CHAPTER 5

CONCLUSION

System modeling and simulation (Penning de Vries et al., 1989) approach as implemented in study has shown that genotype specific coefficients for a sugarcane simulation model, which were estimated from field experimental data sets, could be used to predict development stages of several sugarcane varieties.

The field experimental data sets have shown that a base temperature of 8 °C appears to be a practical value for the prediction of planting to emergence interval, whereas a base temperature of 16 °C is appropriate to determined the growing degree requirement for all developmental stages after emergence. The summation of growing degree days from planting to emergence ($SUMGDD_8$) of four varieties were not significantly different between experiments, but different between varieties. The average $SUMGDD_8$ of four varieties was 209.66 °Cd. Cumulative growing degree days since emergence (CUMGDD) were more linearly related to number of total expanded leaves (r^2 = 0.99) than total visible leaves (r^2 = 0.98). Leaf development rates (leaf°Cd^{-1}), which was the first differential of the linear relationship between CUMGDD and number of total expanded leaves, were not significantly different between crop types and photoperiods, but different between varieties. The phyllochron, which was the inverse of the first differential value, of K88-92, CP78-1628, K84-200, and U-Thong2 were 82.64, 83.33, 86.21, and 86.96 °Cd.$leaf^{-1}$, respectively. The beginning of tillering stage and tiller mortality is a predictable phenological stage and related to leaf numbers. However, the number of live shoot or stalk might be related to solar radiation.

All sugarcane plants did not initiate panicle in any extended photoperiod treatments. However in natural photoperiod treatment, the panicle initiation event was observed in both the plant and first ratooned canes of U-Thong2 and K84-200 varieties, which the initiation of plant cane of K84-200 variety was found only in the first experiment. Consequently, the threshold photoperiod (P2O) and photoperiod sensitivity (PS) could not be calculated from the experimental data set. Thus, P2O was assumed to be 12.5 hours based on existing literature and the PS was estimated by simulated panicle initiation of the first experiment with ScFM 1.0 program. The PS values of 1.3 $hour^{-1}$ for U-Thong2 and 6.0 $hour^{-1}$ for K84-200 gave similar the simulated and the observed panicle initiation dates. Panicle emergence event was observed only in U-Thong2 variety in the first experiment with an average growing degree day from panicle initiation to panicle emergence was 720.8 °Cd.

Testing for sugarcane development events were done on all treatments in both experiments using the genotype specific values, which were estimated from the first experimental data set. Good agreement between the model and the observed values was found in simulating daylengths at Chiang Mai latitude; emergence timing; leaf number of the main stem; the panicle initiation timing of the plant of U-Thong2 and K84-200 variety in the first experiment, and the first ratooned of U-Thong2 in the second experiment; and the panicle emergence timing of the plant cane U-Thong2 variety in 1997. Reasonable agreement between the observed and simulated was found in simulating the panicle initiation timing of the plant of U-Thong2 variety and the first ratooned of K84-200 variety; the panicle emergence timing of the plant and first ratooned cane of K84-200 varieties in the first and the second experiment, respectively. However, the simulated panicle initiation time of plant cane K84-200 variety in the second experiment and the simulated panicle emergence time of plant and first ratooned U-Thong2 variety of the second experiment were on October 15, 1998, and November 29, 1998, respectively, but the events were not observed in the experiment. These different might be result of the effect of other factors, in which the current flowering model did not design to account for.

The simulated panicle initiation events were most sensitive to P2O coefficient. Panicle initiations were also highly sensitive to changes in PS values, but its sensitivity decreased as PS increased. Therefore, the difference in flowering time of early and late flowering variety might be the result of their different in P2O. However, now we have no enough data to test the hypothesis. By using the planting dates of Chanmueng, (1997) and Jintrawet et al., (1997a), while the other crop coefficients held constant, good agreement between the simulated and the observed flowering time.

If the genetic coefficient of varieties were known, which could be determined by designing experiment similar to this study, the ScFM 1.0 model would assist in such management decision as scheduling the orderly plant and harvest of crop, selection of variety, and in breeding program as synchronizing the flowering for breeding program.