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# Predicting the Effect of Planting Dates on Sugarcane in Thailand: I Chiang Mai

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## ABSTRACT

Cane growers in Lower Northern Thailand normally plant their cane in two main seasons, one each at the end and at the beginning of the rainy season. The aim of this research was to predict and explain the yield potentials of two cane cultivars in four contrasting planting dates using a simulation model, which quantitatively describe the processes of yield formation. Also, to demonstrate the potentials of system modeling and simulation approach in agricultural research. ThaiCane 1.0 simulation model was tested against data set conducted in Chiang Mai, Thailand. Predictions from the model was evaluated and compared with the data. The model simulated fresh cane yields differences among planting dates very well, but underestimated CCS sugar yields. The results indicate that the model are able to capture yield differences in a wide range of cane planting dates in Thailand, where fresh cane yield ranges from 65.6 to 165.0 t/ha. Cane yields from the four planting dates varied due to subsequence management practices, appear to have plateaued at about 165 t/ha.

**Key words**: sugarcane model testing, water limited crop production, planting, dates

## INTRODUCTION

Lower Northern Thailand contributes approximately 25% of total sugarcane production in Thailand. Farmers begin sugarcane planting during the end-of-rainy season planting time in order to maximize cane and sugar yield in sandy soils under rainfed conditions. There are several incentives for the growers and the industry in adopting such technique. These incentives include increasing length of cane growing period and minimizing weed control during the dry season. Normally, the growers plant sugarcane during October to November, by putting cane stalks as deep as 50 cm below ground surface, where soil moisture are relatively high and sufficient for germination. Lose and well-aerated top soil layer acts as natural mulch for newly planted cane stalks from planting to emergence. New shoots and leaves are emerging around February, with well-established root systems. This technique allows sugarcane to be in the field for 12 to 13 months after planting. Weed control in sugarcane field consisted of several cultivations between rows, using buffalo-pull plow and/or small tractor plow. The ThaiCane simulation model for sugarcane was developed to capture and describe the responses of two major commercial sugarcane cultivars to changes in sugarcane management practices and growing environments. For this reason, it is necessary to test the ability of the model in predicting contrasting planting dates in the areas. The objectives of this paper are to report (i) the effect of planting dates on sugarcane development and growth as well as the effect of an interaction between sugarcane cultivars and planting dates on yield, and (ii) the ability of the simulation model in predicting these effects.

## RESEARCH METHODS

### Field Experiment

Sugarcane cv. K 84-200 and U-Thong 2 were planted in four planting dates; 26 February 1995 (Dl), 26 April 1995 (D2), 26 November 1995 (D3), and 16 January 1996

(D4) (Figure1). Sugarcane rows were planted 1.2 m apart, on Mae Hia Research and Training Station, Chiang Mai University, Chiang Mai, Thailand (180 45'N 98 0 55'E or 4925082074117 UTM). The field had no historical record of sugarcane production. The experimental design was a Jintrawet et al: Predicting effects of planting dates on sugarcane 2 split plot design, with planting dates as the main plot, and the sugarcane cultivars as the sub-plot, each sub-plot measured 16.9 x 15.0 m., with three replications. The soil is classified as a member of Oxic Paleustults based on Soil Taxonomy system (Verlsilp and Suksawat, 1991).

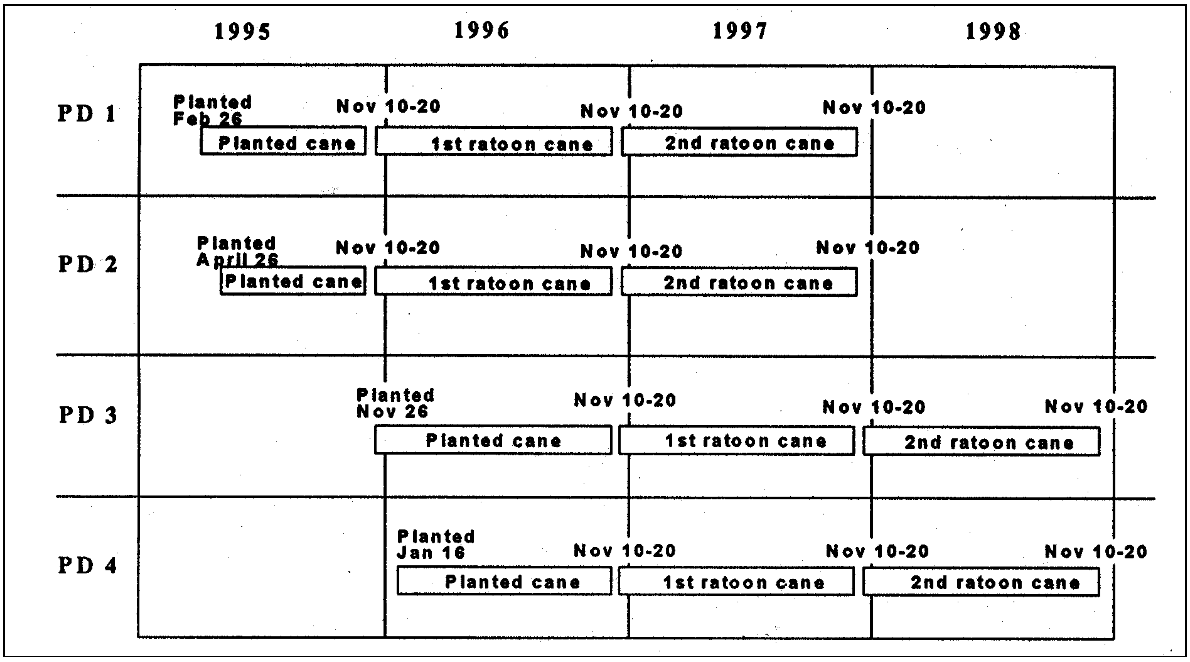


Figure 1. Length of cane growing period as affected by planting date.

The entire field of planted, 1st and 2nd ratoon crops received uniform chemical fertilizer application as 15-15-15 complete fertilizer, at the rate of 625 kg ha-l, split equally at two and three months after emergence. Planted and ratoon canes of U- Thong 2 and K 84-200 were harvested during the second week of November and December, respectively.

An automatic weather data logger was installed nearby to monitor daily solar radiation, air temperature, and rainfall, using the UNIDATA system (UNIDATA, Perth, Australia; http://www.unidata.com.au). 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 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, %fiber and, then, used to calculate the Commercial Cane Sugar (CCS), described by Seranin (1975). Final fresh cane stalk yield estimation was taken from 14 hills, and weight of sugar yield per plot was calculated based on adjusted CCS value.

Treatment and interaction effects on sugarcane yield, juice concentration, and sugar yield were analyzed and examined using the general model procedure of the Statistix package (Analytical Software, 1996).

## Model Description

The ThaiCane 1.0 model, spawn from the CANEGRO model (Inman-Bamber, 1991), is a dynamic model for sugarcane growth and development in different production practices, at the second crop production level (Jintrawet et al, 1997; and Penning de Vries, 1982). The model uses the standard minimum data set concept as defined by the IBSNAT Project (IBSNAT, 1988), and runs under the DSSAT 3.5 shell. , It contains a soil and crop water balance component, but does not include soil and plant nitrogen dynamics. The model simulates eleven cane development stages; germination, i.e., emergence, 1 at to 14th leaf emergence dates, full canopy covered dates, maximum and stable stalk population, panicle initiation and emergence, and crop maturity. The model also simulates the number of Jintrawet et al: Predicting effects of planting dates on sugarcane 3 leaves, tillers, stalks, and sugar yield. Tillers emergence rate and growth in the model are controlled by leaf emergence rate on the main culm, while the actual growth is dependent on assimilate availability, extreme temperature, and water and nutrient stresses. The model uses thermal time concept as the main driving force for leaf appearance rate, and LA! is calculated as a function of leaf tip appearance rate and leaf expansion growth rate.

Inherently, rate of dry matter conversion of sugarcane is quite low and that offer a little opportunity to improve its yield through improvement of canopy photosynthesis. In reality, yield improvement can be achieved through light interception under well-irrigated condition. The model simulates dry matter based on experimental data sets conducted during' 60s and '70s on NC0376 sugarcane cultivar in South Africa by Drs. Thompson, Gosnell, and Rostron (Inman-Bamber, 1991). Sugar yield is calculated from current stalk dry matter, and expressed in %polarity, as shown in equation 1. The equation takes into account current dry matter (DM), day of the year or season (DOY), and crop age (NDAS) of different sugarcane cultivars.

Sugar yield = 0.288 + 0.0053DM-0.0000359DM2+O.O535( -SINๆDOY -10.0)/57.3))+0.0001153 NDAS ………...(1)

The model has been evaluated using data sets from South Africa. This is the first attempt to test the model with Thai's data set.

# RESULTS AND DISCUSSION

## Annual Weather

Annual rainfall volume were 1,043; 1,177; 918 and 801 mm in 1995, 1996, 1997, and 1998, respectively, with corresponding estimated sugarcane ET totaling 1,018; 1,408; 1,550; and 1,720 mm. Compared with the 30-yr mean rainfall of 1200 mm, all years was an exceptionally dry year with 1998 was the exceptionally driest year. Most of rain fell during September, which is considered to be normal for Chiang Mai. The model simulated sugarcane ET during the month of May to September ranged between 2.74 to 5.77 mm dol. Although annual rainfall exceeded ET in all four years, on a weekly basis ET was higher than rainfall more than 50% of each year (Figure 2). It seems that during the mid-season drought period, sugarcane met its water requirement thought water stored in the root zone and upward flux from the water table.

## Cane Phenology

The model predicted dates of each phenological event for planted cane of the four planting date treatments with high degree of accuracy. The model also gave a good estimation of leaf emergence rates in D 1 and D2 of both cultivars, with root mean square errors were 3.51, 1.67 for K 84-200 and 3.64, and 2.33 for V-Thong 2, respectively (Figure 3). Accurate prediction of sugarcane stages is crucial to accurately predict cane biomass throughout its growing season.

## Cane Fresh Weight

Planted cane: Weight of fresh cane stalk from four planting dates was statistically different, and the second planting date produced the highest yield (Table 1). Ratoon canes yielded higher than planted canes in all planting dates, but not significant among dates, attributed to higher number of stalk per unit area and longer growing duration than corresponding planted canes. The model predicted the similar trend of yield response to planting date treatments, with root mean square errors were 31.4 and 37.0 for K 84-200 and V-Thong 2, respectively. The model overestimates fresh cane stalk of both cultivars by about 12% compare to the observed data, which is expected since the model is not yet handle the dynamic of soil-crop nitrogen and pests.

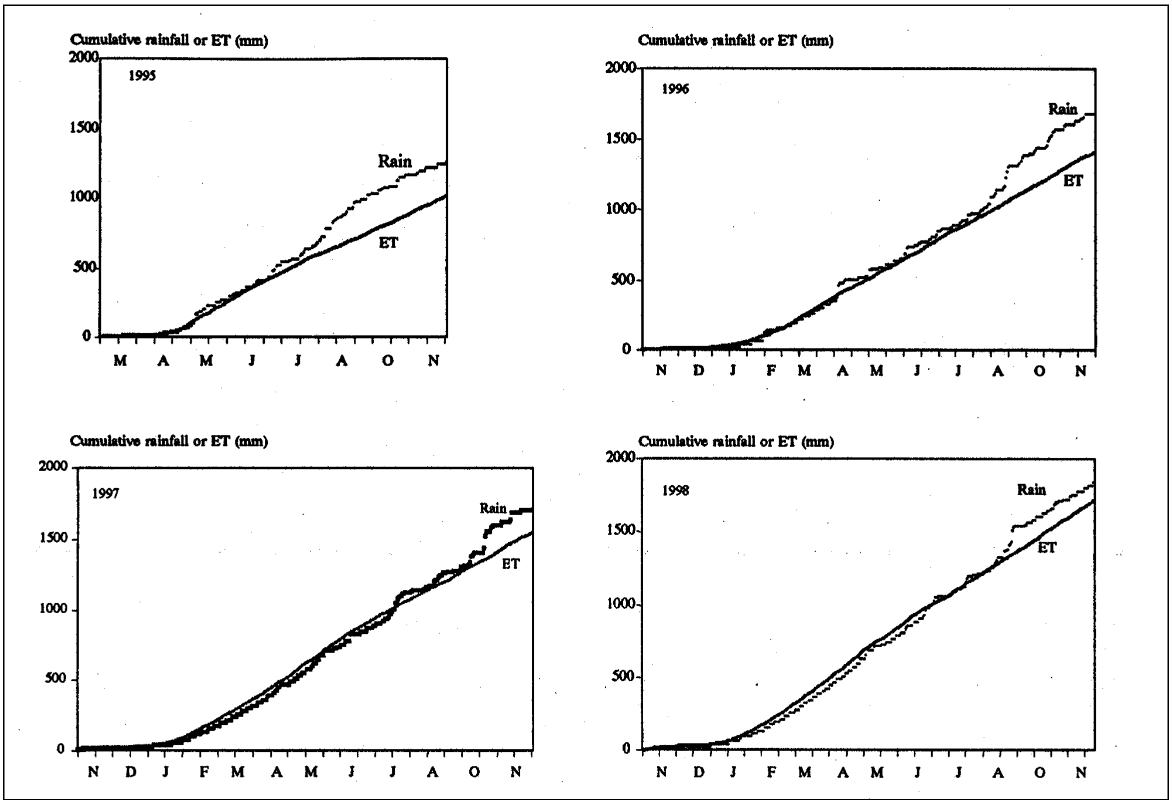


Figure 2. Comparison of rainfall and simulated ET values during 1995-1998.

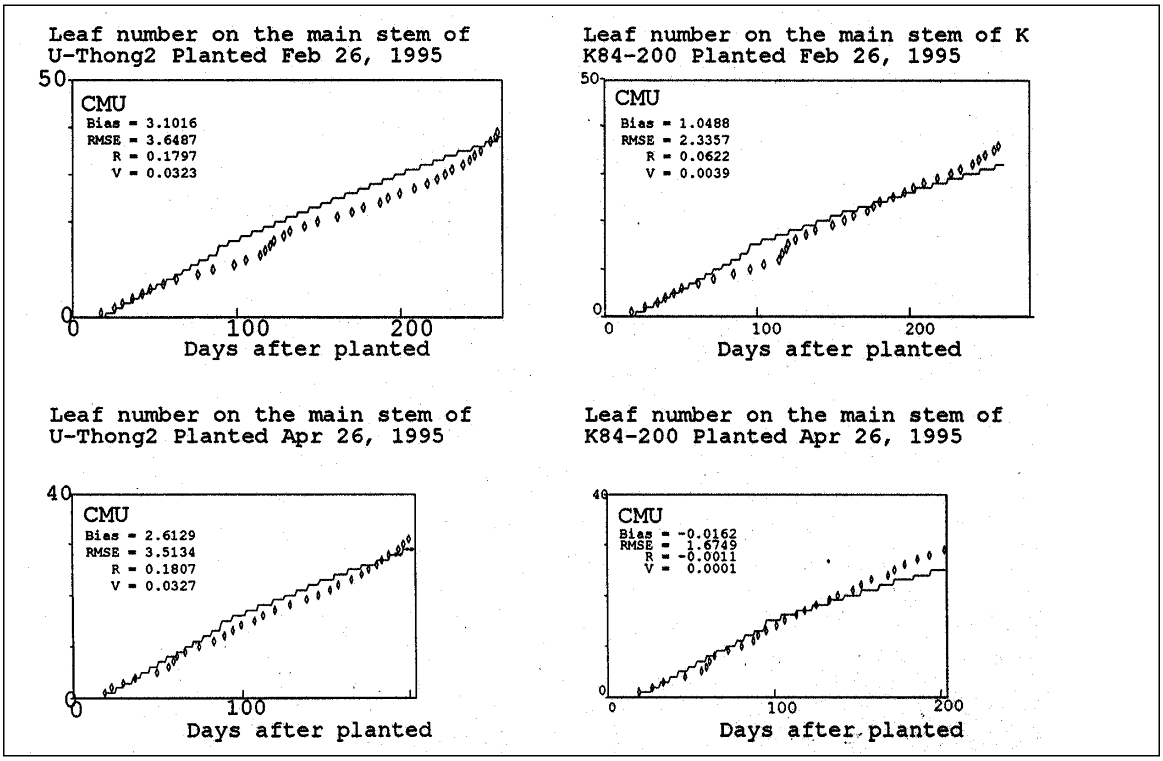


Figure 3. Comparison of the simulated (-) and observed (v) leaf numbers on sugarcane main stalk in 1995 crop year.

Planting date significantly affected fresh sugarcane weight and CCS sugar yields (Table 1) of planted and ratoon canes. Optimal yields were achieved on PD3 for planted cane because of longer growing season. Yields tended to be lower for earlier or later planting dates, with similar reasons.

Weather conditions in 1997 was more favorable for sugarcane growth and development when compared to other years, resulted in higher fresh cane weight and sugar yields for all planting dates, although they were 2nd ratoon canes of PD 1 and PD2 and 1st ratoon canes of PD3 and PD4. In 1998, however, extreme dry conditions resulted in relatively low yields of the 2nd ratoon canes of PD3 and PD4, the farm manager had to limit amount of added irrigation to the experiment. Planted cane ofPD3 enabled both sugarcane cultivars to produce higher number of leaves on the main stem than other planting dates.

The planted and both ratoon canes gave similar fresh cane weight and were not differed statistically as expected, especially since harvested plant populations were equally maintained.

The interaction between planting date and sugarcane cultivars was highly significant ($P>0.01$) on both sugarcane and sugar yields. Planted cane on planting date 3 (November 16, 1995) gave the highest sugarcane and sugar yields.

**Sugar Weight**

Sugar weights, based on CCS values, of four planting dates were statistically significant, and the second planting date was the highest (Table 1). Ratoon canes yielded higher than planted canes in all planting dates, but not significant among dates, attributed to higher number of stalk per unit area and higher polarity than the planting canes. The model predicted the similar trend of sugar yield response to planting date treatments, with root mean square errors were 7.79 and 9.25 for K 84-200 and U- Thong 2, respectively. The model is seriously underestimates CCS sugar yield of both cultivars by 47% and 53%, respectively.

Table 1. Sugarcane yield and quality as affected by planting dates, crop classes, and sugarcane cultivars.

| PD | Crop class | Stalk wt UT 2 | Stalk wt K 84-200 | CCS UT 2 | CCS K 84-200 | CCS sugar UT 2 | CCS sugar K 84-200 | Dates to Harvest |
|---|---|---|---|---|---|---|---|---|
| | | --- t ha$^{-1}$ --- | | - kg CCS sugar/t cane- | | - t ccs sugar ha$^{-1}$ | | -- days- |
| D1 | Planted (1995) | 132.5 | 116.3 | 113 | 98 | 14.97 | 11.39 | 246 |
| | Ratoon 1 (1996) | 151.9 | 123.8 | 109 | 113 | 16.55 | 13.98 | 371 |
| | Ratoon 2 (1997) | 165.6 | 151.3 | 97 | 94 | 16.07 | 14.22 | 341 |
| D2 | Planted (1995) | 65.6 | 53.8 | 84 | 85 | 5.51 | 4.57 | 183 |
| | Ratoon 1 (1996) | 135.6 | 117.5 | 116 | 118 | 15.73 | 13.87 | 371 |
| | Ratoon 2 (1997) | 155.6 | 127.5 | 101 | 97 | 15.72 | 12.37 | 341 |
| D3 | Planted (1996) | 158.1 | 161.3 | 146 | 142 | 23.09 | 22.90 | 370 |
| | Ratoon 1 (1997) | 131.3 | 136.3 | 95 | 103 | 12.47 | 14.03 | 329 |
| | Ratoon 2 (1998) | 113.8 | 108.1 | 162 | 156 | 18.43 | 16.87 | 327 |
| D4 | Planted (1996) | 143.8 | 136.3 | 154 | 143 | 22.14 | 19.48 | 307 |
| | Ratoon 1 (1997) | 165.0 | 129.4 | 95 | 97 | 15.68 | 12.55 | 329 |
| | Ratoon 2 (1998) | 113.1 | 113.1 | 163 | 164 | 18.44 | 18.55 | 327 |
| | CV(%) | PD | 16.5% | | 16.70 | | 24.3 | |
| | | Crop Cl | 29.3% | | 11.80 | | 29.6 | |
| | | Cult. | 19.1% | | 9.50 | | 20.2 | |
| | LSD(t ha$^{-1}$) | PD | 20.5 | | 19.0 | | 3.6 | |
| | | Crop Cl | ns | | 11.3 | | ns | |
| | | Cult. | 12.0 | | ns | | 1.5 | |

## CONCLUSION

Results of this study and those of Laohasiriwong et al (1999) and Lairuengrong et al (1999) suggest that the model demonstrate great potential to simulate yield of sugarcane of different planting dates. Longer growing season gave highest stalk yield and sugar yield.

Although rainfall and temperature varied during the three years study, several important trends were evident. Planting date was the most significant factor in determining sugarcane yield and maintaining high sugar yield in Chiang Mai area which, model was able to capture this trend. Planting cane during the end-of-rainy season gave the highest sugarcane and sugar yields. Sugarcane fresh weight and sugar yields of planted and both ratoon canes were not differed, in some cases 1st and 2nd ratoon sugarcanes gave significantly higher fresh weight and sugar yields. This due primarily to longer growing period of ratoon canes as compare to the planted canes. The ThaiCane model simulates the effect of planting date and sugarcane cultivar on fresh stalk weight satisfactorily, however, great deal of research are needed to further develop its prediction of CCS sugar yield.

Based on this study, under irrigated and rainfed conditions in Chiang Mai area, growers would produce consistent optimal sugarcane and sugar yields by using U-Thong 2 sugarcane cultivars and planting from approximately October to November, with sufficient irrigation. This window would vary geographically but should apply to any area where sandy soils are predominant. Users may use the model to exercise their choices of other cultivars and planting dates.

## ACKN0WLEDGEMENTS

We are grateful to Thailand Research Fund for financial support of this project; to staff of Mae Hia Research and Training Station for providing land area to conduct such a long-term experiment and field support services; to Dr. Methi Ekasingh and Mr. Phrek Gymmantasiri for their support in using system modeling and simulation research approach to tackle the problem.

## LITERATURE CITED

Analytical Software. 1996. Statistix for windows user's manual. Analytical Software, P.O. Box 12185, Tallahassee, FL 32317-2185, USA. 333 pp.

International Benchmark Site Network for Agrotechnology Transfer (IBSNAT). 1988. Experimental Design and Data Collection Procedures for IBSNA T: Minimum data set for systems analysis and crop simulation. 3M edition. Technical Report 1, Dept. of Agronomy and Soils, Univ. of Hawaii, Honolulu, USA.

Inman-Bamber, N.G. 1991. A growth model for sugarcane based on a simple carbon balance and the CERES-Maize water balance. S. Afr. J Plant and Soil. 8:93-99.

Jintrawet, A., Jongkaewwattana, S., and Inman-Bamber, N.G. 1997. ThaiCane 1.0 simulation model. *In* A. Jintrawet, S. Laohasiriwong, and C. Lairuengroung (eds.) The Final Report of the Development and Validation of a Sugarcane Model in Thailand Research Project. Multiple Cropping Center, Chiang Mai Univ., Chiang Mai, Thailand, p 102-112. (in Thai).

Lairungrueng, C., Iamsupasit, N., Prammanee, P., Limrungruengrat, P, and Jintrawet, A. 1999. Predicting the Effect of Planting Dates on Sugarcane in Suphanburi, Thailand. In this issue.

Laohasiriwong, S., Siri, B., Kendnord, I., and Jintrawet, A. 1999. Predicting the Effect of Planting Dates on Sugarcane in Khon Kaen, Thailand. In this issue.

Penning de Vries, F.W.T. 1982. Systems analysis and models of crop growth. In F.W.T. Penning de Vries, and H.H. van Laar (eds.). Simulation of plant growth and crop production. Simulation monographs. CABO, Wageningen, p 9-19.

Seranin, A.P. 1975. Sugarcane payment system. Sugar Tech. Review. Elsevier Pub., Netherlands. P 155-238.

Vearasilp, T., and Songsawat, K. 1991. Soil Information System. Technical Report no. 223. Soil Survey and Classification Div.., Land Development Dept., MOAC, 9 pp.

## APPENDIX 1

### CCS calculation

P = %Polarity of first expressed juice
B = %Brix of first expressed juice
F = %Fiber in cane = [(W2-W3)+100]/W1
Where W1 = wt of fresh fiber before oven, W2 = wt of dried after oven, and W3 = wt of bag

1 Polarity in cane = [(P+100)-(F+5)]/100
2 Brix in cane = [(B+100)-(F+3)]/100
3 CCS = (3/2)P {[1 -(F-5)/100] -(B/2)(1 --(F+3)/100)]}

# APPENDIX 2

## FileX setting for ThaiCane model to allow simulation of the experiment.

```
*EXP.DETAILS: CMMH9501SC CMU SUGAR CANE TEST EXPERIMENT

*GENERAL
@PEOPLE
 A.Jintrawet, S.Jongkaewwattana, T.Onpraphai, A.Charoenmuang.
@ADDRESS
 Multiple Cropping Center, Chiang Mai University, Chiang Mai, Thailand.

@SITE
 Mae Hai Research and Training Center
@NOTES
 This is a test experimental details file

*TREATMENTS                        -------------FACTOR LEVELS------------
@N R O C TNAME.................... CU FL SA IC MP MI MF MR MC MT ME MH SM
!D1
 1 1 0 0 CM FEB95 UT2  H15/11/95    1  1  1  1  1  0  0  0  0  0  0  1  1
 1 2 0 0 CM FEB95 UT2  H15/11/96    1  1  1  1  2  0  0  0  0  0  0  2  2
 1 3 0 0 CM FEB95 UT2  H15/11/97    1  2  1  1  3  0  0  0  0  0  0  3  3
 2 1 0 0 CM FEB95 K200 H15/12/95    2  1  1  2  4  0  0  0  0  0  0  4  4
 2 2 0 0 CM FEB95 K200 H15/12/96    2  1  1  2  5  0  0  0  0  0  0  5  5
 2 3 0 0 CM FEB95 K200 H15/12/97    2  2  1  2  6  0  0  0  0  0  0  6  6
!D2
!3 1 0 0 CM APR95 UT2  H15/11/95    1  1  1  3  7  0  0  0  0  0  0  7  7
!3 2 0 0 CM APR95 UT2  H15/11/96    1  1  1  3  8  0  0  0  0  0  0  8  8
!3 3 0 0 CM APR95 UT2  H15/11/97    1  2  1  3  9  0  0  0  0  0  0  9  9
!4 1 0 0 CM APR95 K200 H15/11/95    2  1  1  4 10  0  0  0  0  0  0 10 10
!4 2 0 0 CM APR95 K200 H15/11/96    2  1  1  4 11  0  0  0  0  0  0 11 11
!4 3 0 0 CM APR95 K200 H15/11/97    2  2  1  4 12  0  0  0  0  0  0 12 12
!D3
 5 1 0 0 CM Nov95 UT2  H15/11/96    1  1  1  1 13  0  0  0  0  0  0 13 13
 5 2 0 0 CM Nov95 UT2  H15/11/97    1  2  1  1 14  0  0  0  0  0  0 14 14
 5 3 0 0 CM Nov95 UT2  H15/11/98    1  3  1  1 15  0  0  0  0  0  0 15 15
 6 1 0 0 CM Nov95 K200 H15/12/96    2  1  1  2 16  0  0  0  0  0  0 16 16
 6 2 0 0 CM Nov95 K200 H15/12/97    2  2  1  2 17  0  0  0  0  0  0 17 17
 6 3 0 0 CM Nov95 K200 H15/12/98    2  3  1  2 18  0  0  0  0  0  0 18 18
!D4
!7 1 0 0 CM Jan96 UT2  H15/11/96    1  2  1  1 19  0  0  0  0  0  0 19 19
!7 2 0 0 CM Jan96 UT2  H15/11/97    1  2  1  1 20  0  0  0  0  0  0 20 20
!7 3 0 0 CM Jan96 UT2  H15/11/98    1  3  1  1 21  0  0  0  0  0  0 21 21
!8 1 0 0 CM Jan96 K200 H15/12/96    2  2  1  2 22  0  0  0  0  0  0 22 22
!8 2 0 0 CM Jan96 K200 H15/12/97    2  2  1  2 23  0  0  0  0  0  0 23 23
!8 3 0 0 CM Jan96 K200 H15/12/98    2  3  1  2 24  0  0  0  0  0  0 24 24

*CULTIVARS
@C CR INGENO CNAME
 1 SC IB0001 UT2
 2 SC IB0002 K200

*FIELDS
@L ID_FIELD WSTA....  FLSA  FLOB  FLDT  FLDD  FLDS  FLST SLTX   SLDP ID_SOIL
 1 CMMH9501 CMMH9501 -99.0     0 DR000     0     0 00000 SACLL     0 IB00000013
@L ...........XCRD ...........YCRD .....ELEV .............AREA .SLEN .FLWR .SLAS
 1         0.00000         0.00000      0.00               0.0     0   0.0   0.0
@L ID_FIELD WSTA....  FLSA  FLOB  FLDT  FLDD  FLDS  FLST SLTX   SLDP ID_SOIL
 2 CMMH9501 CMMH9601 -99.0     0 DR000     0     0 00000 SACLL     0 IB00000013
@L ...........XCRD ...........YCRD .....ELEV .............AREA .SLEN .FLWR .SLAS
 2         0.00000         0.00000      0.00               0.0     0   0.0   0.0
@L ID_FIELD WSTA....  FLSA  FLOB  FLDT  FLDD  FLDS  FLST SLTX   SLDP ID_SOIL
 3 CMMH9501 CMMH9701 -99.0     0 DR000     0     0 00000 SACLL     0 IB00000013
@L ...........XCRD ...........YCRD .....ELEV .............AREA .SLEN .FLWR .SLAS
 3         0.00000         0.00000      0.00               0.0     0   0.0   0.0

*SOIL ANALYSIS
@A SADAT  SMHB  SMPX  SMKE
 1   -99 SA001 SA001 SA001

*INITIAL CONDITIONS
@C   PCR ICDAT  ICRT  ICND  ICRN  ICRE  ICWD ICRES ICREN ICREP ICRIP ICRID
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@C  ICBL  SH2O  SNH4  SNO3
 1    18 0.163   1.0   5.6
 1    35 0.199   0.5   1.9
 1    56 0.222   0.5   2.2
 1    75 0.382   0.5   1.9
 1   115 0.332   0.5   0.6
@C   PCR ICDAT  ICRT  ICND  ICRN  ICRE  ICWD ICRES ICREN ICREP ICRIP ICRID
 2    SC 95051   500     0  1.00  1.00 -99.0     0  0.00  0.00   100    15
@C  ICBL  SH2O  SNH4  SNO3
 2    18 0.163   1.0   5.6
 2    35 0.199   0.5   1.9
 2    56 0.222   0.5   2.2
```

```
 2    75 0.382   0.5   1.9
 2   115 0.332   0.5   0.6
@C   PCR ICDAT  ICRT  ICND  ICRN  ICRE  ICWD ICRES ICREN ICREP ICRIP ICRID
 3    SC 95051   500     0  1.00  1.00 -99.0     0  0.00  0.00   100    15
@C  ICBL  SH2O  SNH4  SNO3
 3    18 0.163   1.0   5.6
 3    35 0.199   0.5   1.9
 3    56 0.222   0.5   2.2
 3    75 0.382   0.5   1.9
 3   115 0.332   0.5   0.6
@C   PCR ICDAT  ICRT  ICND  ICRN  ICRE  ICWD ICRES ICREN ICREP ICRIP ICRID
 4    SC 95051   500     0  1.00  1.00 -99.0     0  0.00  0.00   100    15
@C  ICBL  SH2O  SNH4  SNO3
 4    18 0.163   1.0   5.6
 4    35 0.199   0.5   1.9
 4    56 0.222   0.5   2.2
 4    75 0.382   0.5   1.9
 4   115 0.332   0.5   0.6

*PLANTING DETAILS
@P PDATE EDATE  PPOP  PPOE  PLME  PLDS  PLRS  PLRD  PLDP  PLWT  PAGE  PENV  PLPH  SPRL
!Date 1
 1 95059   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
 2 95318   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
 3 96318   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
 4 95059   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
 5 95340   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
 6 96340   -99   1.5   1.5     R     R   130    90  15.0    55   -99  22.0   1.0   0.0
!Date 2
 7 95118   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
 8 95318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
 9 96318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
10 95118   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
11 95340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
12 96340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
!Date 3
13 95318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
14 96318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
15 97318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
16 95318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
17 96340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
18 97340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
!Date 4
19 96015   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
20 96318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
21 97318   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
22 96015   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
23 96340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0
24 97340   -99   1.5   1.5     R     R   130    90  15.0    55   -99 -99.0   1.0   0.0

*HARVEST DETAILS
@H HDATE  HSTG  HCOM HSIZE   HPC  HBPC
!Date 1
 1 95318    07    HA    HA 100.0   0.0
 2 96317    07    HA    HA 100.0   0.0
 3 97317    07    HA    HA 100.0   0.0
 4 95318    07    HA    HA 100.0   0.0
 5 96339    07    HA    HA 100.0   0.0
 6 97339    07    HA    HA 100.0   0.0
!Date 2
 7 95318    07    HA    HA 100.0   0.0
 8 96317    07    HA    HA 100.0   0.0
 9 97317    07    HA    HA 100.0   0.0
10 95318    07    HA    HA 100.0   0.0
11 96339    07    HA    HA 100.0   0.0
12 97339    07    HA    HA 100.0   0.0
!Date 3
13 96318    07    HA    HA 100.0   0.0
14 97317    07    HA    HA 100.0   0.0
15 98317    07    HA    HA 100.0   0.0
16 96318    07    HA    HA 100.0   0.0
17 97339    07    HA    HA 100.0   0.0
18 98339    07    HA    HA 100.0   0.0
!Date 4
19 96318    07    HA    HA 100.0   0.0
20 97317    07    HA    HA 100.0   0.0
21 98317    07    HA    HA 100.0   0.0
22 96318    07    HA    HA 100.0   0.0
23 97339    07    HA    HA 100.0   0.0
24 98339    07    HA    HA 100.0   0.0

*SIMULATION CONTROLS
@N GENERAL     NYERS NREPS START SDATE RSEED SNAME....................
 1 GE              1     1     S 95051  2150 CM FEB95 D1 UT2 Planted
@N OPTIONS     WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 1 OP              Y     N     N     N     N     N     N     N
@N METHODS     WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
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 1 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 1 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
 1 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 1 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 1 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 1 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 1 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 1 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 2 GE               1     1     S 95318  2150 CM FEB95 D1 UT2 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 2 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 2 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 2 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
 2 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 2 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 2 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 2 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 2 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 2 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 3 GE               1     1     S 96318  2150 CM FEB95 D1 UT2 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 3 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 3 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 3 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
 3 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 3 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 3 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 3 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 3 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 3 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 4 GE               1     1     S 95051  2150 CM FEB95 D1 K84-200 planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 4 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 4 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 4 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
 4 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 4 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 4 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 4 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 4 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 4 HA               0 23829   100     0
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@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 5 GE               1     1     S 95339  2150 CM FEB95 D1 K84-200 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 5 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 5 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 5 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
 5 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 5 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 5 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 5 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 5 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 5 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 6 GE               1     1     S 96339  2150 CM FEB95 D1 K84-200 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 6 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 6 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 6 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
 6 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 6 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 6 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 6 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 6 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 6 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 7 GE               1     1     S 95118  2150 CM FEB95 D2 UT2 planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 7 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 7 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 7 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
 7 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 7 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 7 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 7 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 7 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 7 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 8 GE               1     1     S 95318  2150 CM FEB95 D2 UT2 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 8 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 8 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 8 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
 8 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 8 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 8 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 8 NI              15    50    25 IB001 IB001
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@N RESIDUES     RIPCN RTIME RIDEP
 8 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 8 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
 9 GE               1     1     S 96318  2150 CM FEB95 D2 UT2 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
 9 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
 9 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
 9 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
 9 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
 9 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
 9 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
 9 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
 9 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
 9 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
10 GE               1     1     S 95118  2150 CM FEB95 D2 K84-200 planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
10 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
10 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
10 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
10 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
10 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
10 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
10 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
10 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
10 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
11 GE               1     1     S 95339  2150 CM FEB95 D2 K84-200 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
11 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
11 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
11 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
11 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
11 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
11 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
11 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
11 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
11 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
12 GE               1     1     S 96339  2150 CM FEB95 D2 K84-200 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
12 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
12 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
12 MA               R     A     N     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
12 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
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12 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
12 IR              30    50   100 IB007 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
12 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
12 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
12 HA               0 23829   100     0

!Date 3 U-Thong 2 Nov 19, 1995
@N GENERAL      NYERS NREPS START SDATE RSEED SNAME...................
13 GE               1     1     S 95310  2150 CM APR95 D3 UT 2 Planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
13 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
13 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
13 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
13 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
13 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
13 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
13 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
13 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
13 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME...................
14 GE               1     1     S 96310  2150 CM APR95 D3 UT 2 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
14 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
14 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
14 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
14 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
14 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
14 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
14 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
14 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
14 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME...................
15 GE               1     1     S 97310  2150 CM APR95 D3 UT 2 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
15 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
15 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
15 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
15 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
15 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
15 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
15 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
15 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
15 HA               0 23829   100     0

!Date 3 K 84-200  Nov 19, 1995
@N GENERAL      NYERS NREPS START SDATE RSEED SNAME...................
16 GE               1     1     S 95310  2150 CM APR95 D3 K84-200 Planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
16 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
16 ME               M     M     E     M     S     C     R
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@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
16 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
16 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
16 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
16 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
16 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
16 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
16 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
17 GE               1     1     S 96310  2150 CM APR95 D3 K84-200 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
17 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
17 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
17 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
17 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
17 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
17 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
17 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
17 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
17 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
18 GE               1     1     S 97310  2150 CM APR95 D3 K84-200 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
18 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
18 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
18 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
18 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
18 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
18 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
18 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
18 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
18 HA               0 23829   100     0

!Date 4 UThong 2 Planted on Jan 16, 1996
@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
19 GE               1     1     S 96010  2150 CM APR95 D4 UThong 2 Planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
19 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
19 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
19 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
19 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
19 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
19 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
19 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
19 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
19 HA               0 23829   100     0
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@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
20 GE               1     1     S 96310  2150 CM APR95 D4 UThong 2 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
20 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
20 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
20 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
20 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
20 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
20 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
20 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
20 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
20 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
21 GE               1     1     S 97310  2150 CM APR95 D4 UThong 2 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
21 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
21 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
21 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
21 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
21 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
21 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
21 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
21 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
21 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
22 GE               1     1     S 96010  2150 CM APR95 D4 K84-200 Planted
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
22 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
22 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
22 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
22 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
22 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
22 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
22 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
22 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
22 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME....................
23 GE               1     1     S 96317  2150 CM APR95 D4 K84-200 1st ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
23 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
23 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
23 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOU
23 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
23 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
23 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
23 NI              15    50    25 IB001 IB001
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@N RESIDUES     RIPCN RTIME RIDEP
23 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
23 HA               0 23829   100     0

@N GENERAL      NYERS NREPS START SDATE RSEED SNAME...................
24 GE               1     1     S 97317  2150 CM APR95 D4 K84-200 2nd ratoon
@N OPTIONS      WATER NITRO SYMBI PHOSP POTAS DISES  CHEM  TILL
24 OP               Y     N     N     N     N     N     N     N
@N METHODS      WTHER INCON LIGHT EVAPO INFIL PHOTO HYDRO
24 ME               M     M     E     M     S     C     R
@N MANAGEMENT   PLANT IRRIG FERTI RESID HARVS
24 MA               R     A     R     N     R
@N OUTPUTS      FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT  LONG CHOUT OPOUT
24 OU               N     Y     Y     1     Y     N     Y     N     N     N     Y     N     N

@  AUTOMATIC MANAGEMENT
@N PLANTING     PFRST PLAST PH2OL PH2OU PH2OD PSTMX PSTMN
24 PL           29516 29530    40   100    30    40    10
@N IRRIGATION   IMDEP ITHRL ITHRU IROFF IMETH IRAMT IREFF
24 IR              30    50   100 IB001 IB001    10  1.00
@N NITROGEN     NMDEP NMTHR NAMNT NCODE NAOFF
24 NI              15    50    25 IB001 IB001
@N RESIDUES     RIPCN RTIME RIDEP
24 RE             100     1    20
@N HARVEST      HFRST HLAST HPCNP HPCNR
24 HA               0 23829   100     0
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