150	51	95057.0	0.00
93N1154	1408.0	23.27	583	7	174	51	58936.0	6.40
93N1160	1310.0	33.01	502	9	164	63	96958.0	0.40
93N1178	1090.0	25.23	384	8	153	59	74145.0	0.00
93N1217	1396.0	23.80	494	7	143	56	138783.0	0.10
93N1234	1181.0	26.81	613	9	146	63	79848.0	2.40
93N1239	1027.0	27.21	476	7	173	54	108365.0	0.40
93N1258	968.0	26.39	322	7	149	56	24715.0	0.00
93N1262	1326.0	26.90	531	8	161	58	93156.0	0.60
93N1264	1054.0	24.84	453	8	140	57	70343.0	7.20
93N1301	1487.0	26.37	367	7	154	56	100761.0	0.10
93N1303	1646.0	27.00	592	8	170	58	102662.0	1.80
93N1318	1013.0	28.72	621	8	134	61	79848.0	0.00
93N1330	1618.0	26.36	529	8	152	51	77947.0	5.40
93N1343	1299.0	21.10	449	7	139	55	85551.0	6.40
93N1350	1389.0	29.63	551	8	149	69	85552.0	0.05
93N1356	978.0	31.16	578	9	152	60	62738.0	0.50
93N1372	1527.0	26.19	586	8	150	52	108365.0	0.80
93N1384	1010.0	23.54	459	8	149	52	98860.0	0.00
Q117	1322.0	32.90	407	8	149	56	64639.0	0.05
Q117	1159.0	30.51	497	9	150	54	74145.0	0.00
Q117	1258.0	32.12	417	8	158	54	53232.0	0.60
Q117	1361.0	31.90	439	8	146	59	55133.0	0.05
Q117	1552.0	32.50	464	9	150	57	76046.0	0.00
Q117	1283.0	31.25	510	9	150	55	64639.0	0.00
Q120	1592.0	29.83	391	7	161	55	68441.0	2.00
Q120	1469.0	30.00	496	7	155	56	58935.0	0.05
Q120	1310.0	29.03	386	7	156	49	45628.0	1.00
Q120	1742.0	32.30	475	7	160	55	85551.0	1.20
Q120	1619.0	28.10	455	7	158	54	76046.0	0.60
Q120	1316.0	26.26	418	8	159	51	53232.0	0.60
Q135	881.0	24.04	600	8	154	51	81749.0	1.20
Q135	1184.0	28.35	579	8	156	51	98859.0	2.00
Q135	1116.0	26.04	694	9	157	52	93156.0	0.10
Q135	1218.0	30.00	509	8	156	50	76046.0	0.05
Q135	1233.0	27.07	632	8	162	52	95057.0	4.80
Q135	1386.0	27.20	445	8	157	50	89354.0	0.05
85S1185	1070.0	23.93	520	8	158	55	62738.0	0.20
87S7148	1212.0	25.32	532	9	167	55	93156.0	3.00

APPENDIX 5 Clonal means for pre-harvest CCS and appearance grade (July), and harvest data (September) determined in the first-ratoon crop of the series 1 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
BJ7451	12.26	8.50	17.92	8.50	11.25	12.60
84C252	12.11	9.50	14.86	9.00	11.91	5.78
84C275	14.18	7.00	15.10	6.00	7.94	4.85
84C621	14.71	7.00	16.45	7.00	9.26	5.60
89C6015	13.33	4.00	15.08	6.50	8.60	2.82
MY5514	11.48	8.50	14.61	7.50	9.93	3.27
91N363	14.49	8.50	19.72	8.50	11.25	11.58
91N1187	12.38	7.50	18.11	7.00	9.26	11.81
91N1193	12.31	6.50	17.35	7.50	9.93	8.56
91N1198	12.19	8.00	16.95	7.50	9.93	9.82
91N1218	13.64	7.00	18.02	8.00	10.59	9.43
91N1225	11.20	6.50	14.48	6.00	7.94	4.46
91N1232	12.89	7.00	18.47	7.00	9.26	10.01
91N1237	12.25	8.50	17.83	9.00	11.91	7.64
91N1257	12.92	8.00	18.54	8.50	11.25	11.36
91N1266	12.09	5.00	15.20	6.00	7.94	5.27
91N1271	11.78	7.50	15.34	3.00	3.97	2.69
91N1279	11.38	7.00	16.14	7.50	9.93	7.20
91N1280	12.86	7.50	15.51	8.00	10.59	8.39
91N1306	14.15	8.50	17.77	8.50	11.25	12.57
91N1325	12.12	6.50	13.82	5.00	6.62	3.73
91N1362	13.62	7.00	18.24	6.50	8.60	5.60
91N1386	12.51	5.50	16.71	2.00	2.65	0.91
91N1406	13.85	7.00	15.70	7.00	9.26	7.87
91N1422	12.84	7.00	19.52	6.50	8.60	9.27
91N1435	12.04	7.00	17.99	7.00	9.26	8.34
91N2026	13.13	8.00	18.91	7.00	9.26	8.35
91N2030	11.32	7.00	13.85	6.00	7.94	4.85
91N2054	13.49	7.00	18.44	7.50	9.93	13.05
91N2179	12.65	6.00	17.50	6.00	7.94	6.38
91N2249	13.20	5.50	15.65	6.00	7.94	6.07
91N2250	10.50	5.50	13.01	6.50	8.60	2.81
91N2274	13.82	6.00	17.72	8.00	10.59	10.42
91N2279	13.69	8.00	16.45	7.00	9.26	5.81
91N2388	10.18	5.00	17.18	8.00	10.59	2.67
91N2453	12.99	7.00	17.77	7.50	9.93	7.93
91N2795	13.42	7.00	18.22	8.50	11.25	4.81
91N2813	12.01	6.50	18.57	6.50	8.60	5.70
91N2862	12.03	8.50	16.93	8.50	11.25	11.59
91N2862	13.17	7.50	17.89	8.00	10.59	8.56
91N2904	12.37	6.50	14.75	6.50	8.60	4.15
91N2904	12.78	5.00	17.88	6.50	8.60	8.88
91N2936	13.98	9.50	20.37	10.00	13.24	12.95
91N2967	13.43	8.50	19.54	8.50	11.25	13.78
91N2971	12.51	6.50	16.97	6.50	8.60	7.49
91N2976	13.15	6.00	18.27	7.00	9.26	10.35
91N2988	13.50	5.50	16.75	4.00	5.29	3.82
91N2997	13.20	5.50	17.11	6.00	7.94	5.82
91N2998	12.02	6.00	17.55	6.00	7.94	5.18
91N3008	12.40	8.00	18.97	8.00	10.59	8.23
91N3020	13.36	7.00	14.65	7.00	9.26	3.81
91N3021	12.09	6.50	18.28	6.50	8.60	6.55
91N3029	12.45	8.50	18.61	8.00	10.59	13.27
91N3053	12.37	8.50	18.40	8.50	11.25	10.20
91N3073	11.80	8.50	18.46	8.50	11.25	13.14
91N3101	12.74	6.50	15.05	7.00	9.26	7.61
91N3129	12.98	7.50	17.52	7.50	9.93	8.33
91N3147	13.35	8.00	18.48	7.00	9.26	8.89
91N3252	13.68	8.50	15.97	7.50	9.93	5.44
91N3285	12.84	5.50	17.12	6.00	7.94	5.00
91N3288	12.92	6.50	14.41	6.50	8.60	4.84
91N3307	14.55	7.50	18.85	7.00	9.26	5.82
91N3336	11.92	6.00	17.90	6.00	7.94	8.64
91N3378	11.20	7.50	16.73	7.50	9.93	8.46

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
91N3393	14.44	7.00	15.84	7.00	9.26	5.02
91N3440	12.66	7.00	16.80	7.00	9.26	9.13
91N3447	14.03	6.50	18.79	7.00	9.26	9.13
91N3459	13.44	6.00	11.89	5.00	6.62	2.68
91N3460	13.15	7.00	19.19	7.00	9.26	7.79
91N3487	13.26	8.50	18.34	8.50	11.25	14.49
91N3492	13.48	8.50	19.06	8.00	10.59	15.63
91N3504	13.11	6.50	15.62	7.00	9.26	6.20
91N3518	13.44	7.00	17.52	7.00	9.26	8.65
91N3563	12.74	6.00	17.11	6.50	8.60	9.89
91N3620	14.93	7.50	19.06	8.00	10.59	9.18
91N3620	14.03	7.00	18.70	7.50	9.93	8.22
91N3647	12.70	6.50	17.87	7.00	9.26	9.01
91N3658	11.07	7.50	18.98	8.0	10.59	14.05
91N3661	13.84	7.00	18.58	7.00	9.26	11.21
91N3666	13.56	7.00	18.00	5.00	6.62	6.31
91N3725	13.95	7.50	17.63	7.50	9.93	10.62
91N3745	13.33	7.00	18.06	7.00	9.26	6.71
91N3760	11.48	6.50	15.60	4.00	5.29	5.94
91N3767	13.02	5.00	17.67	4.00	5.29	7.17
91N3770	13.71	7.50	14.32	7.50	9.93	5.79
91N3789	12.33	6.50	17.54	6.00	7.94	7.81
91N3854	12.05	7.00	16.63	7.00	9.26	10.57
91N3877	11.98	7.00	18.35	8.50	11.25	11.07
91N3916	12.30	4.00	18.30	6.50	8.60	6.39
91N6010	14.76	6.50	16.66	6.50	8.60	6.64
93N35	13.69	7.50	18.55	7.00	9.26	10.33
93N64	12.50	7.00	15.10	6.50	8.60	8.85
93N65	13.43	7.00	17.60	6.50	8.60	9.72
93N68	13.10	7.00	19.14	7.00	9.26	8.80
93N77	12.83	7.00	18.68	6.50	8.60	8.62
93N78	14.58	6.50	17.90	6.50	8.60	7.38
93N83	13.83	8.00	18.57	8.00	10.59	13.84
93N87	11.89	7.00	17.58	7.50	9.93	9.63
93N89	13.23	7.50	18.24	7.50	9.93	8.98
93N95	13.29	6.50	19.22	6.00	7.94	9.26
93N125	12.18	6.50	14.66	6.00	7.94	6.71
93N157	13.58	6.00	19.04	6.50	8.60	6.25
93N227	13.69	7.00	16.30	6.50	8.60	6.51
93N240	11.79	7.00	18.19	7.50	9.93	16.75
93N291	13.49	7.50	17.68	7.50	9.93	9.97
93N297	10.58	5.00	14.43	4.00	5.29	1.82
93N310	13.85	5.50	19.78	7.00	9.26	13.30
93N328	13.18	4.50	19.67	6.50	8.60	9.64
93N338	13.22	8.00	18.38	7.50	9.93	12.37
93N360	14.17	7.00	14.94	7.50	9.93	4.82
93N361	13.15	6.50	18.42	7.00	9.26	6.64
93N387	13.53	6.50	17.54	6.50	8.60	9.11
93N392	11.30	6.50	14.60	6.00	7.94	7.03
93N408	14.28	8.00	19.05	7.50	9.93	9.81
93N412	9.56	6.50	15.25	7.00	9.26	5.33
93N455	11.25	6.50	12.29	4.00	5.29	3.84
93N465	12.60	6.50	16.65	5.00	6.62	5.16
93N519	14.36	6.50	15.23	6.50	8.60	7.51
93N521	13.35	7.50	18.78	8.00	10.59	11.97
93N531	13.48	9.50	14.99	9.50	12.57	9.94
93N575	12.23	6.50	17.02	7.00	9.26	9.43
93N577	14.51	6.50	18.55	7.00	9.26	12.84
93N578	12.38	8.00	18.28	8.50	11.25	13.20
93N580	13.93	5.50	15.50	4.00	5.29	3.82
93N630	10.66	8.00	18.46	9.00	11.91	12.79
93N631	13.03	6.50	14.95	7.00	9.26	9.44
93N640	12.53	7.50	18.49	8.00	10.59	10.63
93N644	12.90	6.50	18.26	4.00	5.29	5.89
93N738	12.54	7.50	18.32	7.50	9.93	12.03
93N742	13.14	6.50	14.41	6.50	8.60	7.34
93N745	14.61	6.50	18.90	6.00	7.94	4.24
93N762	12.14	8.00	19.07	8.00	10.59	11.44
93N785	12.68	6.50	13.97	6.50	8.60	4.34
93N789	14.18	7.50	18.91	7.50	9.93	11.65

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
93N803	12.86	7.50	13.85	8.00	10.59	7.15
93N811	14.59	7.50	18.21	7.50	9.93	8.65
93N816	13.14	6.50	17.61	6.50	8.60	9.32
93N819	13.35	7.00	18.03	7.50	9.93	12.57
93N820	12.22	7.50	18.81	7.50	9.93	10.52
93N825	13.05	7.00	18.15	7.50	9.93	6.60
93N826	12.23	7.00	14.25	7.50	9.93	7.97
93N830	14.09	6.50	18.24	6.50	8.60	3.78
93N852	11.63	6.50	13.46	2.00	2.65	1.80
93N893	13.16	7.00	15.57	7.50	9.93	7.78
93N914	12.77	6.50	16.04	3.00	3.97	3.27
93N921	14.25	9.00	19.08	8.00	10.59	9.70
93N924	13.10	9.00	18.16	8.50	11.25	12.70
93N925	12.69	8.00	19.36	7.00	9.26	12.16
93N926	13.83	7.50	19.65	7.00	9.26	12.50
93N932	13.04	8.50	18.55	9.00	11.91	16.76
93N955	14.08	5.50	18.56	6.00	7.94	9.53
93N957	13.49	6.00	18.83	6.50	8.60	9.37
93N960	14.13	6.50	18.72	4.00	5.29	4.98
93N973	12.68	6.50	16.63	6.00	7.94	6.34
93N983	12.08	7.50	13.99	7.00	9.26	6.44
93N984	11.17	6.50	17.21	6.50	8.60	6.60
93N1004	14.22	8.50	18.78	8.00	10.59	11.56
93N1005	12.91	8.00	18.08	8.00	10.59	11.08
93N1045	12.69	4.00	13.94	4.00	5.29	3.13
93N1047	12.63	7.00	18.18	8.00	10.59	12.50
93N1049	13.27	6.00	17.32	6.00	7.94	7.79
93N1057	14.11	7.00	18.58	7.00	9.26	9.70
93N1059	12.85	7.50	16.05	7.00	9.26	8.89
93N1073	13.37	7.00	19.25	7.00	9.26	7.40
93N1102	13.91	7.00	15.94	7.00	9.26	9.28
93N1141	13.73	6.50	17.13	6.50	8.60	6.46
93N1154	13.90	6.50	17.29	4.00	5.29	4.97
93N1160	12.93	7.50	17.76	6.50	8.60	8.30
93N1178	13.49	8.00	15.93	7.50	9.93	7.58
93N1217	12.42	8.00	17.38	7.50	9.93	10.54
93N1234	13.91	7.50	18.71	8.00	10.59	11.81
93N1239	12.90	7.00	19.02	7.00	9.26	8.83
93N1258	12.94	6.00	18.56	2.00	2.65	1.00
93N1262	14.57	8.00	19.32	7.50	9.93	11.05
93N1264	12.67	5.00	17.49	6.00	7.94	3.94
93N1301	13.47	8.50	19.56	7.50	9.93	12.96
93N1303	13.35	7.00	17.77	7.50	9.93	11.76
93N1318	10.22	7.00	17.63	8.50	11.25	7.15
93N1330	12.05	6.00	17.88	5.00	6.62	6.72
93N1343	13.34	5.00	15.14	2.00	2.65	1.67
93N1350	12.47	7.50	14.37	6.50	8.60	8.13
93N1356	12.92	7.50	18.03	7.50	9.93	9.27
93N1372	13.14	6.50	17.76	7.00	9.26	10.20
93N1384	12.42	9.50	18.44	9.50	12.57	12.76
Q117	13.93	8.50	19.54	8.00	10.59	15.02
Q117	12.66	7.50	16.42	8.00	10.59	7.54
Q117	12.64	8.00	19.70	7.50	9.93	10.42
Q117	13.03	8.00	18.84	8.00	10.59	12.91
Q117	12.34	8.50	19.04	8.50	11.25	12.75
Q117	13.70	9.00	16.20	7.50	9.93	8.99
Q120	13.86	8.50	18.58	7.50	9.93	10.66
Q120	12.05	7.50	17.97	7.00	9.26	10.81
Q120	13.30	7.50	18.75	7.00	9.26	7.72
Q120	12.14	8.00	15.67	7.50	9.93	9.27
Q120	13.52	8.00	19.24	7.50	9.93	11.13
Q120	13.05	8.00	18.31	7.50	9.93	7.60
Q135	13.47	8.00	19.71	7.00	9.26	9.43
Q135	12.21	7.00	14.90	6.50	8.60	7.07
Q135	12.01	6.50	18.45	6.50	8.60	9.22
Q135	13.28	8.50	14.82	8.50	11.25	7.85
Q135	13.43	8.00	19.78	7.00	9.26	11.44
Q135	13.70	9.50	16.18	9.00	11.91	9.76
85S1185	11.23	6.50	14.18	6.50	8.60	5.92
87S7148	12.70	6.50	13.77	6.00	7.94	5.31

APPENDIX 6 Summary of the plant and first-ratoon crop clonal evaluations for the series 1 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
BJ7451	12.73	6.75	16.34	8.75	11.18	12.79
84C252	12.18	8.75	15.43	9.25	11.81	7.56
84C275	14.39	4.50	15.76	6.5	8.29	8.01
84C621	15.49	3.50	16.91	7.00	8.95	6.78
89C6015	13.23	2.50	15.97	5.75	7.38	3.33
MY5514	11.77	8.75	14.85	8.50	10.82	5.44
91N363	13.66	8.25	18.25	8.75	11.18	9.59
91N1187	12.29	6.25	17.09	8.00	10.18	14.73
91N1193	12.57	6.25	16.25	7.50	9.59	8.71
91N1198	12.72	7.00	15.39	7.50	9.59	7.99
91N1218	13.19	7.00	17.02	8.00	10.22	9.81
91N1225	12.00	4.50	14.13	7.00	8.90	5.27
91N1232	12.97	6.50	16.86	6.00	7.71	8.62
91N1237	12.32	8.00	16.99	8.50	10.88	8.21
91N1257	13.17	8.25	17.15	8.25	10.55	8.05
91N1266	11.64	2.75	14.88	4.00	5.21	3.63
91N1271	12.08	7.75	15.30	4.75	5.99	5.17
91N1279	11.87	5.00	15.52	7.75	9.89	7.74
91N1280	12.92	7.25	15.68	8.25	10.54	9.81
91N1306	13.73	8.25	17.45	8.50	10.87	12.15
91N1325	12.20	6.25	14.18	5.00	6.39	4.27
91N1362	13.61	6.00	17.45	6.75	8.62	6.16
91N1386	12.54	2.75	15.96	2.50	3.17	1.66
91N1406	13.93	8.00	16.29	7.25	9.26	9.61
91N1422	13.48	6.00	17.96	6.75	8.62	8.51
91N1435	11.86	7.00	16.73	6.75	8.63	7.85
91N2026	13.49	8.00	17.67	8.00	10.18	8.84
91N2030	12.49	6.50	14.81	6.75	8.60	5.54
91N2054	15.05	6.00	16.95	7.50	9.59	12.94
91N2179	12.12	4.50	15.43	6.75	8.60	6.63
91N2249	13.21	3.25	15.20	4.00	5.21	3.85
91N2250	11.44	2.75	12.87	6.75	8.62	3.53
91N2274	13.88	6.00	17.02	8.75	11.15	10.86
91N2279	13.94	7.50	16.11	7.75	9.87	8.03
91N2388	11.85	3.00	16.32	6.50	8.38	3.62
91N2453	13.49	5.00	16.61	7.50	9.59	8.11
91N2795	13.62	7.25	17.36	8.50	10.87	5.93
91N2813	12.50	5.75	17.33	7.75	9.85	7.01
91N2862	12.29	8.75	15.75	8.75	11.18	11.02
91N2862	13.52	6.25	16.83	8.00	10.22	8.97
91N2904	13.04	6.25	15.18	6.75	8.62	5.96
91N2904	13.21	5.50	16.39	6.25	8.00	7.83
91N2936	13.92	8.25	18.50	9.75	12.47	13.07
91N2967	13.20	8.00	18.16	8.25	10.55	13.32
91N2971	12.39	3.25	15.64	6.25	8.00	7.01
91N2976	13.62	5.00	17.14	7.75	9.87	11.65
91N2988	12.70	3.00	15.71	3.50	4.50	3.34
91N2997	12.38	3.25	15.92	6.50	8.29	6.41
91N2998	12.32	5.00	15.80	4.50	5.82	4.02
91N3008	12.12	8.00	17.47	9.00	11.46	9.66
91N3020	14.36	3.50	15.23	5.50	7.09	3.97
91N3021	12.82	3.25	17.46	6.75	8.62	5.37
91N3029	12.36	8.75	16.49	8.50	10.85	12.61
91N3053	12.54	8.75	16.48	9.00	11.48	11.36
91N3073	12.47	7.25	16.75	8.50	10.87	11.48
91N3101	12.97	3.75	15.68	7.25	9.26	8.24
91N3129	13.43	4.25	16.74	5.75	7.43	6.79
91N3147	13.03	6.00	17.44	7.00	8.95	8.35
91N3252	13.51	9.25	16.56	8.50	10.82	8.33
91N3285	13.48	4.75	16.49	5.50	7.05	4.50
91N3288	13.20	6.00	15.20	7.50	9.54	6.55
91N3307	14.13	5.75	17.87	6.75	8.63	7.74
91N3336	12.41	5.75	16.16	7.00	8.90	9.77
91N3378	12.26	6.75	16.34	8.25	10.52	9.61
91N3393	14.03	6.50	16.13	6.75	8.63	6.29
91N3440	12.51	7.00	16.11	8.00	10.18	9.56

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
91N3447	14.15	4.25	17.34	6.00	7.71	6.31
91N3459	13.17	5.50	12.62	5.50	7.01	3.52
91N3460	13.72	7.00	17.80	7.00	8.95	8.86
91N3487	13.14	8.75	17.41	8.75	11.18	14.22
91N3492	13.40	8.75	17.16	8.25	10.54	12.74
91N3504	13.26	6.25	15.59	7.25	9.26	7.07
91N3518	13.60	4.50	16.68	7.25	9.26	8.47
91N3563	12.41	6.50	16.30	5.25	6.76	7.83
91N3620	14.38	5.25	18.05	7.75	9.92	8.34
91N3620	13.15	6.25	17.34	7.25	9.28	8.18
91N3647	12.74	5.00	16.84	7.00	8.95	9.95
91N3658	12.08	7.75	17.43	8.75	11.15	14.35
91N3661	13.85	7.00	17.48	6.75	8.63	10.06
91N3666	13.89	3.50	17.40	6.00	7.62	7.97
91N3725	13.88	7.25	16.45	7.50	9.59	10.81
91N3745	13.70	5.00	17.14	7.50	9.56	7.85
91N3760	11.23	6.25	15.33	5.50	6.96	8.45
91N3767	12.78	6.00	16.54	5.25	6.65	8.98
91N3770	13.91	6.75	15.12	8.25	10.52	7.42
91N3789	11.54	5.00	16.31	6.00	7.67	7.26
91N3854	12.04	6.00	16.12	7.00	8.95	10.98
91N3877	12.24	8.00	16.80	8.00	10.25	9.62
91N3916	12.79	5.50	16.91	7.25	9.23	7.79
91N6010	14.62	5.75	16.59	5.75	7.38	5.90
93N35	14.56	6.75	17.29	6.75	8.63	9.83
93N64	12.89	7.00	15.27	6.25	8.00	7.68
93N65	12.37	7.00	16.48	6.50	8.30	8.62
93N68	13.44	6.00	17.31	7.00	8.95	8.79
93N77	12.74	7.00	17.34	6.75	8.62	9.29
93N78	15.08	3.25	17.00	6.25	8.00	7.22
93N83	13.76	9.00	17.36	8.75	11.15	14.53
93N87	12.22	6.00	16.77	7.25	9.28	8.40
93N89	13.32	6.75	17.35	7.75	9.89	9.81
93N95	13.53	4.75	17.43	6.00	7.67	7.55
93N125	10.71	6.75	14.52	6.25	7.97	7.00
93N157	12.46	3.00	17.39	3.75	4.92	3.58
93N227	14.08	6.50	16.25	5.75	7.38	6.70
93N240	11.58	6.00	16.82	6.75	8.66	13.57
93N291	13.04	4.25	16.26	7.75	9.89	9.97
93N297	10.36	4.25	12.99	3.50	4.50	1.91
93N310	12.76	4.25	18.03	7.75	9.87	13.68
93N328	13.57	4.25	17.95	6.50	8.30	10.57
93N338	13.38	8.00	17.10	7.50	9.59	11.21
93N360	13.43	7.00	15.18	8.00	10.21	7.37
93N361	13.94	7.25	17.37	7.75	9.87	8.38
93N387	13.26	6.75	16.19	6.75	8.62	9.51
93N392	10.79	5.25	13.74	6.25	7.97	7.65
93N408	14.34	7.00	18.09	7.75	9.89	9.69
93N412	10.56	6.75	13.44	7.00	8.95	5.54
93N455	11.42	5.25	13.05	5.25	6.65	5.56
93N465	13.16	4.75	16.23	4.50	5.78	4.04
93N519	14.09	3.75	16.13	7.00	8.93	9.45
93N521	13.42	8.25	17.50	8.50	10.85	12.29
93N531	13.30	9.25	15.22	9.50	12.14	9.95
93N575	12.49	6.75	16.62	7.50	9.56	10.51
93N577	13.59	4.25	17.55	7.50	9.56	14.27
93N578	12.12	8.50	16.76	8.75	11.18	12.76
93N580	14.59	5.75	16.79	5.50	6.96	8.13
93N630	11.22	6.50	17.09	8.50	10.88	11.77
93N631	12.87	6.75	15.78	7.50	9.56	11.39
93N640	13.05	7.75	17.38	8.25	10.54	10.32
93N644	13.37	5.25	17.23	4.25	5.42	5.87
93N738	12.89	6.75	16.88	7.75	9.89	10.47
93N742	13.19	7.25	14.89	7.75	9.85	9.86
93N745	14.52	3.25	17.87	4.50	5.82	3.86
93N762	12.21	7.50	17.89	8.00	10.22	13.07
93N785	12.65	4.25	14.79	5.75	7.38	5.29
93N789	13.65	7.50	17.61	7.75	9.89	12.73
93N803	13.13	7.75	14.99	8.50	10.85	9.65
93N811	14.79	6.75	17.34	8.25	10.52	9.36

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
93N816	13.20	6.25	16.17	7.00	8.93	10.29
93N819	13.24	5.00	16.61	8.00	10.21	12.59
93N820	12.15	4.00	17.17	7.25	9.28	9.74
93N825	12.62	5.50	16.47	7.25	9.28	6.09
93N826	11.65	6.50	15.02	7.75	9.89	9.27
93N830	12.96	4.75	17.48	7.25	9.23	5.23
93N852	11.02	6.25	14.01	3.00	3.79	3.17
93N893	12.29	5.00	15.41	7.25	9.28	7.33
93N914	13.51	7.25	15.59	5.75	7.22	6.88
93N921	14.09	9.00	17.83	8.75	11.15	9.87
93N924	12.90	8.50	17.10	8.75	11.18	13.48
93N925	13.26	6.50	17.75	7.75	9.87	12.24
93N926	13.38	6.25	17.66	5.50	7.09	9.34
93N932	13.14	6.25	17.27	8.25	10.58	13.85
93N955	13.48	6.25	17.46	5.00	6.43	7.75
93N957	14.26	7.50	17.71	7.50	9.54	10.85
93N960	14.29	6.75	17.80	6.00	7.58	8.13
93N973	12.76	5.25	16.07	7.25	9.21	12.43
93N983	12.36	6.25	14.89	7.25	9.26	8.45
93N984	12.64	5.25	15.69	7.50	9.54	6.87
93N1004	13.53	8.75	17.57	7.75	9.92	11.10
93N1005	13.20	7.00	17.25	8.75	11.15	11.44
93N1045	13.45	2.00	14.94	5.75	7.27	5.41
93N1047	13.41	8.50	17.05	8.50	10.85	13.14
93N1049	13.30	4.50	16.64	5.00	6.43	6.33
93N1057	14.33	3.50	17.64	5.50	7.09	7.39
93N1059	12.61	7.75	16.42	7.50	9.56	10.78
93N1073	14.03	7.25	18.10	7.50	9.56	8.19
93N1102	13.15	7.00	16.33	7.75	9.87	8.29
93N1141	13.76	3.25	16.34	6.75	8.62	7.73
93N1154	13.03	4.25	16.17	3.00	3.88	3.65
93N1160	12.74	8.25	16.49	6.75	8.62	8.97
93N1178	13.37	5.00	15.76	7.00	8.97	8.07
93N1217	12.11	7.50	16.32	8.00	10.21	8.33
93N1234	13.94	7.25	17.70	8.25	10.54	10.75
93N1239	13.10	6.00	17.65	7.25	9.26	9.68
93N1258	13.45	3.50	18.11	4.50	5.64	5.76
93N1262	14.17	7.50	17.90	7.50	9.59	10.09
93N1264	12.45	4.50	16.84	6.00	7.67	4.70
93N1301	13.10	7.75	18.12	8.00	10.21	13.6
93N1303	13.34	7.00	16.91	7.50	9.59	11.88
93N1318	10.99	7.00	17.36	9.00	11.48	9.95
93N1330	12.03	6.00	16.26	4.50	5.78	5.37
93N1343	12.84	2.50	15.87	3.00	3.79	3.42
93N1350	11.69	7.50	14.71	5.50	7.08	7.41
93N1356	12.95	7.25	16.34	8.25	10.52	8.15
93N1372	12.99	6.25	17.29	7.25	9.26	11.66
93N1384	13.01	6.75	16.97	8.75	11.21	10.38
Q117	14.61	8.25	18.07	8.25	10.54	13.47
Q117	14.06	4.75	16.68	7.75	9.92	7.78
Q117	12.91	6.50	18.09	6.75	8.66	8.81
Q117	13.71	8.50	17.75	8.25	10.54	12.74
Q117	13.12	8.75	17.77	8.75	11.18	11.85
Q117	14.44	7.50	15.95	8.25	10.52	10.09
Q120	13.67	6.75	16.95	7.00	8.97	8.09
Q120	12.58	6.75	16.20	7.00	8.95	9.40
Q120	13.28	3.75	17.66	7.25	9.26	7.52
Q120	12.66	7.00	15.55	7.25	9.28	9.09
Q120	13.72	7.50	17.74	8.25	10.52	10.38
Q120	13.43	7.50	17.48	8.00	10.21	9.43
Q135	13.14	6.50	18.40	7.50	9.56	11.39
Q135	12.72	6.00	15.73	7.25	9.23	8.82
Q135	11.98	6.75	16.91	7.50	9.54	8.74
Q135	13.29	6.75	15.94	8.75	11.18	9.99
Q135	13.52	7.50	17.95	8.00	10.18	11.54
Q135	13.93	8.75	16.52	9.25	11.81	11.27
85S1185	11.96	4.25	13.99	6.75	8.62	6.68
87S7148	13.19	6.25	14.21	6.50	8.29	6.39

APPENDIX 7 Clonal means for pre-harvest CCS and appearance grade (June) and harvest data (September) determined in the plant crop of the series 1 HF2 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
91N1187	13.59	6.67	17.04	7.33	10.86	14.86
91N1306	13.25	7.17	17.50	8.00	11.85	9.11
91N1406*	14.06	6.67	17.86	7.50	11.11	14.30
91N2274	14.29	6.83	16.81	6.67	9.88	10.83
91N2936	14.09	7.00	17.54	7.83	11.60	6.52
91N2967*	15.44	7.83	17.98	8.67	12.84	15.27
91N2976	13.73	7.50	16.85	6.83	10.12	11.78
91N2026	14.43	6.83	17.65	6.00	8.89	9.16
91N3252	11.98	7.50	17.24	8.33	12.34	10.85
91N3487*	13.61	7.83	17.27	8.00	11.85	14.39
91N3658	12.64	7.50	17.87	6.83	10.12	9.91
93N83*	14.96	8.17	16.61	8.67	12.84	14.24
93N310	13.53	6.33	15.96	6.50	9.63	10.23
93N519	14.69	6.50	18.00	6.17	9.14	14.20
93N577*	16.05	7.83	18.32	7.33	10.86	11.42
93N631	15.65	7.17	17.95	7.00	10.37	7.67
93N762	14.66	7.50	17.65	6.50	9.63	7.67
93N789	14.91	6.83	17.64	5.50	8.15	6.46
93N803	12.73	7.50	16.13	7.83	11.60	7.31
93N811	14.56	6.67	16.57	7.17	10.62	13.20
93N921*	13.76	8.00	17.74	8.67	12.84	11.99
93N924	13.65	7.33	16.74	7.67	11.36	14.42
93N925	16.15	7.83	17.66	7.83	11.60	11.32
93N957	15.43	7.00	18.23	7.67	11.36	9.36
93N1005	14.38	7.17	17.18	7.50	11.11	14.59
93N1047	14.68	8.00	16.70	7.50	11.11	10.62
93N1059	14.23	6.83	18.16	6.67	9.877	11.62
93N1301	13.32	7.50	16.96	7.00	10.37	14.46
93N1318	12.83	7.17	16.58	8.50	12.59	12.11
93N1372	13.58	7.00	16.17	7.00	10.37	10.34
Q120	14.23	6.67	16.19	6.50	9.63	7.18
Q120	14.57	7.00	18.44	7.00	10.37	8.03
Q135	13.33	6.67	17.53	6.83	10.12	12.75
Q135	13.61	6.83	16.35	7.17	10.62	11.86
Q174$^{\phi}$	14.11	6.50	17.56	6.33	9.38	10.16
Q174$^{\phi}$	14.00	6.50	17.55	6.67	9.88	10.49

*Selected clones advanced to maximum propagation in 2001

APPENDIX 8 Clonal means for pre-harvest CCS and appearance grade (June) and four harvest (September) traits determined in the first-ratoon crop of the series 1 HF2 trial

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
91N1187	17.58	7.00	10.61	11.70
91N1306	16.88	5.17	7.82	5.06
*91N1406	17.55	6.00	9.07	9.67
91N2026	17.85	6.17	9.34	8.74
91N2274	16.77	7.83	11.89	11.71
91N2936	18.65	8.50	12.96	9.87
*91N2967#	17.28	7.33	11.14	11.46
91N2976	16.68	7.33	11.13	11.16
91N3252	18.16	8.50	12.91	13.32
*91N3487#	17.68	8.33	12.66	13.99
91N3658	18.67	7.50	11.38	13.93
*93N83	17.20	7.00	10.63	9.98
93N310	15.74	4.00	6.10	5.16
93N519	18.08	3.67	5.54	6.82
*93N577	18.18	7.50	11.39	12.05
93N631	16.95	7.17	10.90	8.16
93N762	18.61	7.50	11.39	11.41
93N789	17.47	8.00	12.15	8.86
93N803	16.54	7.50	11.40	9.81
93N811	18.66	4.67	7.05	8.71
*93N921	17.35	8.00	12.18	10.72
93N924	17.74	7.00	10.63	12.31
93N925	17.72	7.00	10.64	9.93
93N957	19.42	8.00	12.15	14.09
93N1005	16.99	5.83	8.92	9.01
93N1047	18.10	7.50	11.39	12.59
93N1059	17.87	5.17	7.82	8.99
93N1301	16.69	6.00	9.11	9.73
93N1318	17.27	7.50	11.40	10.80
93N1372	15.41	5.50	8.35	6.69
Q120	18.82	6.83	10.39	10.62
Q120	18.61	6.83	10.37	11.27
Q135	17.27	6.33	9.61	10.92
Q135	17.33	6.67	10.14	9.98
Q174$^{\phi}$	16.33	6.67	10.12	9.66
Q174$^{\phi}$	16.22	6.17	9.36	7.56

* Clones (6) advanced to maximum propagation.
\# Clones (2) advanced to core selection propagation.

APPENDIX 9 Clonal means for seven ideotypic traits and erectness determined in the plant crop of the series 2 HF1 trial

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	# Stalks /ha	Erectness estimate
86A700	2202	23.70	360	8	149	52	75556.0	0.05
87A577	2302	24.54	414	8	139	49	86667.0	4.80
87A1622	2011	24.95	303	8	160	49	122223.0	6.40
88A515	1835	28.09	451	7	167	56	93334.0	0.05
88A861	2453	27.78	410	8	161	57	91112.0	1.80
88A1600	2302	30.05	543	10	154	62	82223.0	1.20
89A3112	2165	34.04	397	9	174	63	80000.0	7.20
89A3598	1659	27.38	432	9	141	48	37778.0	0.00
94A6003	2162	28.22	485	9	173	54	53334.0	0.10
92B2301	2225	21.51	336	8	137	47	82222.0	1.80
85C749	2438	23.93	471	9	142	47	60000.0	1.80
91N1418	2476	32.62	503	10	145	66	73334.0	1.00
91N3839	2085	24.82	446	8	154	54	93333.0	0.05
92N55	1460	26.78	561	8	157	62	64445.0	0.00
92N157	2072	31.26	340	9	174	57	77778.0	4.00
92N176	2465	28.26	511	9	154	49	62223.0	2.10
92N228	2233	27.48	523	10	154	59	80000.0	2.70
92N230	1876	25.41	306	8	162	49	82222.0	0.05
92N264	1937	19.94	235	7	162	44	68889.0	0.50
92N651	2009	23.18	570	9	150	51	97778.0	1.50
92N754	1914	26.51	332	8	154	60	77778.0	3.60
92N936	2584	24.96	344	9	167	58	115556.0	5.60
92N942	2309	30.88	390	8	156	50	51111.0	0.20
92N1059	2365	24.41	394	7	152	59	97778.0	0.20
92N1127	2029	23.21	266	8	129	45	73333.0	6.30
92N1189	3038	28.62	338	8	156	59	80000.0	9.00
92N1194	2291	22.63	370	8	155	51	113334.0	5.60
92N1317	2256	28.74	304	9	159	55	97778.0	6.30
92N1372	2540	27.01	281	8	139	56	124445.0	9.00
92N1519	2330	27.96	392	8	142	62	44445.0	0.90
92N1682	2414	31.30	385	9	178	61	133333.0	6.30
92N1712	2281	31.06	423	8	145	59	57778.0	3.60
92N1782	2749	26.12	433	8	158	51	124445.0	9.00
92N1983	1369	25.72	526	10	145	59	75556.0	0.00
92N2337	1908	22.03	437	8	151	57	93333.0	0.05
92N2368	2496	26.33	629	9	183	57	86667.0	1.20
92N2439	2067	28.57	300	8	162	57	88889.0	6.30
92N2447	2028	28.03	258	8	159	45	80000.0	0.80
93N30	1954	28.29	258	8	148	72	115556.0	7.00
93N137	2190	26.16	373	8	149	54	57778.0	2.70
93N187	1700	29.18	262	8	162	50	64445.0	0.10
93N288	2433	26.24	292	8	153	50	115556.0	6.30
93N486	1915	29.52	343	9	141	56	102223.0	7.20
93N840	1906	28.39	411	8	186	53	71112.0	0.40
93N1043	1722	26.62	275	8	135	47	57778.0	0.00
93N1135	2120	26.02	481	9	184	51	102222.0	3.00
93N1144	2605	30.77	236	8	153	58	77778.0	7.00
93N1150	2051	30.99	397	9	165	51	71111.0	0.05
93N1154	2400	27.23	452	8	184	60	77778.0	0.70
93N1263	1991	27.73	391	9	142	60	73334.0	5.40
93N1328	1831	27.69	425	8	140	53	73334.0	0.00
93N1358	2604	26.48	455	9	136	61	75556.0	8.00
93N1363	2522	31.05	300	9	165	57	111111.0	4.90
93N1377	1908	26.50	413	8	160	56	73334.0	0.80
94N28	1944	25.20	392	7	146	51	80000.0	0.05
94N30	2574	25.70	316	8	126	50	95556.0	7.20
94N40	2270	27.63	504	8	169	52	60000.0	4.50
94N51	2450	23.54	401	7	177	46	124445.0	2.40
94N60	2193	30.19	666	9	170	60	64445.0	5.60
94N65	1939	31.13	344	8	128	53	73334.0	2.10
94N84	1906	21.05	477	8	173	51	86667.0	0.00
94N105	2118	26.10	409	8	174	57	84445.0	0.40
94N113	2579	27.03	328	7	131	45	111112.0	8.00
94N131	2347	24.44	356	8	147	54	93334.0	6.30
94N133	2156	30.70	469	8	160	54	64445.0	1.60
94N206	2132	28.17	434	7	173	71	57778.0	0.20

Clone	Cane height (cm)	Stalk diameter (mm)	Cabbage length (mm)	# Leaves	Leaf length (cm)	Leaf width (mm)	# Stalks /ha	Erectness estimate
94N303	2244	21.50	308	8	126	50	97778.0	1.40
94N307	1570	20.49	371	8	154	53	71112.0	0.00
94N318	2321	30.58	448	8	152	52	95556.0	2.70
94N320	1944	26.18	280	7	143	48	77778.0	1.20
94N360	2159	25.34	377	8	128	48	86667.0	0.90
94N388	2028	35.91	503	9	155	60	66667.0	0.40
94N438	2542	29.06	594	9	143	53	80000.0	6.30
94N465	2060	34.46	468	9	165	63	86667.0	1.80
94N494	1496	22.23	456	8	149	57	53334.0	0.00
94N512	2436	25.59	505	8	141	65	62223.0	0.40
94N545	1954	26.50	395	9	154	53	100000.0	1.80
94N592	2044	33.02	338	8	171	61	82223.0	7.20
94N604	2114	25.75	478	8	136	54	66667.0	8.10
94N617	2491	26.02	348	8	178	53	117778.0	7.20
94N647	1971	27.60	599	9	164	53	71112.0	1.80
94N698	2331	26.75	389	8	161	54	82223.0	7.20
94N714	1874	25.33	677	11	163	47	77778.0	0.00
94N720	1808	23.76	348	8	145	44	48889.0	0.00
94N722	2218	28.27	497	9	157	48	55556.0	1.60
94N796	2366	26.57	621	9	159	61	71111.0	1.60
94N799	2343	27.48	320	7	168	48	106667.0	7.20
94N815	2186	28.85	334	8	190	65	111112.0	7.20
94N844	2095	26.23	315	7	125	48	104445.0	0.05
94N928	2322	27.35	262	7	152	53	106667.0	6.30
94N930	2063	25.91	285	7	164	46	113333.0	7.20
94N963	2339	31.12	630	9	152	63	73334.0	1.20
94N974	2561	29.25	306	8	155	58	91111.0	9.00
94N1012	1977	29.26	403	8	141	59	82222.0	1.80
94N1073	1694	31.11	329	7	151	62	53334.0	0.20
94N1085	1989	28.05	276	8	125	59	86667.0	0.10
94N1097	2065	27.06	493	8	132	57	68889.0	2.40
94N1099	2018	25.85	498	9	161	51	77778.0	2.70
94N1183	2189	32.48	437	8	161	50	75556.0	0.60
94N6006	2233	28.00	393	8	163	59	77778.0	6.30
Q120	2389	27.69	299	8	153	48	77778.	0.40
Q120	1937	29.16	277	7	156	45	71112.0	0.20
Q120	2356	28.84	309	7	145	49	97778.0	3.60
Q120	2029	29.73	269	7	153	48	100000.0	3.60
Q120	2557	28.25	252	7	153	50	104444.0	5.60
Q135	2032	23.58	595	9	156	51	66667.0	1.20
Q135	1869	27.11	591	8	157	53	100000.0	0.80
Q135	1722	27.50	505	9	153	53	82222.0	1.80
Q152	2194	25.06	435	7	168	53	84445.0	0.80
Q152	2178	24.86	675	8	174	52	84445.0	4.00
Q152	2314	23.50	449	7	164	50	62223.0	0.60
Q152	2322	25.70	311	7	170	50	111111.0	6.30

APPENDIX 10 Clonal means for pre-harvest CCS and appearance grade (July) and harvest data (September) in the plant crop of the series 2 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
86A700	14.78	8.00	14.48	8.50	11.46	8.91
87A577	15.81	7.5	16.27	6.50	8.76	10.92
87A1622	15.35	7.50	12.16	2.00	2.70	2.87
88A515	13.00	8.50	13.07	8.00	10.79	7.53
88A861	13.94	8.50	13.73	9.00	12.13	12.42
88A1600	15.96	9.00	14.46	8.50	11.46	12.71
89A3112	15.55	7.50	14.17	5.00	6.74	6.93
89A3598	15.25	7.00	13.94	2.00	2.70	0.41
94A6003	14.44	8.00	14.06	7.00	9.44	8.10
92B2301	15.97	8.00	13.83	8.00	10.79	6.81
85C749	15.02	7.00	13.94	7.00	9.44	6.73
91N1418	16.23	8.50	15.34	8.50	11.46	12.88
91N3839	14.46	8.00	12.80	8.00	10.79	6.53
92N55	13.78	9.50	14.86	9.00	12.13	7.69
92N157	16.53	8.00	16.33	8.50	11.46	13.27
92N176	15.89	8.50	15.01	9.50	12.81	13.76
92N228	15.08	8.00	14.55	7.00	9.44	9.07
92N230	15.06	9.50	14.80	8.00	10.79	7.54
92N264	15.83	7.50	13.95	7.50	10.11	4.28
92N651	13.03	8.50	13.19	7.50	10.11	6.58
92N754	15.80	7.50	15.06	6.50	8.76	6.50
92N936	14.58	5.50	13.39	8.00	10.79	9.19
92N942	16.37	8.00	15.72	7.50	10.11	12.35
92N1059	14.99	9.00	12.45	9.50	12.81	11.21
92N1127	14.88	5.50	13.18	5.00	6.74	3.76
92N1189	13.43	6.00	12.68	3.00	4.04	3.17
92N1194	15.20	8.00	15.52	7.50	10.11	13.77
92N1317	14.11	6.50	15.27	6.50	8.76	14.21
92N1372	15.19	6.50	14.28	1.00	1.35	1.45
92N1519	15.80	8.50	15.14	8.00	10.79	11.61
92N1682	14.77	6.50	13.72	6.00	8.09	10.31
92N1712	15.86	6.50	15.75	2.00	2.70	3.07
92N1782	15.53	6.50	15.29	4.00	5.39	7.28
92N1983	16.90	9.00	14.48	8.50	11.46	9.98
92N2337	13.51	8.00	16.27	8.00	10.79	8.69
92N2368	14.21	7.50	12.16	7.00	9.44	8.93
92N2439	15.97	6.50	15.36	6.00	8.09	7.05
92N2447	16.76	8.50	13.07	7.50	10.11	8.16
93N30	12.26	6.50	13.73	7.50	10.11	8.79
93N137	15.34	8.00	14.46	8.50	11.46	9.75
93N187	15.25	8.50	14.17	8.50	11.46	4.85
93N288	17.02	7.50	13.94	7.00	9.44	13.95
93N486	11.07	6.00	14.06	1.00	1.35	1.05
93N840	14.50	7.00	13.83	7.00	9.44	5.31
93N1043	15.51	8.00	13.94	7.50	10.11	5.36
93N1135	14.47	6.50	15.34	7.50	10.11	11.05
93N1144	15.83	5.00	12.80	1.00	1.35	1.24
93N1150	15.62	9.50	14.86	9.00	12.13	11.54
93N1154	15.77	7.50	16.33	7.50	10.11	11.52
93N1263	16.07	7.00	15.01	6.00	8.09	6.67
93N1328	15.82	9.50	14.55	9.50	12.81	13.08
93N1358	14.33	6.50	14.80	3.00	4.04	4.50
93N1363	14.43	8.50	13.95	7.00	9.44	14.21
93N1377	14.63	8.50	13.19	8.50	11.46	10.99
94N28	14.72	8.00	15.06	7.50	10.11	11.06
94N30	14.00	6.50	13.39	6.50	8.76	6.39
94N40	16.55	6.50	15.72	3.00	4.04	3.45
94N51	14.91	7.50	12.45	8.00	10.79	11.83
94N60	12.94	6.00	13.18	5.00	6.74	5.43
94N65	15.71	7.50	12.68	7.00	9.44	7.54
94N84	14.92	8.50	15.52	8.50	11.46	10.26
94N105	13.75	9.50	15.27	9.50	12.81	16.09
94N113	12.90	6.50	14.28	6.00	8.09	5.43
94N131	14.64	7.50	15.14	7.00	9.44	11.13
94N133	16.14	6.50	13.72	1.00	1.35	1.39

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
94N206	13.68	9.00	15.75	9.50	12.81	7.85
94N303	12.64	7.50	15.29	7.00	9.44	5.91
94N307	15.11	7.50	13.37	8.50	11.46	5.52
94N318	15.47	8.00	14.59	5.50	7.42	7.18
94N320	14.83	8.50	14.56	8.00	10.79	5.58
94N360	15.43	7.00	12.42	6.00	8.09	6.10
94N388	15.50	8.00	13.81	7.00	9.44	10.16
94N438	13.35	7.00	14.23	6.00	8.09	7.62
94N465	10.32	8.50	12.78	8.50	11.46	10.96
94N494	15.16	9.00	13.68	9.00	12.13	6.05
94N512	13.29	7.00	14.50	8.00	10.79	10.10
94N545	15.44	5.50	13.79	2.00	2.70	2.62
94N592	14.77	7.00	14.88	7.50	10.11	11.04
94N604	15.11	7.00	12.97	6.50	8.76	6.64
94N617	15.42	5.00	14.29	5.00	6.74	7.37
94N647	13.84	8.50	12.57	8.00	10.79	8.63
94N698	13.23	7.00	12.40	7.00	9.44	6.40
94N714	14.83	8.50	14.20	6.50	8.76	7.04
94N720	14.17	8.00	13.17	6.50	8.76	5.63
94N722	12.65	8.00	12.18	7.50	10.11	5.96
94N796	14.15	8.50	13.66	7.00	9.44	10.3
94N799	16.08	5.00	15.34	3.00	4.04	4.32
94N815	14.22	8.50	13.38	9.00	12.13	14.36
94N844	15.06	8.00	13.02	9.50	12.81	10.21
94N928	14.08	6.00	13.72	7.00	9.44	9.92
94N930	14.64	7.50	13.55	6.50	8.76	10.91
94N963	15.58	7.50	15.37	8.50	11.46	10.58
94N974	15.33	4.00	12.61	1.00	1.35	1.75
94N1012	15.19	8.00	15.93	7.50	10.11	11.73
94N1073	14.20	8.5	12.58	9.00	12.13	5.31
94N1085	15.44	8.00	13.74	8.00	10.79	10.05
94N1097	13.99	7.50	13.79	7.00	9.44	8.85
94N1099	14.03	8.00	12.94	7.50	10.11	8.13
94N1183	13.47	9.00	12.27	7.50	10.11	6.75
94N6006	15.91	8.50	14.21	8.00	10.79	13.21
Q120	15.18	6.50	13.07	3.00	4.04	4.18
Q120	16.71	8.00	13.98	6.50	8.76	7.99
Q120	15.50	9.50	14.46	8.50	11.46	11.11
Q120	16.81	9.00	16.21	8.50	11.46	10.46
Q120	14.39	8.00	15.05	8.00	10.79	11.81
Q135	14.29	8.00	14.42	7.50	10.11	10.19
Q135	15.27	8.00	14.14	8.00	10.79	9.17
Q135	15.27	8.00	15.20	8.50	11.46	11.96
Q152	15.12	8.50	14.05	8.00	10.79	11.05
Q152	15.58	9.00	13.80	9.00	12.13	10.45
Q152	15.85	7.50	14.08	6.50	8.76	10.39
Q152	14.57	7.00	14.40	7.00	9.44	10.28

APPENDIX 11 Clonal means for pre-harvest CCS and appearance grade (June), and harvest data (October) determined in the first-ratoon crop of the series 2 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
86A700	13.87	8.0	18.01	7.0	9.66	11.43
87A577	15.42	7.0	19.76	6.5	8.97	3.84
87A1622	14.81	7.0	19.65	7.0	9.66	8.60
88A515	14.23	8.0	16.72	7.5	10.34	10.65
88A861	15.80	7.0	20.55	7.0	9.66	4.70
88A1600	15.14	7.0	19.25	7.0	9.66	9.84
89A3112	16.40	6.5	18.44	4.0	5.52	2.23
89A3598	15.46	7.0	19.37	7.0	9.66	3.04
94A6003	16.46	9.0	19.85	8.0	11.03	11.63
92B2301	16.79	8.0	19.00	7.5	10.34	9.22
85C749	14.51	7.0	16.34	7.0	9.66	8.67
91N1418	14.17	7.0	17.26	7.0	9.66	6.80
91N3839	14.76	7.5	18.13	7.5	10.34	6.05
92N55	14.02	6.5	17.73	6.5	8.97	2.98
92N157	16.09	8.0	19.49	8.0	11.03	13.20
92N176	16.10	7.5	18.98	7.0	9.66	10.41
92N228	16.99	8.5	19.74	7.5	10.34	10.15
92N230	14.28	7.5	18.06	7.5	10.34	7.37
92N264	15.29	7.0	20.55	7.5	10.34	6.86
92N651	13.60	7.5	17.12	7.5	10.34	4.57
92N754	13.64	7.0	16.72	4.0	5.52	1.08
92N936	14.81	6.5	17.84	6.0	8.28	7.24
92N942	15.01	8.0	20.36	7.0	9.66	14.69
92N1059	14.60	8.5	17.91	7.5	10.34	11.91
92N1127	14.89	4.0	18.01	6.0	8.28	2.18
92N1189	14.45	6.5	18.79	4.0	5.52	4.36
92N1194	12.58	7.0	19.04	7.0	9.66	18.28
92N1317	13.11	6.5	19.19	6.5	8.97	13.90
92N1372	14.96	7.0	18.70	6.0	8.28	10.86
92N1519	15.69	7.5	19.67	7.0	9.66	5.73
92N1682	10.97	6.0	18.36	6.5	8.97	9.29
92N1712	14.85	4.0	18.74	4.0	5.52	0.76
92N1782	15.83	6.5	19.63	7.0	9.66	19.94
92N1983	13.80	7.5	17.13	8.0	11.03	7.93
92N2337	13.97	7.5	17.09	7.0	9.66	5.91
92N2368	13.65	8.0	19.03	7.0	9.66	9.84
92N2439	16.24	7.0	20.08	7.0	9.66	9.14
92N2447	16.49	7.0	19.28	6.5	8.97	3.68
93N30	12.47	7.0	18.63	7.5	10.34	11.65
93N137	16.31	7.0	18.03	7.0	9.66	9.70
93N187	11.77	7.0	17.00	6.5	8.97	3.50
93N288	15.12	7.5	18.93	7.5	10.34	20.70
93N486	14.54	6.5	17.80	4.0	5.52	2.18
93N840	13.09	7.0	17.43	6.5	8.97	3.68
93N1043	16.37	7.0	19.13	7.0	9.66	5.05
93N1135	13.38	7.0	16.35	7.0	9.66	11.45
93N1144	15.28	4.0	21.08	4.0	5.52	1.92
93N1150	15.60	8.0	17.97	7.0	9.66	8.46
93N1154	14.07	7.5	17.38	7.0	9.66	5.69
93N1263	14.79	7.0	19.40	6.5	8.97	5.57
93N1328	15.73	7.0	19.20	6.0	8.28	6.90
93N1358	15.47	6.5	18.01	6.0	8.28	7.77
93N1363	14.04	7.0	17.57	7.0	9.66	14.26
93N1377	15.42	8.5	18.38	8.0	11.03	6.11
94N28	15.08	8.0	17.92	7.5	10.34	10.14
94N30	14.87	7.5	18.20	7.0	9.66	10.93
94N40	15.80	4.0	19.39	6.0	8.28	1.86
94N51	14.67	7.5	17.61	7.5	10.34	12.46
94N60	12.92	7.0	18.02	6.5	8.97	5.60
94N65	14.43	4.0	17.03	2.0	2.76	0.00
94N84	12.71	8.0	17.47	8.5	11.72	12.59
94N105	14.25	8.0	19.36	8.5	11.72	11.67
94N113	15.09	7.0	19.00	7.0	9.66	12.58
94N131	15.49	8.0	17.39	7.5	10.34	8.42
94N133	14.41	6.5	19.13	6.5	8.97	11.11
94N206	13.84	7.5	16.97	7.0	9.66	8.05

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
94N303	15.78	6.5	18.76	6.0	8.28	3.05
94N307	14.69	7.5	18.46	7.0	9.66	4.95
94N318	16.62	8.5	18.76	7.0	9.66	7.47
94N320	13.66	8.0	15.73	7.0	9.66	3.76
94N360	15.08	7.5	20.60	7.0	9.66	8.03
94N388	10.51	7.0	19.15	6.5	8.97	7.69
94N438	15.33	8.0	20.20	7.0	9.66	8.03
94N465	14.93	7.0	18.68	7.0	9.66	5.17
94N494	14.97	7.0	17.85	7.0	9.66	4.11
94N512	13.75	8.5	17.44	7.0	9.66	7.46
94N545	17.24	6.0	17.50	4.0	5.52	1.43
94N592	14.79	6.5	18.54	7.0	9.66	12.44
94N604	16.87	7.0	20.07	7.0	9.66	8.18
94N617	16.21	6.5	17.85	6.5	8.97	2.90
94N647	14.82	7.5	18.25	7.0	9.66	7.02
94N698	17.49	7.0	18.53	6.0	8.28	6.63
94N714	17.35	8.5	19.97	7.5	10.34	9.25
94N720	17.42	7.5	18.43	7.0	9.66	5.51
94N722	15.54	8.5	19.03	7.5	10.34	8.47
94N796	13.59	7.5	19.23	7.0	9.66	13.99
94N799	17.54	7.0	19.38	6.5	8.97	8.66
94N815	14.53	7.5	17.99	8.0	11.03	14.33
94N844	13.51	7.5	17.19	7.0	9.66	9.54
94N928	14.88	7.0	18.92	7.0	9.66	11.02
94N930	13.30	7.5	19.23	8.5	11.72	20.72
94N963	17.22	7.5	18.11	7.5	10.34	5.46
94N974	16.66	6.0	19.19	4.0	5.52	3.64
94N1012	16.78	7.5	17.98	7.0	9.66	7.39
94N1073	15.54	8.0	18.54	7.0	9.66	4.77
94N1085	15.34	8.0	18.41	6.5	8.97	8.45
94N1097	15.50	7.0	18.32	7.0	9.66	7.81
94N1099	17.00	7.5	19.16	6.5	8.97	6.04
94N1183	14.27	7.5	18.93	7.0	9.66	7.33
94N6006	16.25	8.0	19.40	7.5	10.34	7.00
Q120	14.79	7.0	17.93	7.0	9.66	13.49
Q120	15.42	7.0	19.72	6.5	8.97	5.69
Q120	14.43	8.0	19.87	7.5	10.34	11.70
Q120	14.77	8.0	19.90	7.0	9.66	5.08
Q120	16.14	7.5	19.16	7.0	9.66	10.56
Q135	15.40	7.5	19.47	7.0	9.66	8.75
Q135	15.59	8.0	20.33	7.0	9.66	8.96
Q135	16.35	8.0	19.82	7.0	9.66	8.33
Q152	17.46	8.0	19.62	8.0	11.03	12.56
Q152	14.69	8.0	18.33	8.0	11.03	9.67
Q152	15.69	7.0	18.39	8.0	11.03	17.13
Q152	13.52	8.0	19.37	7.0	9.66	9.26

APPENDIX 12 Clonal means for two pre-harvest, and four harvest traits in plant and first-ratoon crops in the series 2 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
86A700	14.32	8.00	16.25	7.75	10.56	10.17
87A577	15.62	7.25	18.02	6.50	8.87	7.38
87A1622	15.08	7.25	15.90	4.50	6.18	5.74
88A515	13.62	8.25	14.89	7.75	10.56	9.09
88A861	14.87	7.75	17.14	8.00	10.89	8.56
88A1600	15.55	8.00	16.86	7.75	10.56	11.28
89A3112	15.97	7.00	16.30	4.50	6.13	4.58
89A3598	15.36	7.00	16.66	4.50	6.18	1.73
94A6003	15.45	8.50	16.95	7.50	10.23	9.87
92B2301	16.38	8.00	16.41	7.75	10.56	8.02
85C749	14.77	7.00	15.14	7.00	9.55	7.70
91N1418	15.20	7.75	16.30	7.75	10.56	9.84
91N3839	14.61	7.75	15.46	7.75	10.56	6.29
92N55	13.90	8.00	16.30	7.75	10.55	5.33
92N157	16.31	8.00	17.91	8.25	11.24	13.23
92N176	15.99	8.00	17.00	8.25	11.23	12.09
92N228	16.04	8.25	17.14	7.25	9.89	9.61
92N230	14.67	8.50	16.43	7.75	10.56	7.46
92N264	15.56	7.25	17.25	7.50	10.22	5.57
92N651	13.31	8.00	15.15	7.50	10.22	5.58
92N754	14.72	7.25	15.89	5.25	7.14	3.79
92N936	14.70	6.00	15.62	7.00	9.54	8.21
92N942	15.69	8.00	18.04	7.25	9.88	13.52
92N1059	14.79	8.75	15.18	8.50	11.57	11.56
92N1127	14.88	4.75	15.60	5.50	7.51	2.97
92N1189	13.94	6.25	15.73	3.50	4.78	3.77
92N1194	13.89	7.50	17.28	7.25	9.88	16.02
92N1317	13.61	6.50	17.23	6.50	8.87	14.05
92N1372	15.07	6.75	16.49	3.50	4.82	6.16
92N1519	15.74	8.00	17.41	7.50	10.22	8.67
92N1682	12.87	6.25	16.04	6.25	8.53	9.80
92N1712	15.36	5.25	17.25	3.00	4.11	1.92
92N1782	15.68	6.50	17.46	5.50	7.53	13.61
92N1983	15.35	8.25	16.05	8.25	11.24	8.96
92N2337	13.74	7.75	14.66	7.50	10.22	7.30
92N2368	13.93	7.75	16.02	7.00	9.55	9.38
92N2439	16.11	6.75	17.72	6.50	8.88	8.10
92N2447	16.62	7.75	16.55	7.00	9.54	5.92
93N30	12.37	6.75	14.91	7.50	10.22	10.22
93N137	15.82	7.50	15.98	7.75	10.56	9.72
93N187	13.51	7.75	14.71	7.50	10.21	4.17
93N288	16.07	7.50	17.13	7.25	9.89	17.32
93N486	12.80	6.25	14.67	2.50	3.44	1.61
93N840	13.79	7.00	15.59	6.75	9.21	4.50
93N1043	15.94	7.50	17.54	7.25	9.88	5.21
93N1135	13.93	6.75	14.54	7.25	9.88	11.25
93N1144	15.55	4.50	16.11	2.50	3.44	1.58
93N1150	15.61	8.75	16.18	8.00	10.89	10.00
93N1154	14.92	7.50	16.21	7.25	9.88	8.61
93N1263	15.43	7.00	17.34	6.25	8.53	6.12
93N1328	15.78	8.25	17.61	7.75	10.54	9.99
93N1358	14.90	6.50	16.07	4.50	6.16	6.13
93N1363	14.23	7.75	15.68	7.00	9.55	14.23
93N1377	15.03	8.50	16.56	8.25	11.24	8.55
94N28	14.90	8.00	16.22	7.50	10.22	10.60
94N30	14.44	7.00	14.97	6.75	9.21	8.66
94N40	16.18	5.25	16.40	4.50	6.16	2.65
94N51	14.79	7.50	15.78	7.75	10.56	12.14
94N60	12.93	6.50	15.44	5.75	7.86	5.51
94N65	15.07	5.75	15.39	4.50	6.10	3.77
94N84	13.81	8.25	16.09	8.50	11.59	11.43
94N105	14.00	8.75	17.16	9.00	12.27	13.88

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
94N113	13.99	6.75	15.18	6.50	8.88	9.01
94N131	15.06	7.75	16.23	7.25	9.89	9.78
94N133	15.28	6.50	15.14	3.75	5.16	6.25
94N206	13.76	8.25	14.39	8.25	11.23	7.95
94N303	14.21	7.00	15.69	6.50	8.86	4.48
94N307	14.90	7.50	15.91	7.75	10.56	5.24
94N318	16.05	8.25	16.68	6.25	8.54	7.33
94N320	14.24	8.25	15.14	7.50	10.22	4.67
94N360	15.26	7.25	16.51	6.50	8.88	7.07
94N388	13.01	7.50	16.48	6.75	9.21	8.93
94N438	14.34	7.50	17.21	6.50	8.88	7.83
94N465	12.62	7.75	15.73	7.75	10.56	8.06
94N494	15.06	8.00	15.77	8.00	10.89	5.08
94N512	13.52	7.75	15.97	7.50	10.22	8.78
94N545	16.34	5.75	15.64	3.00	4.11	2.02
94N592	14.78	6.75	16.71	7.25	9.88	11.74
94N604	15.99	7.00	16.52	6.75	9.21	7.41
94N617	15.81	5.75	16.07	5.75	7.86	5.13
94N647	14.33	8.00	15.41	7.50	10.22	7.83
94N698	15.36	7.00	15.46	6.50	8.86	6.51
94N714	16.09	8.50	17.09	7.00	9.55	8.14
94N720	15.79	7.75	15.80	6.75	9.21	5.57
94N722	14.10	8.25	15.61	7.50	10.22	7.21
94N796	13.87	8.00	16.45	7.00	9.55	12.14
94N799	16.81	6.00	17.36	4.75	6.50	6.49
94N815	14.38	8.00	15.69	8.50	11.58	14.35
94N844	14.29	7.75	15.11	8.25	11.23	9.88
94N928	14.48	6.50	16.32	7.00	9.55	10.47
94N930	13.97	7.50	16.39	7.50	10.24	15.81
94N963	16.40	7.50	16.74	8.00	10.90	8.02
94N974	15.99	5.00	15.90	2.50	3.44	2.69
94N1012	15.98	7.75	16.95	7.25	9.88	9.56
94N1073	14.87	8.25	15.56	8.00	10.89	5.04
94N1085	15.39	8.00	16.07	7.25	9.88	9.25
94N1097	14.74	7.25	16.05	7.00	9.55	8.33
94N1099	15.52	7.75	16.00	7.00	9.54	7.08
94N1183	13.87	8.25	15.60	7.25	9.88	7.04
94N6006	16.08	8.25	16.80	7.75	10.56	10.11
Q120	14.98	6.75	15.50	5.00	6.85	8.84
Q120	16.07	7.50	16.85	6.50	8.87	6.84
Q120	14.96	8.75	17.16	8.00	10.90	11.40
Q120	15.79	8.50	18.05	7.75	10.56	7.77
Q120	15.27	7.75	17.11	7.50	10.22	11.19
Q135	14.85	7.75	16.95	7.25	9.88	9.47
Q135	15.43	8.00	17.23	7.50	10.22	9.06
Q135	15.81	8.00	17.51	7.75	10.56	10.14
Q152	16.29	8.25	16.84	8.00	10.91	11.80
Q152	15.13	8.50	16.07	8.50	11.58	10.06
Q152	15.77	7.25	16.23	7.25	9.89	13.76
Q152	14.04	7.50	16.89	7.00	9.55	9.77

APPENDIX 13 Clonal means for pre-harvest CCS and appearance grade (June), and harvest data (August) in the plant crop of the series 2 HF2 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
86A700	12.26	8.50	16.36	9.17	11.74	13.46
87A577	14.88	7.50	17.91	7.33	9.37	9.52
88A861	12.97	7.83	16.74	9.00	11.54	12.36
88A1600*	13.81	7.53	17.57	8.54	11.00	11.18
91N1418	14.73	7.00	17.18	7.83	10.02	6.76
92N55	12.33	8.33	16.72	8.83	11.28	10.55
92N157	14.21	8.33	17.08	7.33	9.39	11.44
92N176#	12.95	8.00	16.68	9.00	11.50	13.80
92N228	14.67	7.50	17.14	7.33	9.35	7.29
92N230	13.12	8.50	16.37	9.17	11.72	12.04
92N936	12.95	8.50	15.78	8.83	11.32	10.81
92N942	13.35	7.50	17.57	8.17	10.46	9.82
92N1059	11.59	8.33	15.80	8.50	10.90	9.41
92N1194#	11.80	8.83	16.58	9.50	12.18	14.94
92N1317#	12.27	8.67	16.72	9.83	12.58	17.00
92N1519	13.28	7.67	16.00	7.50	9.59	9.70
92N1983**	13.57	7.28	17.14	8.62	11.03	11.28
92N2447#	15.91	8.00	17.82	8.67	11.09	15.92
93N137	12.37	7.33	15.76	7.83	10.02	6.85
93N288#	14.13	8.00	17.95	8.83	11.32	17.78
93N1043	13.31	8.00	17.19	7.67	9.85	10.44
93N1150	13.44	8.50	15.58	8.67	11.05	9.65
93N1154	13.28	7.33	16.67	8.00	10.17	8.65
93N1328	13.55	7.00	17.26	7.17	9.16	6.74
93N1363	13.85	8.17	16.34	8.67	11.05	16.69
93N1377	13.23	8.67	16.56	9.00	11.50	11.21
94N28	12.58	7.83	16.71	7.17	9.16	10.91
94N51	13.71	7.33	16.33	7.50	9.55	7.09
94N84	12.96	8.33	16.05	8.67	11.1	11.58
94N105#	14.37	8.33	16.62	9.50	12.16	13.05
94N131	12.98	7.50	16.30	8.17	10.41	8.28
94N320	12.42	6.00	16.32	7.33	9.39	6.04
94N465	11.40	6.33	14.74	7.67	9.75	4.53
94N512	12.49	7.67	14.92	7.67	9.77	9.05
94N592	10.15	7.33	14.94	7.83	10.00	10.72
94N815*	14.50	8.44	15.78	9.30	11.83	10.16
94N963**	14.54	7.48	17.77	8.14	10.46	12.18
94N1012	13.64	8.33	17.75	7.83	9.97	12.04
Q120	14.83	7.83	17.33	7.17	9.13	7.30
Q120	14.92	7.50	17.79	7.33	9.33	6.50
Q152	13.86	8.00	15.59	8.33	10.66	13.07
Q152	13.26	7.67	15.77	8.50	10.88	14.12

*Contained in 1 replicate; **Contained in 2 replicates; #Selected clones advanced to maximum propagation.

APPENDIX 14 Clonal means for harvest data in the first-ratoon crop of the series 2 HF2 trial

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
86A700	16.79	9.17	10.20	10.64
87A577	19.00	5.67	6.30	5.31
88A861	17.63	9.00	10.01	9.32
88A1600	18.72	7.99	9.05	8.98
91N1418	18.44	7.67	8.55	6.46
92N55	16.71	9.00	10.00	5.49
92N157	18.65	8.50	9.48	9.63
*92N176	18.05	6.83	7.65	7.68
92N228	18.09	6.83	7.60	5.95
92N230	17.55	8.67	9.65	9.78
92N936	17.23	8.17	9.09	8.12
92N942	18.32	7.67	8.54	7.29
92N1059	16.18	8.17	9.09	7.09
*92N1194	17.51	9.17	10.19	9.78
*92N1317#	17.44	8.83	9.83	11.10
92N1519	16.60	7.50	8.33	7.47
92N1983	16.96	9.47	10.52	8.06
*92N2447	18.56	8.33	9.27	9.44
93N137	16.67	7.67	8.53	5.91
*93N288#	18.27	9.50	10.56	11.11
93N1043	18.20	7.17	7.99	6.74
93N1150	16.43	8.67	9.61	8.36
93N1154	16.58	8.33	9.26	5.46
93N1328	18.48	9.50	10.55	10.84
93N1363	17.52	9.17	10.20	12.06
93N1377	16.41	8.17	9.10	6.53
94N28	17.03	8.00	8.91	9.08
94N51	16.42	7.83	8.72	6.96
94N84	17.78	9.50	10.58	9.44
*94N105#	17.07	8.67	9.62	8.12
94N131	17.12	8.00	8.89	7.37
94N320	17.08	7.00	7.80	6.40
94N465	16.30	7.50	8.33	5.32
94N512	16.19	8.00	8.88	6.92
94N592	14.10	6.83	7.61	5.52
94N815	17.42	8.64	9.69	8.20
94N963	17.92	9.24	10.25	10.00
94N1012	17.53	6.17	6.76	5.67
Q120	18.26	8.33	9.25	9.19
Q120	18.33	9.33	10.38	9.66
Q152	17.23	9.50	10.56	11.67
Q152	16.58	8.83	9.81	9.55

*Clones (6) advanced to core selection propagation; # Clones (3) advanced to core selection Final assessment trials; 88A1600 and 94N815 occur only in one replicate; 94N963 and 92N1983 occur only in two replicates; These clones were not included in the complete analyses, above figures were worked out manually.

APPENDIX 15 Clonal means for pre-harvest CCS and appearance grade (June), and four harvest traits (August) in the plant crop of the series 3 HF1 trial

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
95N20	16.11	8.0	18.57	8.0	10.48	8.76
95N22	14.34	7.0	16.21	6.5	8.51	7.12
95N25*	14.82	8.0	16.77	9.5	12.44	15.06
95N32	13.00	7.5	16.29	7.0	9.17	9.18
95N77*	13.03	8.0	18.02	8.5	11.13	13.68
95N79*	14.09	7.5	17.50	8.5	11.13	16.84
95N82	14.39	8.0	16.96	8.0	10.48	11.08
95N91*	14.55	8.0	17.28	9.0	11.79	17.83
95N101	14.43	7.5	17.28	8.0	10.48	14.41
95N172	13.89	8.5	16.31	8.5	11.13	12.35
95N180	13.91	7.5	16.51	9.0	11.79	10.79
95N184	12.59	8.0	15.51	9.0	11.79	15.27
95N189	12.77	7.0	16.44	8.5	11.13	12.16
95N203	6.20	7.5	15.70	7.5	9.82	7.63
95N220	12.19	8.5	16.79	9.5	12.44	14.86
95N226	12.87	7.0	14.85	4.0	5.24	3.75
95N228	14.78	8.0	17.71	6.5	8.51	8.32
95N234*	16.71	9.0	18.53	8.5	11.13	16.66
95N241	12.97	8.0	15.65	9.5	12.44	13.42
95N245	13.19	8.0	15.06	8.0	10.48	7.15
95N247	13.00	7.5	16.30	9.0	11.79	11.87
95N258	12.47	7.5	16.51	7.5	9.82	11.81
95N272	12.80	9.0	16.46	9.5	12.44	12.75
95N273	15.23	7.0	17.72	7.5	9.82	14.30
95N275	11.31	7.5	14.61	8.0	10.48	9.23
95N278	13.48	8.0	16.31	8.0	10.48	11.08
95N279	15.45	7.5	16.11	9.0	11.79	9.26
95N280*	13.09	8.5	16.15	9.5	12.44	14.44
95N286	12.83	8.5	14.45	9.5	12.44	14.43
95N288	14.02	7.0	17.16	6.5	8.51	12.15
95N289*	15.78	8.5	18.06	9.5	12.44	18.38
95N295	13.00	9.0	15.75	9.5	12.44	13.04
95N298	11.35	7.5	14.33	7.5	9.82	11.82
95N305	13.16	8.0	15.62	7.0	9.17	8.23
95N317	12.23	7.0	14.92	8.5	11.13	8.89
95N325	14.45	7.0	15.58	7.5	9.82	9.23
95N332	14.65	8.0	17.88	8.5	11.13	12.38
95N336	12.52	6.5	15.13	7.5	9.82	-
95N347*	13.47	7.5	16.78	8.5	11.13	16.82
95N349	15.18	7.0	17.30	6.5	8.51	9.44
95N360	14.17	8.0	16.02	9.5	12.44	13.39
95N384	11.50	8.0	16.04	9.0	11.79	17.15
95N425	12.13	8.0	15.02	9.5	12.44	13.77
95N484	13.96	7.0	15.73	6.5	8.51	6.06
95N485*	15.14	8.0	16.42	9.5	12.44	16.79
95N498	15.95	7.5	16.40	8.5	11.13	15.65
95N507	14.08	8.0	16.11	9.5	12.44	11.68
95N517	13.54	7.0	15.36	9.0	11.79	13.07
95N521	13.56	8.0	16.27	8.5	11.13	12.32
95N523	15.07	8.0	16.86	7.5	9.82	10.34
95N526	13.68	6.5	17.04	6.5	8.51	9.76
95N536	14.18	9.0	17.17	8.0	10.48	9.68
95N539	13.91	7.0	16.40	6.5	8.51	-
95N545*	15.28	8.0	17.59	8.0	10.48	16.11
95N558	14.01	7.5	16.14	6.0	7.86	4.62
95N566	14.23	8.0	18.30	7.5	9.82	13.20
95N575	14.09	7.5	17.58	6.5	8.51	12.01
95N594	12.34	8.0	14.37	9.5	12.44	16.38
95N606	13.80	6.0	16.73	4.0	5.24	4.74
95N613	12.29	8.5	15.77	9.0	11.79	11.65
95N614	13.23	7.5	15.88	8.5	11.13	6.66
95N621	14.03	7.5	16.07	6.5	8.51	7.32
95N624	14.31	8.0	16.49	8.0	10.48	11.82
95N628	13.75	7.5	16.98	7.0	9.17	5.74
95N639	13.56	8.0	16.31	7.0	9.17	10.02
95N652	14.98	7.0	15.57	8.0	10.48	11.61

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
95N666	12.50	7.5	16.06	7.0	9.17	16.35
95N670*	15.19	8.0	16.14	9.5	12.44	16.68
95N681*	12.90	9.0	16.24	9.5	12.44	13.96
95N686*	14.43	8.0	17.59	9.0	11.79	17.20
95N696	13.54	7.0	17.37	7.0	9.17	8.53
95N707	14.26	7.0	15.90	7.0	9.17	9.15
95N714	14.46	7.5	16.42	8.0	10.48	12.60
95N724	13.51	7.0	16.49	6.0	7.86	5.55
95N725	10.49	8.5	15.33	9.5	12.44	8.97
95N731	12.36	8.5	16.05	9.0	11.79	13.47
95N746	11.43	8.5	14.52	9.5	12.44	12.78
95N762	13.77	9.5	16.74	9.0	11.79	7.97
95N773	12.72	7.5	16.17	8.5	11.13	12.50
95N777	13.94	7.0	16.43	9.0	11.79	12.90
95N789	11.38	7.0	16.43	6.5	8.51	7.67
95N793	14.39	7.5	16.71	8.0	10.48	9.02
95N794	13.54	8.5	15.98	9.5	12.44	12.74
95N801	13.91	8.0	17.04	8.5	11.13	13.27
95N811	13.03	7.0	16.42	7.0	9.17	10.25
95N813	12.86	7.5	16.01	7.5	9.82	12.63
95N843	13.82	7.5	16.48	8.5	11.13	13.10
95N873	12.98	6.5	16.52	7.0	9.17	4.36
95N874	13.12	8.0	17.34	7.5	9.82	8.98
95N897	15.28	8.0	16.60	8.5	11.13	14.19
95N919	15.69	7.5	15.57	6.5	8.51	8.17
95N937	13.60	8.5	16.71	9.0	11.79	11.40
95N951	15.17	7.5	16.99	8.5	11.13	10.98
95N955	13.25	7.5	16.23	9.5	12.44	11.30
95N964	15.17	7.5	16.65	8.5	11.13	13.52
95N972	12.78	7.5	16.04	7.0	9.17	7.90
95N983	13.22	7.5	15.86	8.5	11.13	14.04
95N1000	13.52	8.5	16.04	9.5	12.44	17.12
95N1004	14.17	6.0	18.48	7.0	9.17	8.59
95N1009	15.36	7.0	17.29	7.0	9.17	8.75
95N1011	14.89	8.5	16.70	8.0	10.48	16.26
95N1015*	13.63	8.0	16.51	9.5	12.44	13.37
95N1024	14.54	8.5	15.13	7.0	9.17	8.74
95N1029	10.91	8.0	15.59	8.5	11.13	10.40
95N1030	14.52	7.5	15.66	7.0	9.17	8.45
95N1034	13.96	7.5	16.48	6.5	8.51	6.12
95N1036	13.05	7.0	15.00	7.0	9.17	7.61
95N1039	14.87	7.0	17.29	7.5	9.82	9.45
95N1042	13.32	8.5	17.47	8.0	10.48	9.54
95N1052	12.58	8.0	14.26	9.0	11.79	11.38
95N1056	14.12	8.0	16.16	7.5	9.82	10.49
95N1071	14.26	8.5	18.58	8.5	11.13	9.30
95N1074	12.65	7.0	16.45	7.5	9.82	11.05
95N1083*	14.42	8.5	18.17	9.5	12.44	16.08
95N1086*	10.54	9.0	15.13	9.5	12.44	17.77
95N1103	12.75	8.5	15.70	7.0	9.17	8.88
95N1111	12.96	7.5	14.72	9.0	11.79	9.19
95N1116*	12.94	8.0	16.70	9.5	12.44	12.64
95N1139	14.58	7.5	16.94	6.0	7.86	9.17
95N1151	13.69	8.0	15.89	8.5	11.13	9.13
95N1198*	14.88	8.5	17.18	8.0	10.48	15.86
95N1203	13.83	7.0	16.19	9.5	12.44	12.26
95N1210	10.98	7.5	14.87	8.5	11.13	13.98
95N1224	14.71	7.5	16.71	7.0	9.17	6.39
95N1236	13.58	8.5	14.74	9.0	11.79	11.27
95N1239*	14.85	7.0	16.97	8.5	11.13	18.10
95N1250	14.69	8.0	17.96	9.0	11.79	21.46
95N1260	14.97	9.0	17.50	8.5	11.13	15.81
95N1263	16.57	6.5	17.69	7.0	9.17	12.94
95N1280	14.94	8.0	15.58	9.0	11.79	11.35
95N1303*	13.47	8.5	16.22	9.5	12.44	17.01
95N1308	14.10	8.0	16.07	9.0	11.79	15.06
95N1312	11.25	9.5	15.05	7.5	9.82	8.20
95N1318	15.03	8.0	16.85	9.0	11.79	11.53
95N1319	13.47	6.5	15.35	8.5	11.13	14.31
95N1325	13.99	8.5	16.10	9.5	12.44	13.85
95N1332	13.53	7.5	16.35	7.0	9.17	7.20
95N1334	14.51	6.5	16.45	8.0	10.48	11.77

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
95N1336*	15.79	7.0	17.76	9.0	11.79	14.79
95N1337	15.10	8.5	16.55	9.0	11.79	9.67
95N1340	12.87	8.5	16.28	9.0	11.79	12.75
95N1356	12.63	8.5	16.02	9.5	12.44	11.97
95N1368	13.13	7.5	16.44	7.5	9.82	10.86
95N1373	13.91	8.0	16.49	7.0	9.17	7.52
95N1400	11.84	9.0	15.82	9.5	12.44	12.06
95N1407	16.12	7.5	16.56	8.0	10.48	13.02
95N1412	14.81	8.5	17.09	8.5	11.13	11.19
95N1413*	15.69	7.5	18.59	8.5	11.13	16.28
95N1417*	13.51	8.0	17.27	8.5	11.13	16.86
95N1420	14.62	8.0	16.91	7.0	9.17	13.55
95N1432	14.15	8.5	13.76	7.0	9.17	7.06
95N1433	15.26	7.0	17.37	7.0	9.17	11.39
95N1434	16.07	7.0	17.25	6.5	8.51	7.00
95N1443	11.03	8.5	15.15	9.0	11.79	10.46
95N1449	12.26	6.5	15.71	6.0	7.86	1.79
95N1455	13.53	8.5	17.21	9.0	11.79	10.60
95N1456	14.62	8.5	17.64	7.0	9.17	8.50
95N1457	11.69	7.5	14.34	9.0	11.79	10.32
95N1470	12.18	7.5	16.21	8.0	10.48	7.62
95N1471	11.93	6.0	16.58	4.0	5.24	2.30
95N1476	14.53	6.0	16.83	3.0	3.93	1.03
95N1483*	16.07	8.0	18.43	9.0	11.79	16.19
95N1488	9.67	6.0	14.62	7.0	9.17	6.51
95N1501	8.78	9.0	15.74	9.0	11.79	14.54
95N1506	13.09	4.0	14.97	2.0	2.62	0.32
95N1525	13.72	8.0	15.73	8.5	11.13	11.42
95N1553	14.31	8.5	17.35	8.5	11.13	9.97
95N1599	17.28	7.5	17.11	7.0	9.17	7.50
95N1601	12.27	6.5	15.43	7.0	9.17	5.14
95N1640	13.18	7.5	16.27	8.0	10.48	12.53
95N1645	15.04	8.0	16.15	7.0	9.17	9.01
95N1669	14.33	6.5	16.92	6.0	7.86	3.95
95N1686	14.23	8.5	16.85	9.0	11.79	12.78
95N1690	12.38	7.5	16.63	7.5	9.82	11.66
95N1692	11.61	8.0	15.84	8.5	11.13	17.08
95N1694	14.30	7.0	17.31	7.0	9.17	5.92
95N1700*	15.22	8.0	17.74	8.5	11.13	14.05
95N1714	13.58	8.5	16.96	9.0	11.79	13.47
95N1718	14.23	7.0	18.18	5.0	6.55	6.21
95N1737	12.54	8.5	16.64	8.5	11.13	9.48
95N1739	12.49	7.5	17.22	2.0	2.62	0.79
95N1741	13.30	7.0	17.19	3.0	3.93	2.05
95N1755	10.18	7.0	13.89	7.0	9.17	7.73
95N1789	12.28	7.5	15.34	7.0	9.17	7.19
95N1793	14.56	8.5	17.42	8.0	10.48	13.24
95N1796	12.82	8.5	17.04	9.0	11.79	14.42
95N1806*	14.22	8.5	15.92	9.5	12.44	16.21
95N1807*	11.01	8.0	16.40	9.5	12.44	17.15
95N1809	12.27	8.5	15.26	9.5	12.44	13.17
95N1811	12.48	7.5	15.37	7.5	9.82	10.54
95N1812	14.81	8.5	17.99	7.5	9.82	13.44
95N1817	14.11	9.0	16.30	8.0	10.48	8.47
95N1820*	13.89	7.5	18.60	8.0	10.48	13.86
95N1822	12.02	8.0	13.56	9.0	11.79	8.95
95N1829*	15.27	8.0	17.56	8.5	11.13	16.53
95N1838	14.19	8.0	17.08	8.0	10.48	7.94
95N1849	14.02	7.5	16.25	7.0	9.17	8.83
95N1850	13.91	7.5	18.48	7.0	9.17	9.17
95N1852	12.31	8.5	15.82	6.5	8.51	7.71
95N1865*	14.60	8.5	16.49	9.0	11.79	13.85
95N1893	14.73	9.0	16.05	7.5	9.82	10.05
95N1894	13.39	8.5	16.01	7.5	9.82	12.63
95N1905	13.04	8.5	16.65	8.5	11.13	11.66
95N1914	12.74	9.0	16.81	10.0	13.10	10.82
95N1916	12.74	9.5	15.34	9.0	11.79	9.62
95N1936	14.24	8.0	16.37	8.5	11.13	8.26
95N1941	14.24	7.5	16.94	9.0	11.79	12.99
95N1965	13.05	7.5	16.28	8.0	10.48	15.81
95N1977	11.27	7.0	16.61	7.0	9.17	9.18
95N1987	14.87	8.0	16.43	8.0	10.48	13.65

Clone	Pre-harvest CCS	Pre-harvest appearance grade	Harvest CCS	Harvest appearance grade	Adjusted harvest appearance grade	Harvest net merit grade
Q120	13.91	7.0	17.87	7.0	9.17	6.05
Q120	15.37	7.0	16.26	7.0	9.17	4.34
Q120	14.01	7.5	17.14	8.0	10.48	8.38
Q120	14.29	7.0	16.84	6.5	8.51	3.62
Q120	14.83	8.5	16.70	7.5	9.82	9.04
Q120	13.83	8.0	16.03	9.0	11.79	12.07
Q120	12.02	9.0	16.59	9.0	11.79	12.29
Q120	13.51	8.0	17.05	8.5	11.13	11.68
Q120	13.84	7.5	16.86	6.5	8.51	9.64
Q120	14.24	7.5	16.48	8.5	11.13	8.98
Q120	14.68	8.0	16.74	7.5	9.82	8.36
Q152	13.91	7.5	16.51	7.5	9.82	10.79
Q152	13.85	7.5	16.08	6.5	8.51	6.63
Q152	14.30	7.5	16.16	7.0	9.17	10.98
Q152	14.15	7.0	16.31	7.0	9.17	7.81
Q152	14.68	7.0	16.65	7.0	9.17	10.82
Q152	14.64	8.5	16.49	7.5	9.82	13.38
Q152	14.57	8.5	16.26	8.5	11.13	12.25
Q152	14.19	8.0	16.25	8.5	11.13	14.74
Q152	14.12	8.5	16.63	8.0	10.48	14.15
Q152	13.62	7.5	17.35	7.0	9.17	14.50
Q152	15.39	8.0	17.30	8.5	11.13	11.04

- No NMG calculated because no weight was recorded at harvest; *Selected clones advanced to series 3 HF2 trial

APPENDIX 16 Clonal results for four harvest-season traits for 210 unreplicated clones and two cultivars assessed in the first-ratoon crop in the series 3 HF1 trial

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N20	19.34	8.00	9.64	5.18
95N22	17.60	6.50	7.84	2.95
*95N25	15.85	8.50	10.25	4.97
95N32	18.02	7.00	8.44	7.47
*95N77	18.40	8.00	9.64	13.45
*95N79	18.40	8.50	10.25	12.05
95N82	17.36	5.00	6.03	4.19
*95N91	17.66	8.50	10.25	10.39
95N101	17.81	8.00	9.64	9.06
95N172	18.39	8.00	9.64	9.80
95N180	18.85	7.50	9.04	8.82
95N184	17.20	9.00	10.85	10.58
95N189	17.01	9.00	10.85	6.96
95N203	18.40	6.50	7.84	6.62
95N220	18.26	10.00	12.05	17.84
95N226	18.45	7.00	8.44	8.90
95N228	18.97	9.00	10.85	11.13
*95N234#	18.84	8.00	9.64	8.51
95N241	16.92	8.50	10.25	7.75
95N245	17.32	8.50	10.25	7.75
95N247	18.62	8.50	10.25	12.65
95N258	18.80	5.00	6.03	6.52
95N272	16.67	10.00	12.05	6.20
95N273	19.01	8.00	9.64	11.41
95N275	17.42	9.50	11.45	11.73
95N278	18.83	9.50	11.45	11.73
95N279	17.57	10.00	12.05	10.80
*95N280	16.93	9.50	11.45	11.25
95N286	16.15	9.50	11.45	10.79
95N288	19.14	9.50	11.45	13.82
*95N289#	18.41	9.00	10.85	9.38
95N295	17.47	9.50	11.45	11.16
95N298	14.77	6.00	7.23	6.65
95N305	17.57	8.50	10.25	10.24
95N317	15.23	8.50	10.25	8.24
95N325	18.07	8.50	10.25	10.41
95N332	18.88	6.50	7.84	8.69
95N336	17.15	6.00	7.23	4.75
*95N347	18.47	7.00	8.44	8.94
95N349	18.12	8.00	9.64	7.22
95N360	18.24	9.50	11.45	11.10
95N384	16.37	9.00	10.85	10.85
95N425	17.94	8.00	9.64	11.65
95N484	17.64	7.00	8.44	8.55
*95N485	17.55	8.50	10.25	7.92
95N498	18.51	8.00	9.64	9.38
95N507	18.89	10.00	12.05	10.30
95N517	17.44	6.50	7.84	4.93
95N521	17.51	9.00	10.85	7.26
95N523	17.91	5.00	6.03	3.14
95N526	17.64	4.00	4.82	2.80
95N536	17.84	9.00	10.85	8.78
95N539	19.01	5.00	6.03	4.73
*95N545	18.24	8.00	9.64	10.54
95N558	18.01	7.50	9.04	5.70
95N566	18.38	5.50	6.63	4.30
95N575	17.87	9.00	10.85	8.73
95N594	16.66	10.00	12.05	13.39
95N606	17.86	6.50	7.84	5.36
95N613	18.22	7.50	9.04	9.63

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N614	17.19	10.00	12.05	10.58
95N621	17.50	8.00	9.64	9.62
95N624	18.50	5.00	6.03	6.30
95N628	16.87	9.50	11.45	9.11
95N639	17.59	7.50	9.04	6.74
95N652	18.54	6.50	7.84	6.58
95N666	16.01	8.00	9.64	8.54
*95N670	17.02	9.00	10.85	9.76
*95N681#	18.53	10.00	12.05	13.83
*95N686	17.80	7.50	9.04	10.08
95N696	18.31	8.50	10.25	12.33
95N707	18.36	8.00	9.64	6.85
95N714	18.89	7.00	8.44	5.84
95N724	18.39	7.50	9.04	6.77
95N725	18.99	9.50	11.45	13.43
95N731	18.02	8.00	9.64	9.11
95N746	16.49	10.00	12.05	9.21
95N762	17.62	10.00	12.05	7.29
95N773	17.12	10.00	12.05	15.58
95N777	19.19	8.50	10.25	6.93
95N789	17.78	6.50	7.84	7.85
95N793	19.76	9.50	11.45	9.62
95N794	18.69	9.00	10.85	11.98
95N801	18.20	9.50	11.45	15.40
95N811	18.26	8.00	9.64	8.61
95N813	17.60	7.00	8.44	7.56
95N843	16.11	7.00	8.44	5.25
95N873	16.61	8.50	10.25	2.14
95N874	17.79	8.00	9.64	5.98
95N897	18.90	7.50	9.04	8.19
95N919	17.06	8.00	9.64	6.31
95N937	16.80	9.50	11.45	8.15
95N951	18.12	5.00	6.03	3.28
95N955	17.33	9.00	10.85	9.33
95N964	19.83	8.00	9.64	10.91
95N972	18.06	6.00	7.23	3.66
95N983	18.66	8.50	10.25	9.05
95N1000	17.64	9.00	10.85	11.62
95N1004	17.84	6.50	7.84	6.47
95N1009	19.37	5.00	6.03	3.64
95N1011	16.52	7.00	8.44	8.93
*95N1015	17.44	9.50	11.45	13.48
95N1024	16.72	5.00	6.03	4.48
95N1029	17.73	8.50	10.25	11.99
95N1030	16.24	6.50	7.84	3.62
95N1034	16.71	8.00	9.64	6.48
95N1036	17.21	9.50	11.45	7.72
95N1039	14.36	2.00	2.41	0.80
95N1042	17.88	6.50	7.84	6.20
95N1052	17.32	9.50	11.45	12.12
95N1056	18.36	5.50	6.63	6.93
95N1071	19.34	10.00	12.05	11.46
95N1074	17.63	7.50	9.04	8.55
*95N1083	18.84	9.00	10.85	12.40
*95N1086	15.95	9.00	10.85	9.69
95N1103	17.49	8.50	10.25	11.87
95N1111	17.01	9.50	11.45	9.01
*95N1116	18.10	10.00	12.05	15.50
95N1139	17.17	4.00	4.82	3.96
95N1151	19.17	9.50	11.45	11.48
*95N1198	18.43	8.50	10.25	10.79
95N1203	17.92	7.00	8.44	7.26
95N1210	15.54	6.50	7.84	4.44
95N1224	19.34	8.00	9.64	7.80
95N1236	17.98	9.00	10.85	11.43
*95N1239	17.65	5.50	6.63	7.40

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N1250	17.83	6.00	7.23	7.03
95N1260	18.42	9.00	10.85	10.38
95N1263	19.63	4.00	4.82	4.12
95N1280	17.04	7.50	9.04	8.46
*95N1303	18.00	7.00	8.44	7.85
95N1308	18.01	8.00	9.64	9.41
95N1312	16.76	8.00	9.64	7.97
95N1318	19.29	8.50	10.25	9.61
95N1319	15.57	7.00	8.44	5.87
95N1325	17.93	9.50	11.45	10.15
95N1332	17.60	10.00	12.05	11.67
95N1334	18.26	6.00	7.23	6.22
*95N1336	19.80	6.50	7.84	6.79
95N1337	17.97	8.50	10.25	8.28
95N1340	17.43	8.00	9.64	9.48
95N1356	18.39	9.00	10.85	12.50
95N1368	19.20	8.00	9.64	9.92
95N1373	18.62	9.50	11.45	11.76
95N1400	15.17	9.00	10.85	8.36
95N1407	16.71	4.00	4.82	1.60
95N1412	16.89	7.50	9.04	6.85
*95N1413	18.85	8.00	9.64	8.18
*95N1417	17.02	6.50	7.84	9.30
95N1420	17.53	7.00	8.44	5.39
95N1432	17.84	7.50	9.04	7.19
95N1433	17.75	5.00	6.03	6.60
95N1434	19.51	7.00	8.44	8.15
95N1443	16.78	10.00	12.05	12.06
95N1449	17.37	9.00	10.85	7.77
95N1455	17.28	10.00	12.05	8.56
95N1456	18.45	9.00	10.85	11.16
95N1457	16.19	7.00	8.44	6.23
95N1470	16.57	10.00	12.05	9.06
95N1471	17.68	10.00	12.05	8.11
95N1476	18.97	7.00	8.44	3.44
*95N1483#	18.75	7.50	9.04	7.92
95N1488	17.02	4.00	4.82	2.95
95N1501	17.51	9.00	10.85	11.07
95N1506	19.08	2.00	2.41	1.33
95N1525	17.44	7.50	9.04	8.56
95N1553	17.96	9.50	11.45	9.48
95N1599	19.27	5.00	6.03	5.07
95N1601	16.92	7.00	8.44	8.83
95N1640	17.53	9.00	10.85	8.20
95N1645	17.21	3.00	3.62	1.97
95N1669	18.15	7.00	8.44	7.54
95N1686	16.91	9.50	11.45	7.89
95N1690	18.78	7.00	8.44	9.23
95N1692	17.00	6.00	7.23	7.80
95N1694	17.43	9.50	11.45	8.83
*95N1700#	18.56	8.00	9.64	9.44
95N1714	19.22	9.00	10.85	11.24
95N1718	19.43	7.00	8.44	5.86
95N1737	18.07	8.00	9.64	7.90
95N1739	18.57	6.50	7.84	5.38
95N1741	18.08	8.50	10.25	6.62
95N1755	16.45	8.00	9.64	6.84
95N1789	17.80	9.00	10.85	7.98
95N1793	19.39	8.00	9.64	11.39
95N1796	17.39	9.00	10.85	9.67
*95N1806	18.79	10.00	12.05	12.35
*95N1807	17.07	10.00	12.05	13.72
95N1809	17.24	9.50	11.45	10.55
95N1811	15.95	4.00	4.82	3.13
95N1812	19.27	9.00	10.85	15.28
95N1817	17.50	10.00	12.05	7.76

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
*95N1820#	19.55	8.50	10.25	12.19
95N1822	15.91	10.00	12.05	9.41
*95N1829	17.38	9.00	10.85	9.14
95N1838	18.21	7.50	9.04	9.14
95N1849	18.37	6.50	7.84	6.53
95N1850	18.28	9.00	10.85	9.64
95N1852	16.52	8.00	9.64	3.99
*95N1865	18.21	7.00	8.44	8.66
95N1893	18.44	6.50	7.84	6.96
95N1894	18.41	9.00	10.85	15.62
95N1905	17.33	9.00	10.85	12.38
95N1914	18.20	10.00	12.05	7.26
95N1916	16.96	9.00	10.85	9.34
95N1936	17.82	10.00	12.05	8.52
95N1941	17.36	8.50	10.25	8.20
95N1965	16.38	7.00	8.44	5.70
95N1977	17.20	6.00	7.23	5.65
95N1987	17.87	9.00	10.85	10.27
Q120	19.12	9.00	10.85	13.84
Q120	19.20	9.00	10.85	13.06
Q120	19.17	9.00	10.85	12.40
Q120	19.37	9.00	10.85	12.02
Q120	18.95	9.00	10.85	10.14
Q120	19.05	9.00	10.85	9.72
Q120	19.70	8.00	9.64	9.81
Q120	18.14	9.00	10.85	8.80
Q120	18.01	9.00	10.85	8.01
Q120	18.88	7.00	8.44	8.79
Q120	18.81	7.50	9.04	7.29
Q152	18.04	9.50	11.45	13.93
Q152	18.22	9.00	10.85	12.33
Q152	17.12	9.50	11.45	12.79
Q152	17.90	8.50	10.25	11.33
Q152	18.42	7.00	8.44	11.01
Q152	18.15	8.00	9.64	9.78
Q152	17.64	8.50	10.25	8.08
Q152	17.37	8.50	10.25	8.51
Q152	17.12	8.00	9.64	7.97
Q152	18.21	6.00	7.23	6.06
Q152	18.08	5.50	6.63	5.55

*Clones (30) advanced to series 3 HF2 trial; # Clones (6) advanced to core selection propagation.

APPENDIX 17 Clonal means for harvest data determined in the plant crop (August) and first-ratoon crop (September) of the series 3 HF2 trial

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N20	18.95	8.00	10.06	6.97
95N22	16.91	6.50	8.18	5.04
*95N25	16.31	9.00	11.35	10.02
95N32	17.16	7.00	8.80	8.32
*95N77	18.21	8.25	10.38	13.56
*95N79	17.95	8.50	10.69	14.45
95N82	17.16	6.50	8.26	7.63
*95N91	17.47	8.75	11.02	14.11
95N101	17.55	8.00	10.06	11.73
95N172	17.35	8.25	10.38	11.07
95N180	17.68	8.25	10.41	9.80
95N184	16.36	9.00	11.32	12.93
95N189	16.73	8.75	10.99	9.56
95N203	17.05	7.00	8.83	7.12
95N220	17.52	9.75	12.24	16.35
95N226	16.65	5.50	6.84	6.33
95N228	18.34	7.75	9.68	9.72
*95N234#	18.68	8.25	10.38	12.59
95N241	16.29	9.00	11.35	10.59
95N245	16.19	8.25	10.37	7.45
95N247	17.46	8.75	11.02	12.26
95N258	17.66	6.25	7.92	9.16
95N272	16.57	9.75	12.24	9.47
95N273	18.36	7.75	9.73	12.86
95N275	16.02	8.75	10.96	10.48
95N278	17.57	8.75	10.96	11.40
95N279	16.84	9.50	11.92	10.03
*95N280	16.54	9.50	11.95	12.85
95N286	15.30	9.50	11.95	12.61
95N288	18.15	8.00	9.98	12.98
*95N289#	18.23	9.25	11.64	13.88
95N295	16.61	9.50	11.95	12.10
95N298	14.55	6.75	8.53	9.23
95N305	16.59	7.75	9.71	9.23
95N317	15.07	8.50	10.69	8.56
95N325	16.82	8.00	10.04	9.82
95N332	18.38	7.50	9.48	10.54
95N336	16.14	6.75	8.53	5.95
*95N347	17.62	7.75	9.79	12.88
95N349	17.71	7.25	9.07	8.33
95N360	17.13	9.50	11.95	12.24
95N384	16.20	9.00	11.32	14.00
95N425	16.48	8.75	11.04	12.71
95N484	16.68	6.75	8.47	7.30
*95N485	16.98	9.00	11.35	12.36
95N498	17.45	8.25	10.38	12.52
95N507	17.50	9.75	12.24	10.99
95N517	16.40	7.75	9.81	9.00
95N521	16.89	8.75	10.99	9.79
95N523	17.39	6.25	7.92	6.74
95N526	17.34	5.25	6.67	6.28
95N536	17.50	8.50	10.66	9.23
95N539	17.70	5.75	7.27	5.93
*95N545	17.91	8.00	10.06	13.32
95N558	17.07	6.75	8.45	5.16
95N566	18.34	6.50	8.22	8.75
95N575	17.73	7.75	9.68	10.37
95N594	15.52	9.75	12.24	14.88
95N606	17.30	5.25	6.54	5.05
95N613	17.00	8.25	10.41	10.64
95N614	16.54	9.25	11.59	8.62
95N621	16.79	7.25	9.07	8.47

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N624	17.50	6.50	8.26	9.06
95N628	16.93	8.25	10.31	7.42
95N639	16.95	7.25	9.11	8.38
95N652	17.05	7.25	9.16	9.10
95N666	16.04	7.50	9.40	12.45
*95N670	16.58	9.25	11.64	13.22
*95N681#	17.39	9.75	12.24	13.89
*95N686	17.70	8.25	10.41	13.64
95N696	17.84	7.75	9.71	10.43
95N707	17.13	7.50	9.40	8.00
95N714	17.66	7.50	9.46	9.22
95N724	17.44	6.75	8.45	6.16
95N725	17.16	9.50	11.95	11.20
95N731	17.04	8.50	10.71	11.29
95N746	15.51	9.75	12.24	10.99
95N762	17.18	9.50	11.92	7.63
95N773	16.64	9.25	11.59	14.04
95N777	17.81	8.75	11.02	9.91
95N789	17.11	6.50	8.18	7.76
95N793	18.23	8.75	10.96	9.32
95N794	17.34	9.25	11.64	12.36
95N801	17.62	9.00	11.29	14.34
95N811	17.34	7.50	9.40	9.43
95N813	16.80	7.25	9.13	10.10
95N843	16.30	7.75	9.79	9.18
95N873	16.57	7.75	9.71	3.25
95N874	17.57	7.75	9.73	7.48
95N897	17.75	8.00	10.09	11.19
95N919	16.32	7.25	9.07	7.24
95N937	16.75	9.25	11.62	9.78
95N951	17.55	6.75	8.58	7.13
95N955	16.78	9.25	11.64	10.31
95N964	18.24	8.25	10.38	12.21
95N972	17.05	6.50	8.20	5.78
95N983	17.26	8.50	10.69	11.54
95N1000	16.84	9.25	11.64	14.37
95N1004	18.16	6.75	8.51	7.53
95N1009	18.33	6.00	7.60	6.20
95N1011	16.61	7.50	9.46	12.6
*95N1015	16.98	9.50	11.95	13.43
95N1024	15.93	6.00	7.60	6.61
95N1029	16.66	8.50	10.69	11.20
95N1030	15.95	6.75	8.51	6.04
95N1034	16.59	7.25	9.07	6.30
95N1036	16.11	8.25	10.31	7.67
95N1039	15.82	4.75	6.12	5.12
95N1042	17.68	7.25	9.16	7.87
95N1052	15.79	9.25	11.62	11.75
95N1056	17.26	6.50	8.22	8.71
95N1071	18.96	9.25	11.59	10.38
95N1074	17.04	7.5	9.43	9.80
*95N1083	18.5	9.25	11.64	14.24
*95N1086	15.54	9.25	11.64	13.73
95N1103	16.59	7.75	9.71	10.38
95N1111	15.87	9.25	11.62	9.10
*95N1116	17.40	9.75	12.24	14.07
95N1139	17.05	5.00	6.34	6.57
95N1151	17.53	9.00	11.29	10.30
*95N1198	17.80	8.25	10.37	13.32
95N1203	17.05	8.25	10.44	9.76
95N1210	15.21	7.50	9.48	9.21
95N1224	18.02	7.50	9.40	7.09
95N1236	16.36	9.00	11.32	11.35
*95N1239	17.31	7.00	8.88	12.75
95N1250	17.89	7.50	9.51	14.24
95N1260	17.96	8.75	10.99	13.10

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
95N1263	18.66	5.50	7.00	8.53
95N1280	16.31	8.25	10.41	9.90
*95N1303	17.11	8.25	10.44	12.43
95N1308	17.04	8.50	10.71	12.23
95N1312	15.90	7.75	9.73	8.09
95N1318	18.07	8.75	11.02	10.57
95N1319	15.46	7.75	9.79	10.09
95N1325	17.02	9.50	11.95	12.00
95N1332	16.98	8.50	10.61	9.44
95N1334	17.36	7.00	8.86	8.99
*95N1336	18.78	7.75	9.81	10.79
95N1337	17.26	8.75	11.02	8.97
95N1340	16.86	8.50	10.71	11.12
95N1356	17.2	9.25	11.64	12.23
95N1368	17.82	7.75	9.73	10.39
95N1373	17.55	8.25	10.31	9.64
95N1400	15.49	9.25	11.64	10.21
95N1407	16.64	6.00	7.65	7.31
95N1412	16.99	8.00	10.09	9.02
*95N1413	18.72	8.25	10.38	12.23
*95N1417	17.14	7.50	9.48	13.08
95N1420	17.22	7.00	8.80	9.47
95N1432	15.80	7.25	9.11	7.12
95N1433	17.56	6.00	7.60	8.99
95N1434	18.38	6.75	8.47	7.58
95N1443	15.96	9.50	11.92	11.26
95N1449	16.54	7.50	9.36	4.78
95N1455	17.25	9.50	11.92	9.58
95N1456	18.05	8.00	10.01	9.83
95N1457	15.27	8.00	10.12	8.28
95N1470	16.39	9.00	11.27	8.34
95N1471	17.13	7.00	8.64	5.21
95N1476	17.90	5.00	6.18	2.23
*95N1483#	18.59	8.25	10.41	12.05
95N1488	15.82	5.50	7.00	4.73
95N1501	16.62	9.00	11.32	12.80
95N1506	17.02	2.00	2.52	0.82
95N1525	16.59	8.00	10.09	9.99
95N1553	17.66	9.00	11.29	9.72
95N1599	18.19	6.00	7.60	6.29
95N1601	16.18	7.00	8.80	6.99
95N1640	16.90	8.50	10.66	10.37
95N1645	16.68	5.00	6.39	5.49
95N1669	17.54	6.50	8.15	5.75
95N1686	16.88	9.25	11.62	10.34
95N1690	17.70	7.25	9.13	10.45
95N1692	16.42	7.25	9.18	12.44
95N1694	17.37	8.25	10.31	7.38
*95N1700#	18.15	8.25	10.38	11.74
95N1714	18.09	9.00	11.32	12.36
95N1718	18.80	6.00	7.50	6.04
95N1737	17.36	8.25	10.38	8.69
95N1739	17.89	4.25	5.23	3.08
95N1741	17.64	5.75	7.09	4.33
95N1755	15.17	7.50	9.40	7.29
95N1789	16.57	8.00	10.01	7.58
95N1793	18.41	8.00	10.06	12.31
95N1796	17.21	9.00	11.32	12.04
*95N1806	17.36	9.75	12.24	14.28
*95N1807	16.73	9.75	12.24	15.44
95N1809	16.25	9.50	11.95	11.86
95N1811	15.66	5.75	7.32	6.83
95N1812	18.63	8.25	10.34	14.36
95N1817	16.90	9.00	11.27	8.12
*95N1820#	19.07	8.25	10.37	13.03
95N1822	14.73	9.50	11.92	9.18

Clone	CCS	Appearance grade	Adjusted appearance grade	Net merit grade
*95N1829	17.47	8.75	10.99	12.84
95N1838	17.64	7.75	9.76	8.54
95N1849	17.31	6.75	8.51	7.68
95N1850	18.38	8.00	10.01	9.40
95N1852	16.17	7.25	9.07	5.85
*95N1865	17.35	8.00	10.12	11.26
95N1893	17.25	7.00	8.83	8.51
95N1894	17.21	8.25	10.34	14.12
95N1905	16.99	8.75	10.99	12.02
95N1914	17.50	10.00	12.57	9.04
95N1916	16.15	9.00	11.32	9.48
95N1936	17.09	9.25	11.59	8.39
95N1941	17.15	8.75	11.02	10.60
95N1965	16.33	7.50	9.46	10.76
95N1977	16.91	6.50	8.20	7.42
95N1987	17.15	8.50	10.66	11.96
Q120	17.91	7.75	9.68	9.89
Q120	17.36	8.25	10.34	8.53
Q120	18.25	8.50	10.66	10.20
Q120	17.88	9.00	11.32	12.35
Q120	17.66	8.00	10.01	7.03
Q120	18.09	8.75	10.99	12.76
Q120	17.86	8.50	10.71	10.94
Q120	17.82	7.00	8.78	5.46
Q120	17.84	8.75	10.99	11.02
Q120	18.38	7.00	8.80	7.42
Q120	17.44	8.25	10.34	8.58
Q152	17.23	8.25	10.31	13.64
Q152	16.60	7.25	9.07	7.30
Q152	17.26	6.50	8.20	6.93
Q152	17.08	8.50	10.69	11.79
Q152	16.90	7.75	9.71	9.53
Q152	17.52	7.50	9.46	12.58
Q152	17.36	6.25	7.90	8.19
Q152	17.34	8.50	10.69	9.78
Q152	17.36	8.25	10.34	11.56
Q152	17.32	7.75	9.73	11.58
Q152	17.14	9.00	11.29	14.34

*Clones (30) advanced to the series 3 HF2 trial; # Clones (6) advanced to core selection propagation.

APPENDIX 18 Clonal means for stalk measurements taken from the plant crop of the series 1 HF2 trial

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/(cm^2) [4]	Force (N) [5]	Erectness [6]
91N1187	2.92	6.74	48.75	7.26	55.51	4.33
91N1306	2.71	5.83	19.35	3.43	33.40	4.27
91N1406*	2.71	5.85	27.28	4.78	49.65	2.83
91N2026	2.95	6.89	40.98	6.00	59.22	3.70
91N2274	2.59	5.30	19.70	3.81	43.74	4.03
91N2936	2.74	5.95	21.67	3.64	38.89	2.90
91N2967*	2.92	6.76	30.17	4.54	47.68	1.83
91N2976	2.82	6.29	33.28	5.32	50.43	4.10
91N3252	2.73	5.90	16.87	2.91	35.75	1.13
91N3487*	2.80	6.23	25.85	4.27	47.15	2.20
91N3658	2.97	6.96	19.15	2.77	33.83	2.00
93N83*	2.75	6.00	33.13	5.53	51.79	1.60
93N310	2.49	4.92	16.72	3.48	29.27	7.33
93N519	2.80	6.20	33.28	5.35	60.49	6.97
93N577*	2.84	6.43	29.87	4.72	47.56	1.30
93N631	2.51	4.98	24.17	4.93	28.19	2.00
93N762	2.60	5.36	28.47	5.30	-	0.47
93N789	2.56	5.18	17.40	3.37	-	1.33
93N803	2.30	4.18	18.38	4.48	27.03	0.83
93N811	3.04	7.34	31.42	4.36	47.03	5.87
93N921*	2.26	4.07	25.67	6.40	41.49	0.70
93N924	2.66	5.62	26.87	4.89	51.06	2.90
93N925	2.93	6.79	25.88	3.89	46.25	0.53
93N957	2.43	4.73	20.43	4.62	46.26	3.73
93N1005	2.67	5.66	21.24	3.83	36.19	2.00
93N1047	3.01	7.21	36.88	5.16	51.55	1.20
93N1059	2.96	7.01	23.03	3.35	47.03	5.13
93N1301	2.89	6.63	34.88	5.35	45.92	3.03
93N1318	2.84	6.37	28.72	4.61	45.42	3.23
93N1372	2.33	4.38	28.89	6.91	38.90	0.67
Q120	2.80	6.20	25.20	4.11	35.12	5.00
Q120	2.66	5.63	21.45	3.91	-	2.80
Q135	2.68	5.68	29.45	5.26	-	6.87
Q135	2.64	5.52	28.82	5.27	42.67	6.47
Q174	2.92	6.80	33.75	5.03	54.14	7.77
Q174	3.07	7.46	35.85	4.84	47.53	8.33

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; - Force measures not taken due to insufficient stalk numbers or lodging in some replicates; *Selected clones advanced to maximum propagation.

APPENDIX 19 Clonal means for six stalk measurements taken from the plant crop of the series 2 HF2 trial

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/(cm^2) [4]	Force (N) [5]	Erectness [6]
86A700	2.31	4.26	17.23	4.18	40.69	1.97
87A577	2.25	4.05	21.53	5.46	41.36	0.20
88A861	2.63	5.50	41.58	7.61	72.83	2.17
88A1600*	2.72	5.87	39.60	6.67	67.34	0.10
91N1418	2.86	6.50	31.98	5.02	72.94	0.10
92N55	2.88	6.58	33.32	5.07	70.97	0.05
92N157	2.95	6.92	22.20	3.29	50.31	0.05
92N176#	2.35	4.40	22.85	5.38	58.55	0.30
92N228	2.34	4.36	29.45	6.73	34.46	0.13
92N230	2.87	6.50	40.12	6.17	72.35	0.00
92N936	2.40	4.55	26.62	5.87	64.46	3.33
92N942	2.89	6.61	26.88	4.12	46.68	1.13
92N1059	2.34	4.34	24.13	5.67	38.26	1.47
92N1194#	2.09	3.46	23.85	6.99	42.38	0.53
92N1317#	2.44	4.74	24.38	5.36	47.32	1.00
92N1519	2.76	6.02	36.50	6.25	63.15	0.13
92N1983**	3.08	7.51	20.98	2.84	42.52	0.00
92N2447#	2.61	5.39	21.13	4.04	50.50	0.77
93N137	2.42	4.64	28.42	6.25	43.45	0.47
93N288#	2.50	5.01	31.07	6.23	48.24	1.90
93N1043	2.59	5.34	26.95	5.08	35.35	0.12
93N1150	2.69	5.75	25.92	4.57	64.85	2.17
93N1154	2.50	4.97	34.17	6.87	69.92	0.60
93N1328	2.63	5.52	27.57	5.28	62.82	0.03
93N1363	2.57	5.26	31.90	6.03	59.17	1.40
93N1377	2.58	5.28	25.45	4.91	51.16	0.35
94N28	2.29	4.2	20.10	4.98	40.33	0.03
94N51	2.20	3.85	25.82	6.79	38.20	2.20
94N84	2.32	4.26	28.82	6.86	52.72	0.20
94N105#	2.67	5.64	29.08	5.17	66.94	0.20
94N131	2.50	4.99	27.02	5.66	51.14	0.63
94N320	3.11	7.72	31.57	4.20	68.47	1.07
94N465	3.15	7.9	33.23	4.46	89.68	0.10
94N512	2.10	3.52	24.02	6.91	38.30	1.27
94N592	2.42	4.62	30.07	6.56	63.40	5.67
94N815*	3.19	8.03	38.15	4.76	72.41	0.10
94N963**	3.01	7.13	40.20	5.65	86.79	0.90
94N1012	2.62	5.49	20.48	3.91	42.17	0.23
Q120	2.58	5.29	23.13	4.54	47.72	0.13
Q120	2.55	5.12	23.15	4.57	47.99	0.10
Q152	2.31	4.25	26.42	6.32	53.69	1.93
Q152	2.27	4.08	24.48	6.08	53.11	1.93

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; **88A1600 and 94N815 occur only in one replicate; *94N963 and 92N1983 occur only in two replicates (These clones were not included in entire analyses. Above figures were worked out manually); #Clones advanced to maximum propagation.

APPENDIX 20 Clonal means for six stalk measurements taken from the plant crop of the series 3 HF1 trial

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/ (cm^2) [4]	Force (N) [5]	Erectness [6]
95N20	3.13	7.72	29.40	3.76	48.66	0.5
95N22	2.90	6.71	31.20	4.86	-	5.6
95N25*	2.80	6.22	31.85	5.12	45.85	0.9
95N32	3.05	7.35	40.95	5.61	-	1.8
95N77*	2.60	5.40	33.95	6.44	50.40	1.0
95N79*	2.79	6.11	24.35	3.98	46.48	0.9
95N82	2.13	3.58	19.85	5.57	28.48	1.8
95N91*	2.29	4.15	23.60	5.71	49.13	3.0
95N101	2.47	4.81	32.50	6.78	40.55	4.8
95N172	2.31	4.26	27.65	6.62	32.39	2.0
95N180	2.50	4.95	27.90	5.72	32.03	1.0
95N184	2.24	3.96	22.75	5.75	44.31	0.9
95N189	2.65	5.54	21.17	3.83	37.79	3.0
95N203	2.25	4.04	20.25	5.10	41.52	1.0
95N220	2.41	4.61	21.50	4.78	43.71	0.6
95N226	2.58	5.29	33.22	6.26	-	6.3
95N228	2.44	4.69	18.40	3.99	35.83	1.0
95N234*	2.41	4.57	21.85	4.79	48.84	1.8
95N241	2.36	4.38	22.65	5.23	49.50	0.9
95N245	2.22	3.92	29.00	7.51	49.05	1.8
95N247	2.37	4.43	24.85	5.66	49.97	2.0
95N258	2.98	7.04	28.15	4.01	63.13	4.0
95N272	2.50	4.92	18.65	3.77	36.55	0.1
95N273	2.34	4.33	23.70	5.54	34.00	3.6
95N275	2.65	5.58	29.85	5.51	41.13	1.8
95N278	2.43	4.73	28.55	6.20	-	3.6
95N279	2.56	5.20	30.80	6.09	-	1.8
95N280*	2.54	5.14	30.95	6.07	39.75	0.1
95N286	2.71	5.79	34.95	5.99	45.09	0.8
95N288	2.91	6.71	26.10	4.00	39.52	0.6
95N289*	2.90	6.62	21.30	3.25	36.92	0.8
95N295	2.80	6.21	33.65	5.43	51.61	0.1
95N298	2.14	3.65	25.90	7.20	-	4.0
95N305	2.88	6.57	34.30	5.36	66.19	0.8
95N317	2.60	5.34	38.20	7.15	-	4.0
95N325	2.31	4.25	30.50	7.27	-	1.8
95N332	2.80	6.21	23.55	3.84	57.75	0.2
95N336	2.73	5.88	27.70	4.72	-	2.4
95N347*	2.34	4.37	23.65	5.53	44.65	1.8
95N349	2.39	4.51	22.05	4.91	-	6.0
95N360	3.04	7.33	31.55	4.36	60.38	0.1
95N384	2.50	4.96	33.50	6.88	40.08	1.8
95N425	2.59	5.32	40.85	7.81	49.19	3.0
95N484	2.71	5.80	28.94	5.02	36.06	0.1
95N485*	2.25	3.99	24.85	6.32	49.76	0.9
95N498	2.45	4.72	20.70	4.41	35.50	1.6
95N507	3.11	7.62	30.55	4.02	45.77	0.1
95N517	2.46	4.76	33.20	6.95	-	4.5
95N521	2.67	5.65	26.05	4.75	40.21	0.2
95N523	2.85	6.45	19.06	3.01	33.32	0.4
95N526	2.78	6.13	37.15	6.03	-	2.7
95N536	2.60	5.39	28.20	5.35	46.12	0.1
95N539	2.73	5.85	22.90	3.94	-	5.4
95N545*	2.29	4.17	25.05	6.04	38.60	1.2
95N558	2.54	5.11	34.55	6.75	39.40	1.5
95N566	2.55	5.16	21.55	4.22	36.47	1.6
95N575	2.35	4.37	23.50	5.46	29.17	4.0
95N594	2.92	6.74	42.00	6.32	80.56	3.0
95N606	2.37	4.44	20.40	4.62	-	9.0
95N613	2.53	5.04	27.45	5.50	47.57	0.9
95N614	2.52	5.01	30.85	6.19	30.63	1.8
95N621	2.42	4.65	26.80	5.93	31.98	1.0
95N624	2.53	5.07	30.50	6.06	47.77	1.8
95N628	2.29	4.16	25.85	6.18	37.26	0.4
95N639	2.35	4.38	19.95	4.76	33.83	4.0
95N652	2.52	5.05	23.45	4.64	34.47	5.4
95N666	2.55	5.15	28.75	5.65	-	6.0
95N670*	2.48	4.83	27.70	5.74	54.91	1.0

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/ (cm^2) [4]	Force (N) [5]	Erectness [6]
95N681*	2.43	4.65	25.15	5.48	43.00	1.8
95N686*	2.42	4.61	31.10	6.77	65.33	2.0
95N696	2.68	5.70	32.40	5.70	42.74	1.8
95N707	2.87	6.49	33.30	5.13	-	4.0
95N714	2.60	5.33	29.65	5.66	-	2.0
95N724	2.95	6.97	43.60	6.46	59.39	2.4
95N725	2.69	5.74	27.95	5.00	59.90	0.1
95N731	2.64	5.49	45.40	8.30	63.97	0.1
95N746	2.61	5.38	24.55	4.61	51.86	0.2
95N762	2.60	5.31	17.70	3.37	35.35	0.1
95N773	2.41	4.59	27.30	6.01	51.25	1.8
95N777	2.24	3.95	23.50	5.94	32.49	0.1
95N789	2.17	3.78	17.15	4.86	25.97	3.6
95N793	2.42	4.61	23.65	5.14	24.52	2.0
95N794	2.34	4.34	20.00	4.62	33.63	0.9
95N801	2.59	5.29	31.05	5.91	52.40	1.8
95N811	2.08	3.41	18.95	5.69	27.80	5.0
95N813	2.72	5.86	20.30	3.51	25.67	2.1
95N843	2.25	4.01	33.75	8.37	37.84	1.8
95N873	2.32	4.29	20.00	4.94	27.02	0.1
95N874	2.46	4.78	21.45	4.47	36.08	1.0
95N897	2.57	5.26	21.25	4.15	40.33	1.0
95N919	3.04	7.30	28.50	3.95	37.91	1.0
95N937	2.92	6.73	30.45	4.56	52.02	0.6
95N951	2.82	6.31	19.55	3.16	30.17	0.8
95N955	3.02	7.17	22.80	3.21	38.71	0.9
95N964	2.87	6.55	33.85	5.17	-	3.0
95N972	2.66	5.59	18.50	3.34	31.66	1.6
95N983	2.26	4.05	24.00	5.93	34.35	1.8
95N1000	2.58	5.25	26.90	5.13	46.90	0.9
95N1004	2.87	6.50	26.00	4.01	48.71	5.4
95N1009	2.21	3.85	18.90	4.96	32.73	1.2
95N1011	2.42	4.66	28.45	6.17	60.72	0.9
95N1015*	2.52	5.03	29.75	5.93	50.90	1.8
95N1024	3.09	7.62	25.35	3.47	73.62	0.8
95N1029	2.40	4.54	31.65	6.96	44.63	2.0
95N1030	2.92	6.75	29.75	4.43	49.25	1.0
95N1034	2.61	5.39	28.10	5.30	61.06	0.2
95N1036	2.80	6.23	34.25	5.54	-	3.6
95N1039	3.39	9.09	32.50	3.55	-	7.0
95N1042	2.99	7.10	26.00	3.76	51.48	0.2
95N1052	2.52	5.00	36.35	7.25	48.82	1.0
95N1056	2.09	3.44	25.75	7.50	30.15	1.8
95N1071	2.63	5.48	22.55	4.24	49.34	0.1
95N1074	2.31	4.20	21.45	5.12	39.06	6.0
95N1083*	2.22	3.88	28.00	7.26	46.25	1.6
95N1086*	2.64	5.46	18.20	3.33	44.98	0.4
95N1103	2.26	4.04	25.05	6.25	39.07	1.8
95N1111	2.41	4.61	22.30	4.87	-	1.8
95N1116*	2.06	3.38	24.40	7.32	41.44	0.8
95N1139	2.57	5.20	29.55	5.67	51.46	5.4
95N1151	2.46	4.77	23.65	4.96	42.84	0.1
95N1198*	2.66	5.58	21.25	3.84	47.05	1.6
95N1203	2.53	5.06	18.15	3.70	32.05	1.8
95N1210	2.44	4.73	24.20	5.23	46.88	1.8
95N1224	2.58	5.29	23.65	4.51	41.37	1.6
95N1236	2.76	6.03	21.50	3.60	49.53	0.9
95N1239*	2.55	5.14	29.10	5.75	42.74	1.8
95N1250	2.76	6.01	20.40	3.38	57.64	1.0
95N1260	2.59	5.30	34.60	6.47	53.98	0.8
95N1263	2.35	4.38	19.65	4.56	27.13	5.0
95N1280	2.78	6.10	26.65	4.38	46.38	2.7
95N1303*	2.63	5.55	29.15	5.69	46.67	1.8
95N1308	2.80	6.20	32.20	5.28	67.97	0.8
95N1312	3.20	8.10	27.25	3.39	73.45	1.0
95N1318	2.60	5.34	31.50	5.90	59.80	1.8
95N1319	2.13	3.60	27.15	7.70	30.05	4.0
95N1325	2.57	5.31	28.40	5.36	46.24	0.1
95N1332	3.04	7.30	27.90	3.81	-	2.7
95N1334	2.20	3.85	16.10	4.25	-	4.0
95N1336*	2.43	4.67	22.45	4.84	-	4.0
95N1337	2.80	6.21	23.00	3.74	43.71	0.1

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/ (cm^2) [4]	Force (N) [5]	Erectness [6]
95N1340	2.47	4.80	32.05	6.58	52.07	1.6
95N1356	2.15	3.66	22.45	6.17	30.41	2.0
95N1368	2.09	3.47	22.00	6.40	35.27	1.8
95N1373	2.50	4.95	26.05	5.34	35.38	1.0
95N1400	2.77	6.05	25.50	4.23	56.83	0.2
95N1407	2.52	5.02	28.65	5.71	31.27	1.8
95N1412	2.63	5.46	23.50	4.29	34.14	0.1
95N1413*	2.51	4.98	27.65	5.57	39.01	1.8
95N1417*	3.11	7.69	49.65	6.62	87.16	1.2
95N1420	3.10	7.69	43.85	5.65	79.98	1.5
95N1432	2.60	5.37	19.15	3.64	36.75	0.1
95N1433	2.97	7.02	37.45	5.46	-	4.5
95N1434	2.58	5.28	25.40	4.89	29.93	0.3
95N1443	2.92	6.71	54.45	8.06	60.36	0.4
95N1449	3.18	7.98	25.20	3.22	45.93	0.1
95N1455	2.31	4.20	25.05	5.94	45.47	0.2
95N1456	2.71	5.81	36.30	6.31	41.48	0.1
95N1457	2.31	4.20	22.10	5.34	-	3.0
95N1470	2.66	5.63	39.85	7.11	60.25	2.7
95N1471	2.87	6.54	36.60	5.85	-	0.9
95N1476	2.82	6.33	20.85	3.38	30.28	0.9
95N1483*	2.55	5.13	29.00	5.66	49.89	1.6
95N1488	2.78	6.11	31.60	5.17	-	7.2
95N1501	2.87	6.50	34.25	5.32	48.40	0.4
95N1506	2.32	4.25	26.00	6.21	-	1.0
95N1525	2.84	6.42	30.95	4.87	79.00	1.8
95N1553	3.08	7.61	43.20	5.94	84.16	0.9
95N1599	2.94	6.79	33.65	4.97	59.15	4.0
95N1601	2.55	5.13	32.22	6.19	41.78	6.3
95N1640	2.75	5.97	23.35	3.98	52.90	1.6
95N1645	2.92	6.77	33.06	4.92	41.43	2.0
95N1669	2.48	4.89	15.60	3.26	25.08	1.6
95N1686	2.60	5.35	20.40	3.91	42.29	0.8
95N1690	2.68	5.64	33.90	6.04	44.20	3.0
95N1692	2.83	6.33	38.80	6.12	66.49	3.0
95N1694	2.47	4.81	26.85	5.65	30.94	0.1
95N1700*	3.18	8.00	44.15	5.51	74.29	0.2
95N1714	2.46	4.76	26.65	5.66	39.57	0.9
95N1718	2.86	6.49	22.35	3.52	51.25	3.0
95N1737	3.19	8.07	35.89	4.57	48.19	0.1
95N1739	3.09	7.56	44.90	5.99	56.23	0.1
95N1741	3.09	7.54	37.85	5.04	60.84	1.6
95N1755	2.81	6.24	33.50	5.44	-	5.0
95N1789	2.33	4.28	24.10	5.71	34.14	0.9
95N1793	2.84	6.41	35.80	5.53	60.04	0.9
95N1796	2.66	5.65	33.20	6.00	55.60	0.9
95N1806*	3.19	8.04	35.15	4.41	78.47	0.4
95N1807*	2.73	5.87	36.50	6.16	63.93	2.7
95N1809	3.01	7.15	43.65	6.22	84.95	0.9
95N1811	2.74	5.93	20.20	3.43	34.83	3.6
95N1812	3.11	7.73	38.90	5.42	84.81	2.0
95N1817	2.91	6.65	24.60	3.71	52.12	0.2
95N1820*	2.68	5.63	34.10	6.08	66.24	2.4
95N1822	3.11	7.59	28.00	3.69	57.39	0.9
95N1829*	2.84	6.37	32.70	5.16	72.65	0.9
95N1838	3.00	7.06	29.40	4.14	55.41	0.5
95N1849	2.58	5.27	25.30	4.91	-	4.5
95N1850	2.88	6.57	23.75	3.72	40.13	0.1
95N1852	2.95	6.93	29.65	4.37	44.51	1.8
95N1865*	2.47	4.82	40.15	8.36	-	5.0
95N1893	2.21	3.87	17.90	4.68	38.56	2.0
95N1894	2.50	4.91	23.95	4.89	40.41	1.8
95N1905	2.58	5.24	25.45	4.91	41.71	0.8
95N1914	2.75	6.03	31.35	5.22	76.58	0.1
95N1916	2.21	3.87	18.80	4.90	50.34	0.1
95N1936	2.43	4.71	22.25	4.80	33.78	2.7
95N1941	2.86	6.52	26.50	4.12	43.57	1.6
95N1965	2.76	6.03	26.33	4.42	-	2.7
95N1977	2.52	5.02	27.30	5.44	-	8.0
95N1987	3.04	7.30	32.85	4.53	-	3.6
Q120	2.75	6.05	27.55	4.63	34.32	0.2
Q120	2.65	5.56	24.25	4.46	42.44	0.4

Clone	Culm-d (cm) [1]	CSA (cm^2) [2]	Charpy ° [3]	Charpy °/ (cm^2) [4]	Force (N) [5]	Erectness [6]
Q120	2.50	4.95	24.55	4.99	49.36	1.8
Q120	2.70	5.76	26.35	4.59	46.30	0.4
Q120	2.85	6.43	27.80	4.36	49.53	0.4
Q120	2.68	5.66	27.20	4.82	50.75	0.8
Q120	2.60	5.36	25.60	4.80	44.67	1.6
Q120	2.57	5.24	26.90	5.21	32.43	0.8
Q120	2.64	5.48	23.94	4.37	43.88	1.8
Q120	2.57	5.21	21.20	4.08	35.63	0.8
Q120	2.66	5.59	28.75	5.26	40.71	0.9
Q152	2.42	4.67	27.95	5.97	47.23	7.0
Q152	2.39	4.51	25.20	5.70	-	7.0
Q152	2.42	4.62	26.15	5.75	-	3.6
Q152	2.54	5.12	31.65	6.18	48.59	3.0
Q152	2.40	4.58	27.10	6.14	50.88	2.7
Q152	2.39	4.55	27.85	6.15	57.31	3.0
Q152	2.31	4.26	25.60	6.12	43.29	2.0
Q152	2.43	4.69	30.25	6.50	40.91	1.6
Q152	2.55	5.13	30.35	5.92	51.37	0.9
Q152	2.60	5.35	33.85	6.39	51.84	2.7
Q152	2.41	4.61	20.25	4.49	46.94	1.6

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; - Clones not measured for force displacement because of lodging or insufficient stalk numbers; *Clones advanced to the maximum propagation.

APPENDIX 21 Clonal means for five stalk measurements and estimated plot erectness taken from the first-ratoon crop of the series 1 HF2 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
91N1187	2.86	38.80	6.50	5.98	74.99	2.80
91N1306	2.78	22.28	6.16	3.74	40.95	4.53
*91N1406	2.77	33.87	6.13	5.52	64.57	4.00
91N2026	2.77	30.45	6.08	5.01	47.96	4.00
91N2274	2.53	21.73	5.08	4.27	53.70	0.67
91N2936	2.73	21.23	6.04	3.76	58.37	0.30
*91N2967#	2.72	28.37	5.89	4.79	61.33	0.20
91N2976	2.75	28.78	6.04	4.68	70.03	1.57
91N3252	2.87	20.45	6.55	3.21	44.22	0.08
*91N3487#	2.89	24.53	6.64	3.69	61.02	0.13
91N3658	2.78	19.07	6.17	3.10	42.51	1.40
*93N83	2.70	32.52	5.79	5.71	60.02	0.30
93N310	2.47	18.00	4.86	3.74	42.48	3.27
93N519	3.07	31.40	7.48	4.25	62.16	5.80
*93N577	2.90	31.03	6.71	4.60	50.53	0.50
93N631	2.60	22.75	5.38	4.26	37.23	1.00
93N762	2.78	34.13	6.10	5.56	45.19	0.93
93N789	2.40	18.15	4.60	4.01	39.35	0.63
93N803	2.48	21.78	4.93	4.52	47.78	1.17
93N811	3.09	32.20	7.59	4.24	39.98	5.47
*93N921	2.21	24.98	3.86	6.46	53.06	0.20
93N924	2.85	36.58	6.42	5.70	64.30	2.13
93N925	3.01	29.57	7.20	4.22	57.98	0.50
93N957	2.46	18.80	4.82	3.93	51.13	2.33
93N1005	2.68	29.55	5.74	5.17	48.31	5.27
93N1047	2.84	34.95	6.44	5.42	60.38	0.10
93N1059	3.31	30.57	8.69	3.52	62.59	4.00
93N1301	2.97	36.58	7.05	5.15	71.75	0.67
93N1318	2.88	21.73	6.58	3.35	62.20	1.33
93N1372	2.42	29.83	4.67	6.28	51.42	2.33
Q120	2.81	24.88	6.32	3.92	49.66	1.80
Q120	2.80	21.35	6.23	3.55	51.81	2.00
Q135	2.94	39.77	6.81	5.83	54.58	4.07
Q135	2.80	35.87	6.23	5.61	61.89	3.80
Q174[(b)]	2.97	23.55	7.00	3.39	54.97	1.80
Q174[(b)]	3.00	24.22	7.13	3.41	62.63	3.93

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; *Clones (6) advanced to maximum propagation; # Clones (2) advanced to core selection propagation.

APPENDIX 22 Clonal means for five stalk measurements and estimated plot erectness taken from the plant and first-ratoon crops of the series 1 HF2 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
91N1187	2.89	43.77	6.62	6.62	65.25	3.56
91N1306	2.75	20.82	6.00	3.58	37.17	4.40
*91N1406	2.94	32.34	6.84	4.80	61.33	3.42
91N2026	2.82	29.27	6.33	4.67	54.51	3.85
91N2274	2.74	30.57	5.99	5.15	57.11	2.35
91N2936	2.86	35.72	6.49	5.50	53.59	1.60
*91N2967#	2.56	20.71	5.19	4.04	48.72	1.01
91N2976	2.73	21.45	6.00	3.70	48.63	2.83
91N3252	2.79	31.03	6.17	5.00	60.23	0.61
*91N3487#	2.8	18.66	6.22	3.06	39.98	1.17
91N3658	2.85	25.19	6.43	3.98	54.09	1.70
*93N83	2.88	19.11	6.57	2.94	38.17	0.95
93N310	2.73	32.83	5.89	5.62	55.91	5.30
93N519	2.48	17.36	4.89	3.61	35.88	6.38
*93N577	2.87	30.45	6.57	4.66	49.05	0.90
93N631	2.56	23.46	5.18	4.59	32.71	1.50
93N762	2.69	31.30	5.73	5.43	#R-45.19	0.70
93N789	2.48	17.77	4.89	3.69	#R-39.35	0.98
93N803	2.39	20.08	4.55	4.50	37.41	1.00
93N811	3.06	31.81	7.46	4.30	43.51	5.67
*93N921	2.23	25.32	3.96	6.43	47.27	0.45
93N924	2.75	31.73	6.02	5.29	57.68	2.52
93N925	2.97	27.73	7.00	4.05	52.12	0.52
93N957	2.44	19.61	4.78	4.28	48.7	3.03
93N1005	2.67	25.39	5.70	4.50	42.25	3.63
93N1047	2.92	35.91	6.83	5.29	55.97	0.65
93N1059	3.13	26.80	7.85	3.44	54.81	4.57
93N1301	2.93	35.73	6.84	5.25	58.84	1.85
93N1318	2.86	25.23	6.47	3.98	53.81	2.28
93N1372	2.38	29.36	4.53	6.59	45.16	1.50
Q120	2.81	25.04	6.26	4.01	42.39	3.40
Q120	2.73	21.40	5.93	3.73	#R-51.81	2.40
Q135	2.81	34.61	6.25	5.54	#R-54.58	5.47
Q135	2.72	32.34	5.88	5.44	52.28	5.13
Q174[(b)]	2.94	28.65	6.90	4.21	54.55	4.79
Q174[(b)]	3.04	30.04	7.29	4.12	55.08	6.13

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; *Clones (6) advanced to maximum propagation; # Clones (2) advanced to core selection propagation; #R Mean result from first-ratoon crop as no data was recorded from the plant crop.

APPENDIX 23 Clonal means for five stalk measurements and estimated plot erectness taken from the first-ratoon crop of the series 2 HF2 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
86A700	2.43	14.07	4.82	3.02	46.92	1.13
87A577	2.39	14.92	4.59	3.36	42.90	3.17
88A861	2.59	25.22	5.35	4.74	55.48	0.87
88A1600	2.79	29.65	6.17	4.96	54.86	2.83
91N1418	2.83	20.22	6.38	3.17	54.16	0.45
92N55	2.67	22.83	5.66	4.08	54.63	0.10
92N157	2.80	12.92	6.24	2.10	53.91	0.08
*92N176	2.71	16.43	5.86	2.86	64.26	1.07
92N228	2.44	19.45	4.73	4.22	33.90	1.80
92N230	2.81	18.90	6.31	3.11	56.11	1.03
92N936	2.50	17.12	4.95	3.47	58.09	3.23
92N942	2.61	15.43	5.39	2.92	38.13	2.33
92N1059	2.50	17.28	5.01	3.53	40.69	3.13
*92N1194	2.32	21.57	4.26	5.00	43.51	0.90
*92N1317#	2.65	18.58	5.59	3.31	45.99	0.77
92N1519	2.64	22.48	5.56	4.11	50.25	1.80
92N1983	2.84	13.90	6.42	2.22	38.93	0.11
*92N2447	2.56	12.92	5.23	2.51	41.75	1.17
93N137	2.63	22.00	5.49	4.03	45.38	2.13
*93N288#	2.74	14.27	5.97	2.42	42.55	0.53
93N1043	2.45	13.40	4.79	2.87	33.15	0.28
93N1150	3.03	17.68	7.37	2.45	61.44	1.87
93N1154	2.61	23.05	5.39	4.31	62.64	0.70
93N1328	2.81	21.73	6.29	3.47	52.26	0.40
93N1363	3.10	28.00	7.67	3.76	55.66	0.60
93N1377	2.61	17.27	5.46	3.25	50.60	0.23
94N28	2.43	14.45	4.70	3.08	39.38	1.13
94N51	2.22	24.58	3.91	6.30	47.71	3.00
94N84	2.32	20.40	4.29	4.86	47.24	0.73
*94N105#	2.86	20.50	6.50	3.34	63.27	0.60
94N131	2.60	17.28	5.42	3.25	53.31	1.57
94N320	3.04	29.80	7.39	4.13	70.88	0.82
94N465	3.20	24.98	8.14	3.04	55.36	0.27
94N512	2.23	19.37	3.96	4.97	35.43	3.13
94N592	2.44	20.00	4.71	4.35	43.18	5.10
94N815	2.78	22.15	6.31	3.79	47.12	0.26
94N963	2.98	25.20	7.04	3.65	63.16	1.76
94N1012	2.68	16.53	5.68	2.95	32.23	1.43
Q120	2.63	15.70	5.56	2.87	45.36	0.88
Q120	2.69	14.97	5.79	2.66	42.01	0.07
Q152	2.63	16.78	5.53	3.05	43.37	0.75
Q152	2.56	15.43	5.21	2.98	44.77	0.57

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; *Clones o core selection propagation; #Clones advanced to five final assessment trials; 88A1600 and 94N815 occur only in one replicate, 94N963 and 92N1983 occur only in two replicates (These clones were not included in entire analyses. Above figures were worked out manually).

APPENDIX 24 Clonal means for five stalk measurements and estimated plot erectness taken from the plant and first-ratoon crops of the series 2 HF2 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
86A700	2.37	15.65	4.54	3.60	43.80	1.55
87A577	2.32	18.23	4.32	4.41	42.13	1.68
88A861	2.61	33.40	5.42	6.17	64.16	1.52
88A1600	2.75	34.62	6.02	5.82	61.10	1.46
91N1418	2.85	26.10	6.44	4.09	63.55	0.28
92N55	2.77	28.07	6.12	4.58	62.80	0.08
92N157	2.88	17.56	6.58	2.69	52.11	0.07
*92N176	2.53	19.64	5.13	4.12	61.41	0.68
92N228	2.39	24.45	4.54	5.47	34.18	0.97
92N230	2.84	29.51	6.41	4.64	64.23	0.52
92N936	2.45	21.87	4.75	4.67	61.27	3.28
92N942	2.75	21.16	6.00	3.52	42.41	1.73
92N1059	2.42	20.70	4.67	4.60	39.48	2.30
*92N1194	2.21	22.71	3.86	6.00	42.95	0.72
*92N1317#	2.54	21.48	5.17	4.33	46.66	0.88
92N1519	2.70	29.49	5.79	5.18	56.70	0.97
92N1983	2.96	17.44	6.96	2.53	40.73	0.06
*92N2447	2.58	17.02	5.31	3.27	46.12	0.97
93N137	2.52	25.21	5.07	5.14	44.41	1.30
*93N288#	2.62	22.67	5.49	4.33	45.40	1.22
93N1043	2.52	20.18	5.07	3.98	34.25	0.20
93N1150	2.86	21.80	6.56	3.51	63.15	2.02
93N1154	2.56	28.61	5.18	5.59	66.28	0.65
93N1328	2.72	24.65	5.91	4.38	57.54	0.22
93N1363	2.83	29.95	6.46	4.89	57.41	1.00
93N1377	2.60	21.36	5.37	4.08	50.88	0.29
94N28	2.36	17.27	4.45	4.03	39.85	0.58
94N51	2.21	25.20	3.88	6.54	42.95	2.60
94N84	2.32	24.61	4.28	5.86	49.98	0.47
*94N105#	2.77	24.79	6.07	4.25	65.11	0.40
94N131	2.55	22.15	5.21	4.46	52.23	1.10
94N320	3.08	30.68	7.55	4.17	69.67	0.94
94N465	3.17	29.11	8.02	3.75	72.52	0.18
94N512	2.17	21.70	3.74	5.94	36.87	2.20
94N592	2.43	25.04	4.67	5.46	53.29	5.38
94N815	2.98	30.15	7.17	4.28	59.77	0.18
94N963	3.00	32.70	7.08	4.65	74.97	1.33
94N1012	2.65	18.50	5.58	3.43	37.20	0.83
Q120	2.60	19.41	5.42	3.71	46.54	0.51
Q120	2.62	19.06	5.46	3.62	45.00	0.08
Q152	2.47	21.60	4.89	4.68	48.53	1.34
Q152	2.42	19.95	4.64	4.53	48.94	1.25

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; *Clones o core selection propagation; #Clones advanced to five final assessment trials; 88A1600 and 94N815 occur only in one replicate, 94N963 and 92N1983 occur only in two replicates (These clones were not included in entire analyses. Above figures were worked out manually).

APPENDIX 25 Clonal means for five stalk measurements and estimated plot erectness taken from a subset of 75 clones and cultivars in first-ratoon crop of the series 3 HF1 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
95N25	2.75	20.80	6.00	3.50	43.72	0.05
95N77	2.56	26.35	5.21	5.15	53.69	3.20
95N79	2.56	15.25	5.21	2.99	37.41	1.00
95N91	2.36	20.55	4.41	4.69	44.98	2.40
95N180-R	2.66	21.50	5.62	3.89	28.74	2.40
95N184-R	2.12	18.65	3.55	5.26	33.20	0.40
^95N220	2.70	20.15	5.77	3.47	38.57	0.90
95N234#	2.36	15.50	4.41	3.53	31.45	0.80
95N280	2.37	23.10	4.50	5.15	39.79	0.05
95N289#	2.81	16.75	6.26	2.70	35.36	1.80
95N325-R	2.52	29.65	5.01	5.94	41.03	0.90
95N347	2.53	15.45	5.09	3.12	29.75	4.50
95N485	2.59	18.50	5.33	3.51	43.32	0.20
95N521-R	2.59	15.45	5.33	2.92	31.71	0.05
95N526-R	2.79	24.55	6.12	4.07	38.62	4.80
95N545	2.42	19.30	4.63	4.24	26.24	1.80
95N670	2.52	18.70	5.00	3.78	47.37	2.40
95N681#	2.51	24.50	5.00	5.09	37.67	0.10
95N686	2.57	43.20	5.21	8.20	57.08	4.50
95N793-R	2.39	18.10	4.50	4.05	28.72	0.05
95N801-R	3.00	24.10	7.10	3.41	47.88	1.60
95N983-R	2.49	16.55	4.92	3.41	38.70	0.90
95N1015	2.52	23.70	5.04	4.72	45.17	1.60
95N1024-R	3.04	19.70	7.28	2.76	46.80	0.40
95N1083	2.27	24.05	4.09	6.08	40.79	1.20
95N1086	2.89	14.70	6.67	2.30	34.68	0.05
95N1116	2.32	22.80	4.28	5.45	37.08	0.20
95N1198	2.72	27.40	5.84	4.62	45.03	0.80
95N1210-R	2.60	19.30	5.39	3.55	44.65	1.80
95N1239	2.49	18.95	4.91	3.82	36.81	1.80
^95N1250	2.82	18.10	6.28	2.85	62.00	3.60
95N1280-R	2.56	18.15	5.21	3.48	43.00	3.60
95N1303	2.91	23.25	6.69	3.50	34.19	0.80
95N1319-R	1.99	19.65	3.16	6.42	27.53	2.70
95N1336	2.75	16.70	6.02	2.79	28.17	2.40
95N1356-R	2.15	20.45	3.65	5.65	37.81	0.90
95N1413	2.46	26.20	4.78	5.54	35.21	0.20
95N1417	3.06	29.50	7.50	3.92	48.32	2.70
95N1434-R	2.64	16.70	5.59	3.14	30.20	0.80
95N1456-R	2.61	25.65	5.42	4.76	35.47	0.05
95N1483#	2.7	20.75	5.79	3.64	35.49	1.80
95N1645-R	2.70	26.80	5.85	4.67	33.05	2.00
95N1700#	3.21	30.05	8.19	3.67	76.74	0.80
^95N1714	2.58	20.45	5.27	3.91	29.20	2.70
^95N1796	2.63	22.80	5.50	4.23	42.31	0.20
95N1806	3.32	24.65	8.73	2.83	52.77	0.05
95N1807	2.89	39.10	6.60	5.82	58.92	0.05
95N1820#	3.00	29.75	7.14	4.22	54.65	1.20
95N1829	2.98	25.50	7.05	3.63	57.48	0.10
95N1838-R	3.19	23.20	8.08	2.92	47.89	0.05
95N1865	2.35	22.00	4.39	4.89	40.57	4.50
^95N1914	2.64	21.65	5.55	3.99	44.45	0.05
^95N1941	2.85	20.95	6.41	3.32	44.63	0.60
Q120	2.68	20.35	5.64	3.58	31.41	0.40
Q120	2.73	18.95	6.03	3.31	32.49	0.05
Q120	2.72	18.55	5.88	3.20	47.66	0.10
Q120	2.87	17.70	6.62	2.76	33.81	0.05
Q120	3.00	16.60	7.16	2.37	35.30	0.40
Q120	2.81	19.15	6.37	3.25	56.61	1.20
Q120	2.92	20.65	6.75	3.08	35.90	0.10
Q120	2.96	21.70	7.00	3.17	50.84	0.60

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
Q120	2.77	18.35	6.15	3.13	52.05	0.10
Q120	2.90	16.85	6.75	2.57	36.66	0.20
Q120	2.84	17.35	6.34	2.74	36.85	0.10
Q152	2.72	20.10	5.88	3.51	36.94	0.10
Q152	2.71	23.35	5.81	4.04	34.94	0.10
Q152	2.64	19.35	5.62	3.49	39.14	0.20
Q152	2.78	19.30	6.14	3.23	30.75	0.40
Q152	2.68	20.20	5.66	3.57	40.00	1.60
Q152	2.56	17.15	5.18	3.35	47.98	0.10
Q152	2.60	20.15	5.35	3.72	40.24	0.90
Q152	2.62	19.60	5.43	3.66	35.84	0.10
Q152	2.87	22.05	6.53	3.36	38.19	0.90
Q152	2.49	20.75	4.98	4.35	42.72	0.05
Q152	2.84	22.60	6.38	3.55	32.31	0.10

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; 75=30 clones selected to advanced to the series 3 HF2 trial; ^Six clones not present in the series 3 HF2 trial that were substituted due to poor quality plants at propagation; R=17 randomly selected clones; + all the standard plots in the trial; #Clones (6) advanced to core selection propagation.

APPENDIX 26 Clonal means for five stalk measurements and estimated plot erectness taken from a subset of 75 clones and cultivars plant and first-ratoon crops of the series 3 HF1 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
95N25	2.77	26.32	6.11	4.31	44.78	0.45
95N77	2.58	30.15	5.30	5.79	52.05	0.50
95N79	2.67	19.80	5.66	3.48	41.95	0.45
95N91	2.33	22.07	4.28	5.20	47.05	1.50
^95N220	2.56	20.82	5.19	4.12	41.14	0.30
95N234#	2.38	18.68	4.49	4.16	40.15	0.90
95N280	2.46	27.02	4.82	5.61	39.77	0.05
95N289#	2.85	19.02	6.44	2.98	36.14	0.40
95N347	2.44	19.55	4.73	4.33	37.20	0.90
95N485	2.42	21.68	4.66	4.92	46.54	0.45
95N545	2.35	22.18	4.40	5.14	32.42	0.60
95N670	2.50	23.20	4.92	4.76	51.14	0.50
95N681#	2.47	24.82	4.83	5.29	40.34	0.90
95N686	2.50	37.15	4.91	7.49	61.20	1.00
95N1015	2.52	26.73	5.04	5.33	48.03	0.90
95N1083	2.25	26.02	3.98	6.67	43.52	0.80
95N1086	2.77	16.45	6.07	2.81	39.83	0.20
95N1116	2.19	23.60	3.83	6.38	39.26	0.40
95N1198	2.69	24.32	5.71	4.23	46.04	0.80
95N1239	2.52	24.02	5.03	4.79	39.77	0.90
^95N1250	2.79	19.25	6.14	3.12	59.82	0.50
95N1303	2.77	26.20	6.12	4.59	40.43	0.90
95N1336	2.59	19.57	5.34	3.81	14.09	2.00
95N1413	2.48	26.93	4.88	5.55	37.11	0.90
95N1417	3.08	39.58	7.59	5.27	67.74	0.60
95N1483#	2.62	24.88	5.46	4.65	42.69	0.80
95N1700#	3.19	37.10	8.10	4.59	75.52	0.10
^95N1714	2.52	23.55	5.01	4.79	34.38	0.45
^95N1796	2.65	28.00	5.58	5.12	48.95	0.45
95N1806	3.25	29.90	8.38	3.62	65.62	0.20
95N1807	2.81	37.80	6.24	5.99	61.42	1.35
95N1820#	2.84	31.93	6.38	5.15	60.45	1.20
95N1829	2.91	29.10	6.71	4.39	65.06	0.45
95N1865	2.41	31.07	4.61	6.62	20.29	2.50
^95N1914	2.69	26.50	5.79	4.61	60.52	0.05
^95N1941	2.85	23.73	6.46	3.72	44.10	0.80
Q120	2.62	20.77	5.42	3.83	31.92	0.10
Q120	2.79	23.38	6.23	3.83	34.06	0.20
Q120	2.61	21.55	5.42	4.09	46.16	0.90
Q120	2.72	22.30	5.93	3.98	34.06	0.20
Q120	2.83	20.43	6.36	3.42	40.80	0.20
Q120	2.71	22.38	5.87	4.03	50.24	0.40
Q120	2.81	23.50	6.25	3.83	42.72	0.80
Q120	2.82	24.45	6.33	4.00	50.80	0.40
Q120	2.76	22.95	6.10	3.88	46.38	0.90
Q120	2.77	20.39	6.12	3.47	39.55	0.40
Q120	2.75	23.05	5.96	4.00	43.10	0.45
Q152	2.57	24.02	5.28	4.74	42.09	3.50
Q152	2.55	24.27	5.16	4.87	17.47	3.50
Q152	2.53	22.75	5.12	4.62	19.57	1.80
Q152	2.66	25.48	5.63	4.71	39.67	1.50
Q152	2.54	23.65	5.12	4.86	45.44	1.35
Q152	2.48	22.50	4.87	4.75	52.65	1.50
Q152	2.46	22.88	4.80	4.92	41.77	1.00
Q152	2.52	24.93	5.06	5.08	38.38	0.80
Q152	2.71	26.20	5.83	4.64	44.78	0.45
Q152	2.54	27.30	5.17	5.37	47.28	1.35
Q152	2.62	21.43	5.50	4.02	39.62	0.80
R-95N180	2.58	24.70	5.29	4.80	30.39	0.50
R-95N184	2.18	20.70	3.75	5.50	38.76	0.45
R-95N325	2.42	30.07	4.63	6.61	20.52	0.90

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
R-95N521	2.63	20.75	5.49	3.83	35.96	0.10
R-95N526	2.79	30.85	6.12	5.05	19.31	1.35
R-95N793	2.40	20.88	4.55	4.59	26.62	1.00
R-95N801	2.79	27.57	6.20	4.66	50.14	0.90
R-95N983	2.38	20.27	4.49	4.67	36.52	0.90
R-95N1024	3.06	22.52	7.45	3.12	60.21	0.40
R-95N1210	2.52	21.75	5.06	4.39	45.77	0.90
R-95N1280	2.67	22.40	5.66	3.93	44.69	1.35
R-95N1319	2.06	23.40	3.38	7.06	28.79	2.00
R-95N1356	2.15	21.45	3.65	5.91	34.11	1.00
R-95N1434	2.61	21.05	5.43	4.01	30.07	0.15
R-95N1456	2.66	30.98	5.62	5.54	38.48	0.05
R-95N1645	2.81	29.93	6.31	4.79	37.24	1.00
R-95N1838	3.10	26.30	7.57	3.53	51.65	0.25

[1]Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; 75=30 clones selected to advanced to the series 3 HF2 trial; ^Six clones not present in the series 3 HF2 trial that were substituted due to poor quality plants at propagation; R=17 randomly selected clones; + all the standard plots in the trial; #Clones (6) advanced to core selection propagation.

APPENDIX 27 Clonal means for five stalk measurements and erectness grades taken from the plant crop of the series 3 HF2 trial

Clone	Culm-d (cm)[1]	Charpy° [2]	CSA (cm^2)[3]	Charpy° /(cm^2)[4]	Force (N)[5]	Erectness[6]
95N25	2.91	31.17	6.67	4.69	49.70	0.32
95N77	2.70	39.57	5.75	6.88	67.60	1.50
95N79	2.69	25.77	5.71	4.58	46.50	0.47
95N91	2.41	22.58	4.59	5.02	52.08	1.93
*95N234	2.39	20.35	4.52	4.52	43.76	0.93
95N280	2.51	32.15	4.97	6.48	63.53	0.05
*95N289	3.03	21.72	7.29	3.02	43.11	3.30
95N347	2.38	24.02	4.47	5.40	56.18	6.47
95N485	2.54	23.68	5.10	4.72	54.00	0.11
95N545	2.56	25.68	5.20	5.06	47.58	0.67
95N670	2.56	22.35	5.17	4.40	44.76	2.13
*95N681	2.46	26.87	4.81	5.58	54.86	0.06
95N686	2.48	34.08	4.84	7.05	76.05	5.33
95N1015	2.82	39.12	6.33	6.29	60.64	1.70
95N1083	2.35	27.55	4.37	6.34	50.47	2.27
95N1086	2.80	21.70	6.20	3.55	56.90	0.30
95N1116	2.31	27.47	4.22	6.55	62.33	1.15
95N1198	2.63	22.08	5.48	4.02	68.31	1.27
95N1239	2.64	25.45	5.51	4.66	65.79	1.80
95N1303	2.89	31.93	6.59	4.88	59.59	0.82
95N1336	2.58	19.47	5.28	3.74	50.96	3.17
95N1413	2.55	28.48	5.16	5.62	60.16	1.43
95N1417	2.99	49.33	7.07	7.03	72.44	4.93
*95N1483	2.70	24.95	5.80	4.38	49.69	0.70
*95N1700	3.28	36.22	8.51	4.35	82.90	0.62
95N1806	3.42	39.70	9.23	4.36	79.41	0.18
95N1807	2.76	38.92	6.03	6.50	80.14	0.68
*95N1820	2.70	29.85	5.74	5.24	62.61	1.80
95N1829	2.93	35.17	6.78	5.26	77.66	0.70
95N1865	2.50	33.15	4.92	6.77	59.31	0.63
Q152	2.61	29.05	5.39	5.45	80.00	0.87
Q152	2.68	28.58	5.66	5.11	64.67	0.10
Q174[(b)]	2.96	30.02	6.93	4.34	76.56	1.67
Q186[(b)]	2.68	29.40	5.69	5.15	68.79	0.97
Q187[(b)]	2.84	24.80	6.39	3.96	59.18	0.73

[1] Culm diameter, cm; [2]Culm cross sectional area (πr^2), in cm^2; [3]Charpy degrees 0-90°; [4]Charpy degrees cm^{-2}; [5]Newton; [6]Erectness grade ={% lodged (0-100) x degree lodged (1-10)} / 100; *Clones advanced to core selection program.