Introduction

Sugarcane is a major field crop in Thailand, and covered an area of one million hectares during the crop year 1997/98. Growers begin sugarcane planting during the end of the rainy season in order to maximize cane and sugar yields in sandy soils under rainfed condition, especially growers in the Northeast region of the country. There are several incentives for the growers and the industry in adopting such a technique. For this reason, it is necessary to test the ability of the model in predicting contrasting planting dates in the areas.

The objective of this paper is to provide a brief report of the ability of the CANEGRO model in predicting effects of planting dates on sugarcane development and yields in Thailand.

Field experiment

Sugarcane varieties, K 84-200 and U-Thong 2 were planted on four dates: 28 February 1995 (D1), 28 April 1995 (D2), 19 November 1995 (D3), and 16 January 1996 (D4). Sugarcane rows were established at 1.3 m apart in three locations, namely: i) Mae Hia Research and Training Station, Chiang Mai University, Chiang Mai, Thailand (18°45'N 98°55'E), ii) Agronomy Farm, Khon Kaen University, Khon Kaen, Thailand (16°28'N 102°48'E), and iii) Suphan Buri Field Crop Center Farm, U-Thong, Suphan Buri, Thailand (14°18'N 99°52'E). The experimental design was a split plot design, with planting date as the main plot factor, and cultivar as the sub-plot factor. Each sub-plot measured 16.9 x 15.0 m, with three replications. The soils at all sites were classified as a member of Oxic Paleustults based on Soil Taxonomy system (Vearalsilp and Songsawat, 1991).

An automatic weather data logger was installed nearby to monitor daily solar radiation, air temperature and rainfall. During the growing season, dates of leaf emergence were recorded from the main culm of 14 selected hills. Plant samples were taken from two adjacent hills, at the monthly interval, to determine the number of tillers and/or stalks, leaf area index, fresh and dried weights of stem, leaf blade and leaf sheath. Stem samples were transported to Suphanburi Field Crop Research Center to determine % brix, % polarity and % fibre, and were then used to calculate the Commercial Cane Sugar (CCS), described by Seranin (1975). Finally, fresh cane stalk yield estimations were taken from 14 hills, and dry weight of sugar yield per plot was calculated based on adjusted CCS value. These data are used to test the ability of the CANEGRO model (Hoogenboom et al., 1999; Inman-Bamber, 1991) to respond to different planting dates.

Results

Cane leaf interval

The model gave a reasonable estimate of leaf interval in D1 and D2 planting dates of both cultivars. RMSE (root mean square errors) were 3.51, 1.67 leaves on the main stem for K 84-200 and 3.64, 2.33 leaves on the main stem for U-Thong 2, respectively, in Chiang Mai; 3.25, 2.28 leaves on the main stem for K 84-200 and 4.98, 3.22 leaves on the main stem for U-Thong 2, respectively, in Khon Kaen; and 3.18, 2.11 leaves on the main stem for K 84-200 and 2.37, 1.92 leaves on the main stem for U-Thong 2, respectively. Accurate prediction of sugarcane leaf interval is crucial to accurately predict cane biomass throughout its growing season.

Cane yield

The interaction between planting date and sugarcane cultivars was highly significant (P>0.01) on sugarcane yield. Cane planted on 1 November 1995 gave the highest sugarcane yields.

In general the model over-estimated sugarcane dried weight, with a root mean square error of 12.5 tonnes/ha for both cultivars (Figure 1). The model over-estimated dried cane stalk of both cultivars by about 32% compared to the observed data, which is expected, since the model does not yet handle the dynamics of soil-crop nitrogen and pests.

Sugar yield

At all sites, sugar yields (dry weight), based on CCS method, of two cultivars from four planting dates were statistically significant, and the second planting date was the highest. Again, the model over-estimated sugar yields in response to planting date treatments, with a root mean
Conclusion

Results of this study suggest that the model demonstrates great potential to simulate yield of sugarcane at different planting dates in Thailand. However, additional work is needed to further develop the model in areas such as the over-estimation of sugar yield and to incorporate the effects of flowering and nitrogen on stalk and sugar yields. Also, especially in Thailand, there is a need to build a Thai-capable CANEGRO model for Thai users, i.e. with a Thai language interface.

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