NIS quality analysis of pre- and post-harvest sugarcane.

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The quality of sugarcane grown on the NE Australian tropical coast (16° 15' - 18° 15' S Lat.) has declined markedly in the past seven years. This has been linked to dilution of mill-supply cane with increasing levels of non mature-stalk material consisting of leaves and sucker culms. The prime research objective was to examine the transition from the pre-harvest, in-field crop to harvested material sent for processing, in terms of quality and crop fraction proportions. A secondary objective was to quantify the effects of preharvest-season crop habit and culm condition on crop quality. Ten quadrat samples from each of 54 random crop sites (17 in 1999 and 37 in 2000), covering a wide range of variables (cultivar, crop class, and edaphic, topographic, climatic, and temporal factors) were collected immediately before harvest. Samples were partitioned into four fractions:- sound and unsound mature stalks (culms), sucker culms, and extraneous matter (leaves). Material harvested from each site was sampled and partitioned into four fractions:- sound and unsound billets (culm pieces), culm-spindle pieces, and leaf. In 2000, before harvest, 14 additional sites were sampled monthly, on three occasions, from March - June. Erect and non-erect culms were divided into sound and unsound classes. All samples were disintegrated and presented to a remote reflectance module of a scanning spectrophotometer using the BSES large cassette module. Near infra-red spectroscopic (NIS) analyses were developed for the rapid determination of quality components (Brix, commercial cane sugar (CCS), fibre, moisture, and polariscope reading). Calibrations for three material groups (culm (n = 639), non-culm (n = 496), and combined) were developed for all components using the 1999 data set. Two sub-sets (n = 178, and 190) of about 10% of the preharvest-season and harvest populations scanned in 2000 also were subjected to full routine laboratory analyses. The 1999 combined calibrations were excellent, but the culm calibrations produced consistently lower standard errors. Non-culm calibrations were marginally better than the combined for only CCS and pol. reading. Analysis of the 2000 culm data with calibrations using all 1999 and 2000 culm data resulted in better predictions relative to the 1999 culm calibrations. This also was true for the combined calibrations. Assessment of quality components in pre- and post-harvest sugarcane using NIS calibrations was more cost effective than using routine laboratory techniques. Outcomes from this NIS-facilitated research will have important economic consequences for the Australian sugarcane industry. Potential CCS present in mature culms is being discounted by dilution with leaves and sucker culms, threatening farm viability. The results question the efficacy of current harvesting technology. The CCS of harvested cane is improved only marginally over that of the in-field crop. Current harvesting technology requires either supplementary, innovative pre-mill processing or a design revolution to improve mill-supply cane quality, and therefore whole of industry economics. NIS-facilitated analyses, before the harvest season, highlighted the benefits of growing erect, sound crops. Loss of CCS then, can be minimized only by a combination of crop improvement and agronomic solutions, applied as part of sound on-farm management.