MODELING RATE OF PLANTING, DATE OF PLANTING AND HYBRID MATURITY EFFECTS ON YIELD OF GRAIN SORGHUM (*SORGHUM BICOLOR*, (L.) MOENCH)

by

Daniel Myron Baker

B.S., Kansas State University, 1978

A THESIS

submitted in partial fulfillment of the requirements
for the degree

MASTER OF SCIENCE

Department of Agronomy

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1982

Approved by:

Major Professor

TABLE OF CONTENTS

LIST OF FIGURES

Appendix A

LIST OF TABLES

Appendix A

Appendix B

INTRODUCTION

Obtaining an adequate stand of grain sorghum is a problem, not infrequent, to the producer of grain sorghum in Kansas. Any decision to replant an established stand should be based on population, hybrid maturity, date, climate and location effects on yield. Determination of these effects based on actual field studies alone is impractical. An alternative is to use a physiological growth model to simulate these effects. Such a model tested aginst actual data and improved by this use will allow for the development of replant guidelines.

The objectives of this study are:

1) To study the effects of rate of planting, date of planting, and hybrid maturity on the yield of grain sorghum.

2) To model these effects using the physiological growth model SORGF.

3) To determine how closely the model response approximates the actual response, and if the model might be used to develop replant guidelines.

4) To determine areas for improvement in SORGF.

This study is the continuation of an ongoing date, rate and hybrid maturity study.

Population

Early studies in grain sorghum production have suggested optimum population, to achieve greatest yields, requires knowledge of a variety's tillering habit. Sieglinger (34) observed that high tillering varieties (milos, common feterita, shallu, sunrise kafir) performed best when the within row spacing was 15 to 76 cm. Low tillering varieties (spur feterita, kaoliangs, kafirs other than sunrise) yielded greatest when the within row spacing was 15 to 30 cm. Karper (17) found milo yielded greatest at an intra-row spacing of 46 to 91 (4,800 pl/ha to 9,600 pl/ha) whereas kafir performed best at an intra-row spacing of 8 to 23 cm (10,800 pl/ha to 23,300 pl/ha). Under these conditions, yield expectation was low.

Recently research has shown that grain sorghum yields are often constant over a range of populations. Population effects on yield are expressed in terms of its components. Stickler and Wearden (40), Stickler and Younis (41), Karchi and Rudich (16), Hedge et al. (14), observed intercompensation among the yield components; number of heads per unit area (tillering), number of seeds per head (panicle size), and seed weight.

Nelson (22), Grimes and Musick (13), and Robinson et al. (32) found that under abundant moisture conditions there was little difference in yield when populations ranged from 178,000 to 563,400 pl/ha, 138,000 to 553,500 pl/ha, and 193,600 to 775,000 seeds/ha, respectively. Gerakis and Tsangarakis (12), under low yield expectation (370 to 405 kg/ha) and limited moisture supply, observed no response to population at 80,000 to 200,000 pl/ha. Hedge et al. (14) noted no consistant response from 75,000 to 396,000 pl/ha.

Other results show more variation. Painter and Leamer (24), Stickler and Laude (36), Welch, Burnett, and Eck (46), and Praeger (28) found at 61,500 to 107,600 pl/ha, 129,200 to 193,700 pl/ha, 24,700 to 148,300 pl/ha, and 74,000 to 98,000 pl/ha respectively, the high populations gave more favorable yields.

Stickler et al. (39), and Olson (23), recorded no population response, and a high population response occurring with equal frequency.

Finally, yield advantage at low populations have been observed under moisture limiting, and stress conditions. Brown and Shrader (8) noted that as depth of initially moist soil changed from 213 cm to 91 cm optimum population decreased from 296,500 pl/ha to 37,000 pl/ha. Under conditions of stress, optimum populations were further decreased. Bond, Army, and Lehman (7), and Atkins, Reich, and Kern (4), found low populations of 44,500 pl/ha, and 69,600 pl/ha to 87,100 pl/ha, respectively, outyielded higher populations when stress occurred. Karchi and Rudich (16) found higher yields from a low population of 49,000 pl/ha when grain sorghum was grown on stored soil moisture alone.

Date of Planting

The average number of frost free days in Kansas varies from 150 to 200 days (43). The range of potential planting dates span 60 to 80 days from late April, early May to late June, early July.

Stickler and Pauli (38), Praeger (28), Jaiyesimi (15), and Bunck (9) in studies at Manhattan, Kansas, observed optimum dates of planting to be 1 May to 20 May; 10 May to 14 May; 3 May and 6 June (1977), 27 April to 15 May (1978); and 26 April to 29 May, respectively, indicating an early to medium date of planting an advantage to yield.

In other locations in the state, Jaiyesimi (15) at Hutchinson observed higher yields on the 20 April planting. Bunck (9) at Manhattan, St. John (dryland), and Hutchinson recorded optimum dates of 26 April to 9 June, 21 April, and 20 April, respectively.

Stickler and Pauli (37, 38), and Pauli, Stickler, and Lawless (25) found that earlier dates of planting tended to lengthen the time from planting to growing point differentiation, and from growing point differentiation to half

bloom but reduce the time from half bloom to physiological maturity. Average temperature at heading above 26.7C was considered detrimental to grain production. Also, reduction in yield components, over dates, were observed. As planting was delayed, number of seeds per head (panicle size), number of heads per unit area (tillering), and seed weight were all affected. The greatest reduction occurring in number of seeds per head.

Conversely, Blum (6) observed, under conditions of limited moisture, that late plantings increased the number of seeds per head. This he attributed to reduced tillering and higher temperatures at growing point differentiation. Early dates gave greater yields primarily as a result of tillering.

Maturity

Maturity is determined by the number of leaves, duration of growth, and ultimate plant size (30). Quinby (29), and Quinby and Karper (30) observed that duration of the vegetative period and plant size were positively correlated. Their results showed that medium and late maturities gave greater yields under favorable growing conditions.

Blum (5) stated "yielding potential was in direct relationship to duration of growth under non-competitive conditions, and in an inverse relationship under extreme competition". Growing grain sorghum on stored soil moisture he found early maturities had favorable yields.

Sticker and Paul (38) noted that early maturing hybrids had relatively less depression in yield over growing conditions when compared with late maturity hybrids, although yield level was less. Dalton (10) applying regression analysis of yield on days to half bloom, computed that (under favorable conditions) yield (kg/ha) = 227.44 + 77.06 kg/ha/days to bloom.

SORGF

SORGF, a dynamic grain sorghum growth model, as described by Maas and Arkin (18), Arkin et al. (1) and Vanderlip and Arkin (45) was developed with the con-

cept that, as a physiological growth model, it could be used as an aid to making management decisions in grain sorghum production. Early modeling, with SORGF, by Vanderlip and Arkin (45) showed that the model provided "unbiased estimates of growing point differentiation, half bloom, physiological maturity, grain yield and harvest index". They also concluded that further work and refinement of the model's partitioning aspects were needed.

Maas and Arkin (19) examined the sensitivity of SORGF to the input variables, temperature, insolation, percent extractable soil water, population, row spacing, number of leaves, and maximum plant leaf area. The model was found most sensitive to percent extractable soil water, temperature, and population, while less sensitive to maximum plant leaf area, insolation, maximum number of leaves and row spacing. Specifically, percent extractable soil water had no effect on yield from emergence to growing point differentiation, after which yield was not significantly affected until extractable soil water was below 0.6. Yields were acutely affected below 0.3 extractable soil water. Also, maximum model grain yields were obtained when seasonal temperatures were 10 percent cooler than normal.

In other studies, Arkin et al. (2) observed that the forecast accuracy of SORGF improved as the growing season progressed. Stinson et al. (42), using SORGF interfaced with a hydrologic model, studied the feasibility of ratoon cropping in Texas. They concluded from modeled results that such a practice would result in only a 25 percent probability of a ratoon crop of grain making 1500 kg/ha in any given year, and therefore ratoon cropping would not be economical.

MATERIALS AND METHODS

The experimental design used at all locations, both years, was a modified split-plot with dates as main plots stripped across hybrids and rates as sub-plots. Treatments (hybrid by rate) were randomized within blocks, with three replications per date. Dates were randomized but not replicated. Hybrids used were Acco 1014, early maturity; Pioneer 8324, medium maturity; and DeKalb F-67, late maturity. Specific location information follows.

1980

Manhattan

Rates: 74,100; 148,300; and 296,500 pl/ha

Dates: 7 May, 6 June, and 27 June

Fertilizer: 84 kg N/ha, 33.6 kg P/ha

Herbicide: 3.36 kg Ramrod/ha, 1.12 kg Atrazine/ha (A.I.)

Some treatments of the second date of planting were lost.

Hutchinson

Rates: 49,400; 98,800; and 197,700 pl/ha

Dates: 12 May, 5 June, and 30 June

Fertilizer: None

Herbicide: 2.24 kg Ramrod/ha, 1.12 kg Atrazine/ha (A.I.)

Due to extremely dry conditions and bird damage no data were taken from the first date, and only partial data from the second date.

1981

Parsons

Rates: 74,100; 148,300; and 296,500 pl/ha

Dates: 24 April, 5 June, and 6 July

Fertilizer: 140 kg N/ha as anhydrous ammonia, and 336 kg 6-24-24/ha

Herbicide: 3.36 kg Ramrod/ha and 1.12 kg Atrazine/ha (A.I.)

The first date suffered light bird damage, and stand establishment was reduced on the second date of planting due to crusting rains at emergence.

Powhattan

Rates: 74,100; 148,300; and 296,500 pl/ha

Dates: 1 May, 10 June, 26 June, and 7 July

Fertilizer: 112 kg N/ha as anhydrous ammonia

Herbicide: First date, 2.24 kg AAtrex 4L/ha, and to achieve greater grass control, second, third, and fourth dates were also sprayed with 3.36 kg Bexton/ha (A.I.)

No data were taken on the early maturity from the first date of planting due to extreme bird damage. Some plots were also lost to chinch bugs in the third and fourth dates.

Manhattan

Rates: 74,100; 148,300; and 296,500 pl/ha

Dates: 8 June, and 12 July

Fertilizer: 61.6 kg N/ha

Herbicide: 3.36 kg Ramrod/ha, 1.12 kg Atrazine/ha (A.I.)

Unusually wet conditions prevented a May planting.

No data were taken on this study.

St. John

Rates: 49,400; 98,800; and 197,700 pl/ha

Dates: 21 May, 16 June, and 8 July

Fertilizer: First date received only 112 kg 18-46-0/ ha, second and third dates also received a sidedress of 44.8 kg N/ha as anhydrous ammonia.

Herbicide: 2.24 kg Igran/ha, and 0.56 kg Miloguard/ha (A.I.)

The first date of planting suffered light bird damage.

Minneola

Rates: 37,100; 74,100; and 148,300 pl/ha

Dates: 22 May, 18 June, and 9 July

Fertilizer: None

Herbicide: None

Plantings were made with a two row cone planter, Furadan granules, at the rate of 1.12 kg/ha (A.I.) were applied with the seed at planting at all locations. Plots were six rows wide, 7.9 m long in 1980, and 7.6 m long in 1981. Row spacing was 76 cm.

Germination and establishment rate was considered 60% in 1980 and 75% in 1981. Planting rates were adjusted accordingly. Stand counts were taken, when possible, at establishment. Plots were hand cultivated when necessary. Sample leaf areas for each treatment were measured at heading for input into SORGF. Daily solar radiation, maximum and minimum temperatures, and rainfall were also recorded as input. Date of half bloom and physiological maturity were noted when possible.

The center two rows were harvested (generally 4.6 m from each row) or the second and fifth row were harvested if the population was more representative of the target population. Harvested heads were counted, and threshed with a small plot thresher. Grain weight was recorded. Moisture content was found by use of an electronic moisture tester. Yields were adjusted to 12.5% moisture. Seed weight was determined from the weight of 200 seeds at dryness. Statistical analysis was conducted with SAS on yield and yield components with ANOVA and GLM.

SORGF

The basic model described by Maas and Arkin (18) has been modified for use in this study. The grain fill period is completed by the accumulation of heat units based on Schaffer's (33) findings. Dry matter accumulation is halted at frost, and a tiller step has been added based on regression data from Praeger (28) and Jaiyesimi (15). The regression of the ratio of tiller head size to main head size on main culm population was found to be Relsz = .4977 + 2.7224 x 10^{-6} P. Where Relsz is the ratio: tiller head size over main head size, and P is the population of main culms/ha. Tiller head yield was calculated (in SORGF) as: model main head weight x Relsz x number of tillers. Model main head weight was computed by SORGF. Relsz was found from the above regression and number of tillers was inputed from plot data (total head count - stand count). Total yield was the sum of main culm head yield and tiller head yield.

RESULTS

Manhattan
1980

Sorghum yield at Manhattan was influenced by hybrid maturity, population, date of planting x hybrid maturity, and date of planting x population (Table A-1).

Medium hybrid maturity yield was significantly higher as a result of more heads per hectare (Table 1). Low population yields were greater due to larger seeds and panicles (Table 2).

Table 1. Hybrid means for yield, seed weight, number of seeds per panicle, and number of heads/ha, Manhattan 1980.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	3132	21.21	1002	159655
Medium	4951	21.58	1394	188300
Late	3887	22.59	1219	152737
LSD .05				
Early/Medium	410	.89	137	17254
Early/Late	440	.95	147	18513
Medium/Late	432	.94	144	18175

Table 2. Rate means for yield, seed weight, number of seeds per panicle, and number of heads/ha, Manhattan 1980.

Rate (pl/ha)*	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
84409	4494	23.49	1724	113998
165613	3997	21.38	1198	157530
286540	3661	20.63	792	224100
LSD .05				
84409/165613	434	.94	145	18258
84409/286540	430	.93	143	18080
165613/286540	414	.90	138	17425

*Based on counts from dates 127 and 157, no counts for date 178.

Medium and late maturity hybrid yields were similar for the 6 June (J.D. 157) planting. Medium maturity gave significantly higher yields for the early and late dates of planting. No difference in yield (early and late maturity hybrids), and a 6 June yield advantage (medium maturity hybrid), were observed over dates of planting (Figure 1, Table A-2).

The interaction of date of planting and population on yield (Figure 2, Table A-3) shows no difference in yield over rates (early planting); highest at the low population (6 June planting); low and middle, middle and high populations equal (late planting).

Seed weight showed a decreasing trend between early and late dates of planting (medium and late maturity hybrids), and a sharp drop on 6 June (early maturity hybrid) as apparent from the interaction of date of plant-

ing x hybrid maturity on seed weight (Figure 3, Table A-2).

Number of seeds per panicle did not vary (early and medium maturity hybrids), and increased (late date of planting, late maturity hybrid) over dates of planting (Figure 4, Table A-2). Differences between hybrid panicle sizes decreased as population increased. Generally larger heads were produced by the low population (Figure 5, Table A-4).

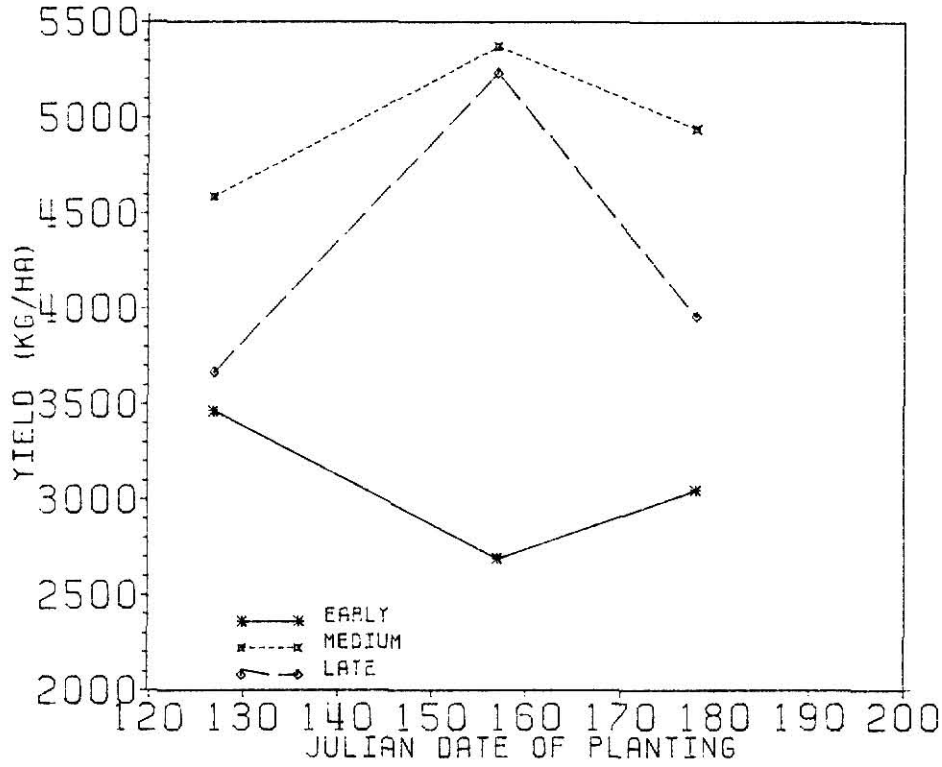

Figure 1. Interaction of Date x Hybrid Maturity on Yield, Manhattan 1980.

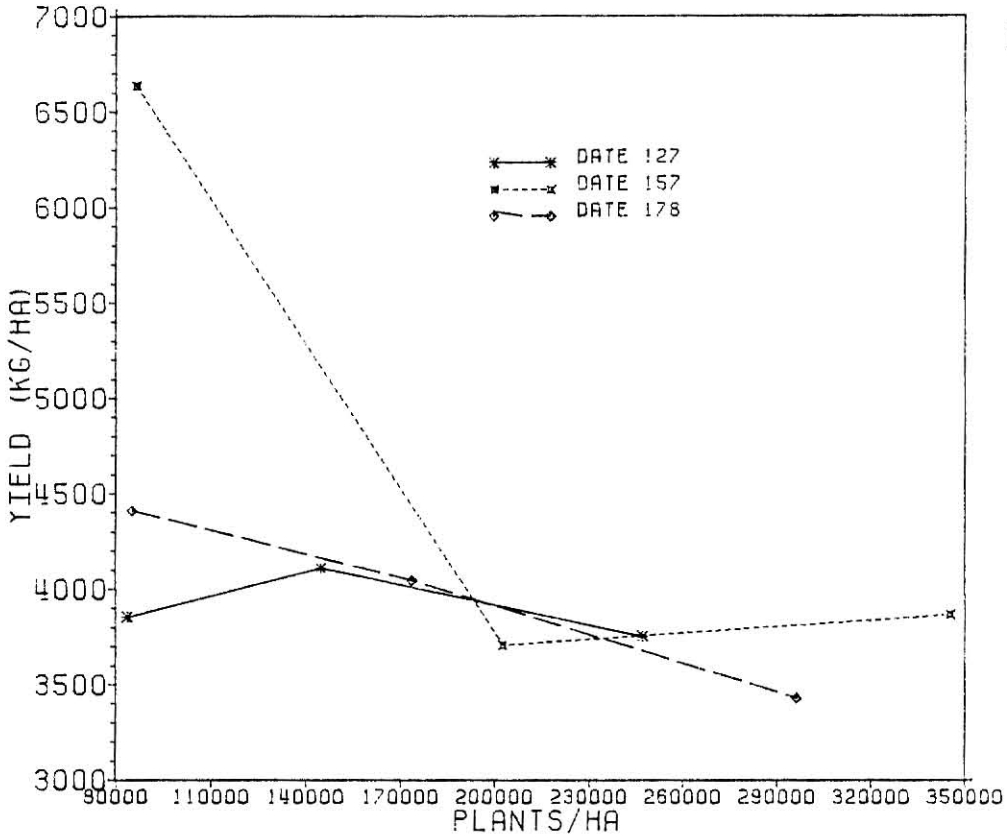

Figure 2. Interaction of Date x population on yield Manhattan 1980.

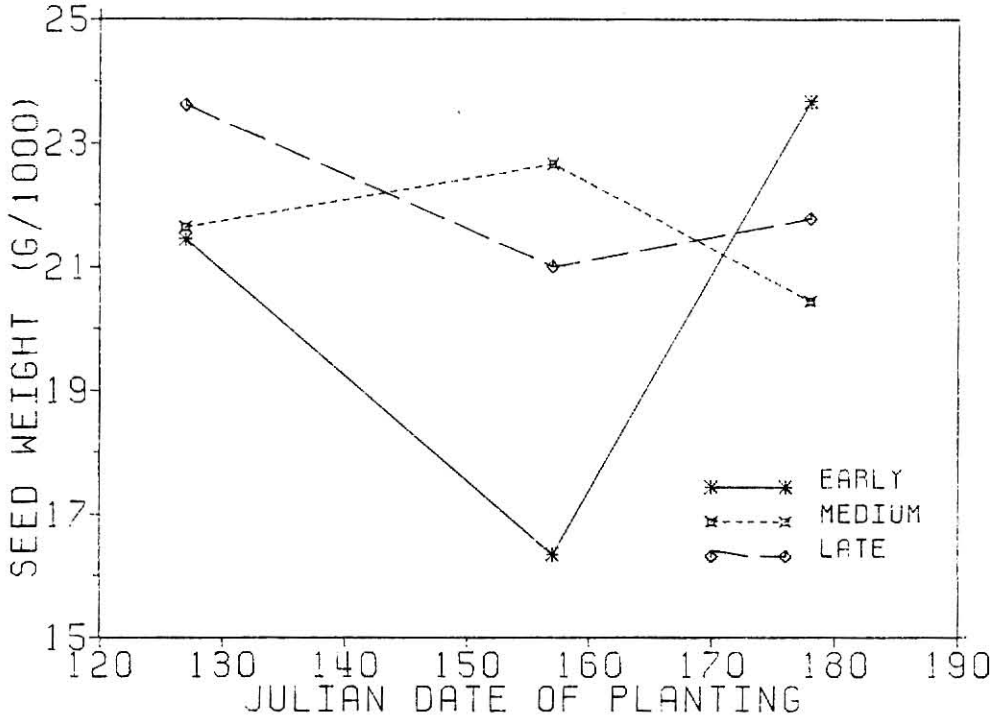

Figure 3. Interaction of Date x Hybrid Maturity on Seed Weight, Manhattan 1980.

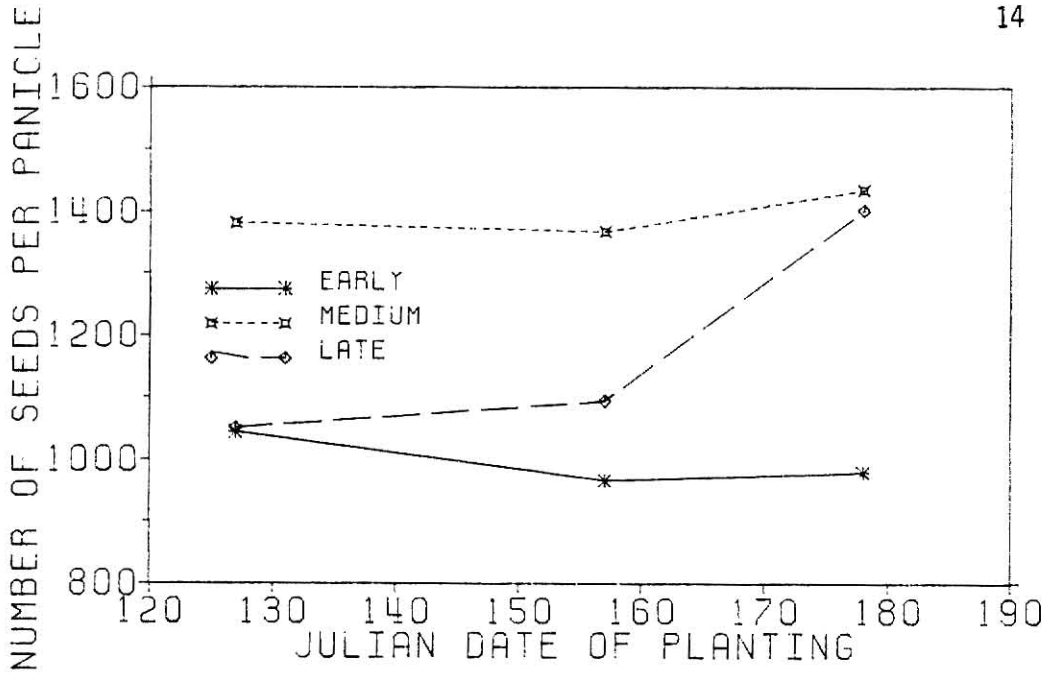

Figure 4. Interaction of Date x Hybrid Maturity on Number of Seeds Per Panicle, Manhattan 1980.

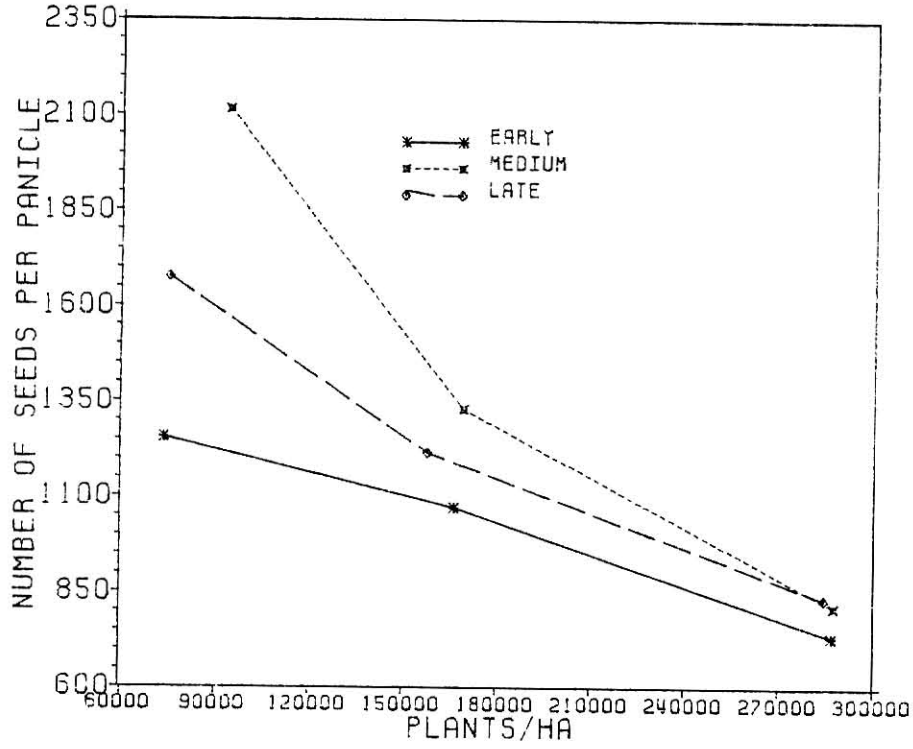

Figure 5. Interaction of Hybrid Maturity x population on Number of Seeds/Panicle, Manhattan 1980.

Hutchinson

Yield at Hutchinson was affected by hybrid maturity, and a hybrid maturity x population interaction (Table A-5). Medium and late maturity hybrid yields were comparable. Early maturity hybrid yield was significantly lower due to fewer seeds per panicle (Table 3).

Table 3. Hybrid maturity means for yield, seed weight, number of seeds per panicle, and number of heads/ha, Hutchinson 1980.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	2235	26.83	700	117622
Medium	2990	17.88	1633	116992
Late	3168	22.18	1504	95633
LSD .05				
Early/Medium	651	1.82	155	21729
Early/Late	630	1.76	150	21011
Medium/Late	598	1.67	142	19964

Table 4. Rate of planting means for seed weight, number of seeds per panicle, and number of heads/ha, Hutchinson 1980.

Rate (pl/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
60997	23.77	1554	87325
102438	21.71	1352	100716
174378	20.52	1038	141979
LSD .05			
60997/102438	1.70	145	20315
60997/174378	1.77	151	21183
102438/174378	1.74	148	20790

The interaction of hybrid maturity x population on yield (Figure 6, Table A-6) shows the yield of the maturities equal at the middle population. Response was dependent upon hybrid maturity at low and high populations. Trends show; late maturity hybrid yield favored the low population; Medium hybrid maturity yield favored the high population; Early hybrid maturity yield was unchanged over populations.

Early maturity seed weight response was reverse to medium and late hybrid maturity response over dates, as apparent from the interaction of date x hybrid maturity on seed weight (Figure 7, Table A-7). Number of seeds per panicle increased (late and medium maturity hybrids) and was uncnanged (early maturity hybrid) over dates of planting (Figure 8, Table A-7).

Number of seeds per panicle was unchanged (early maturity hybrid), and significantly lower at the high population (medium and late maturity hybrids), over increasing population (Figure 9, Table A-6). Number of seeds per panicle increased for each population between the 5 June and 30 June plantings (Figure 10, Table A-8). A date x hybrid maturity x population effect on number of seeds per panicle also was observed (Table A-9).

Rate of planting affected number of heads/ha produced. Generally, more heads resulted from higher populations (Table 4). The interaction of hybrid maturity x population shows, however, more heads produced at the middle and high populations (early maturity), at the high population (medium maturity), and the high and low; low and middle populations equal (late maturity) Figure 11. Table A-6.

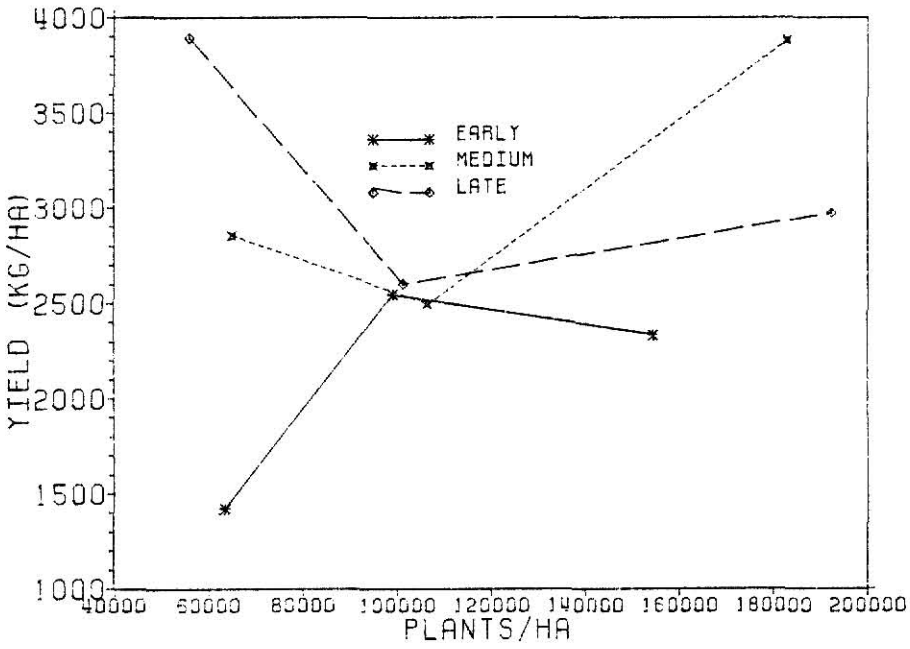

Figure 6. Interaction of Hybrid Maturity x population on yield, Hutchinson 1980.

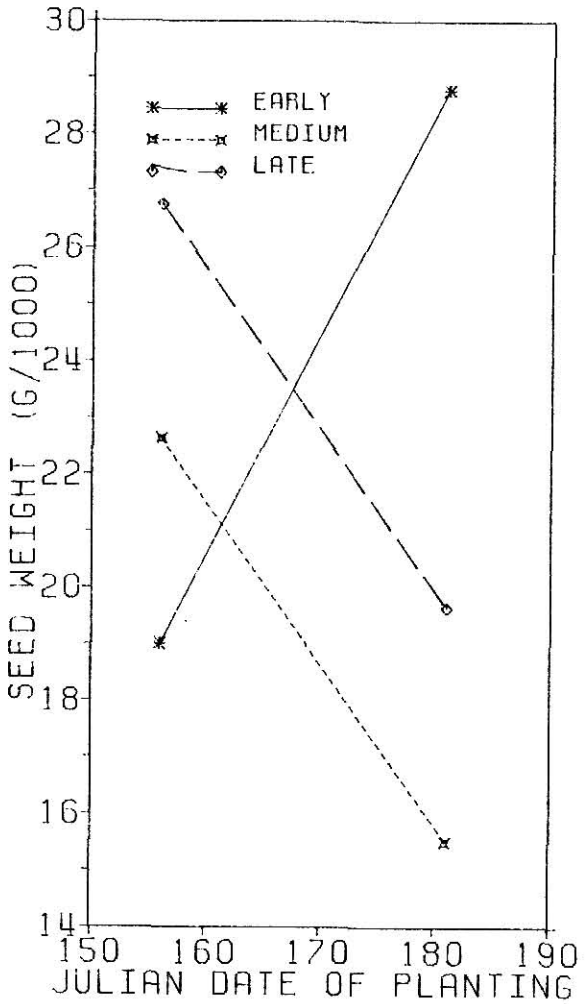

Figure 7. Interaction of Hybrid Maturity x Date of Planting on Seed Weight, Hutchinson 1980.

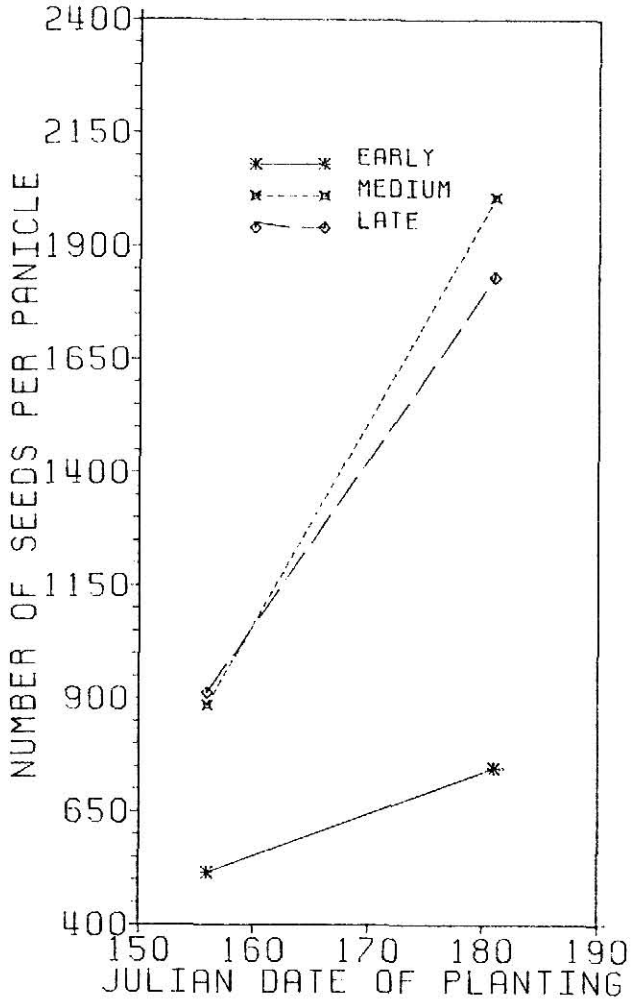

Figure 8. Interaction of Hybrid Maturity x Date of Planting on Number of Seeds per panicle, Hutchinson 1980.

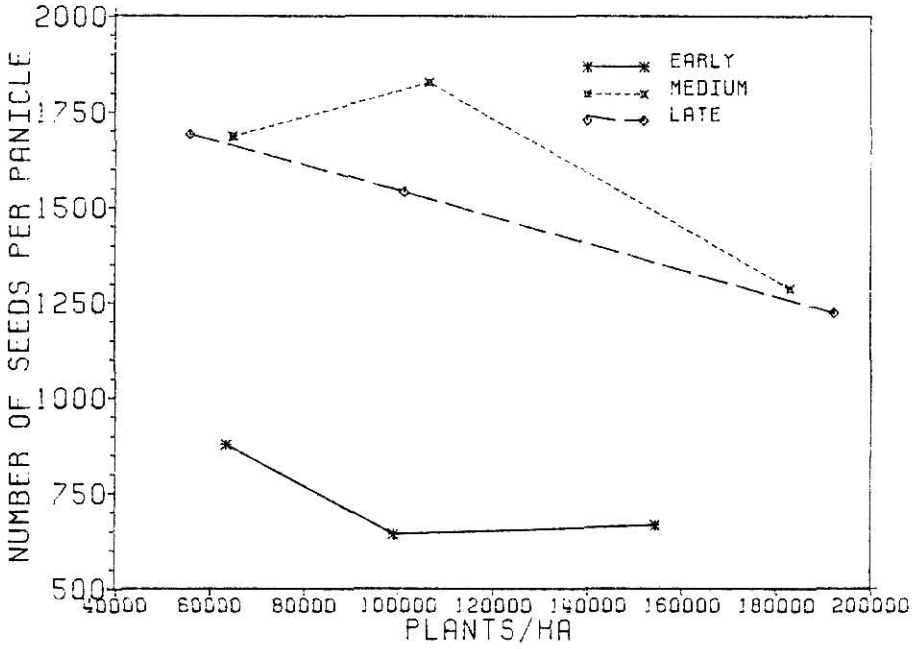

Figure 9. Interaction of Hybrid Maturity x Population on Number of Seeds per panicle, Hutchinson 1980.

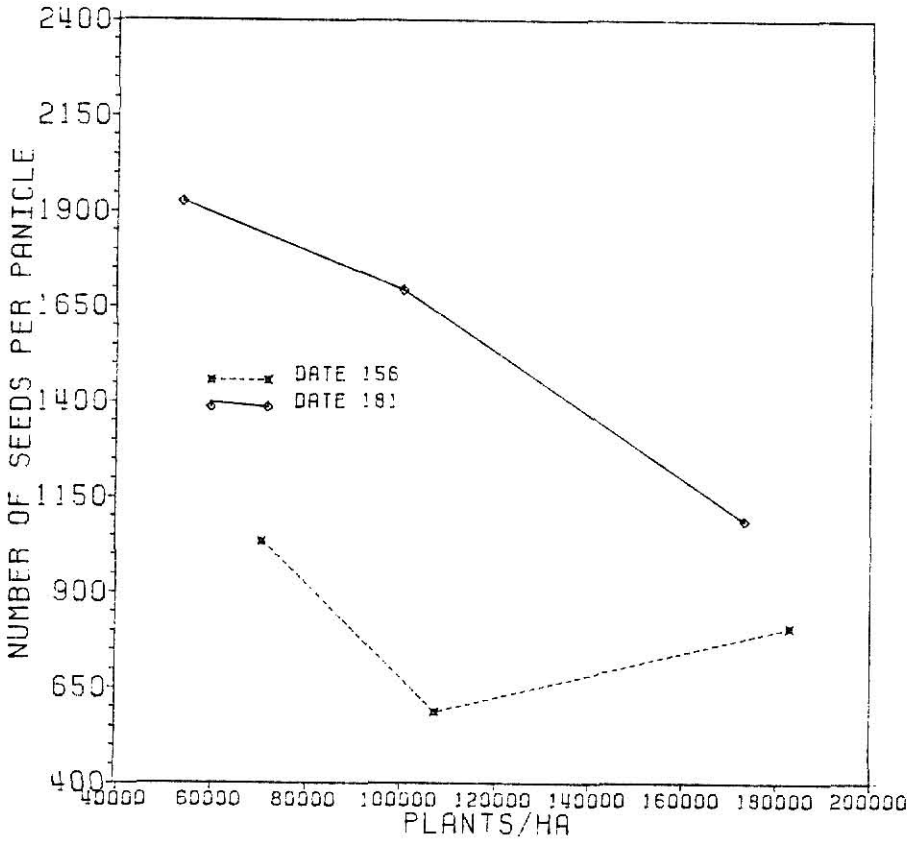

Figure 10. Interaction of Date of Planting x Population on Seeds per panicle, Hutchinson 1980.

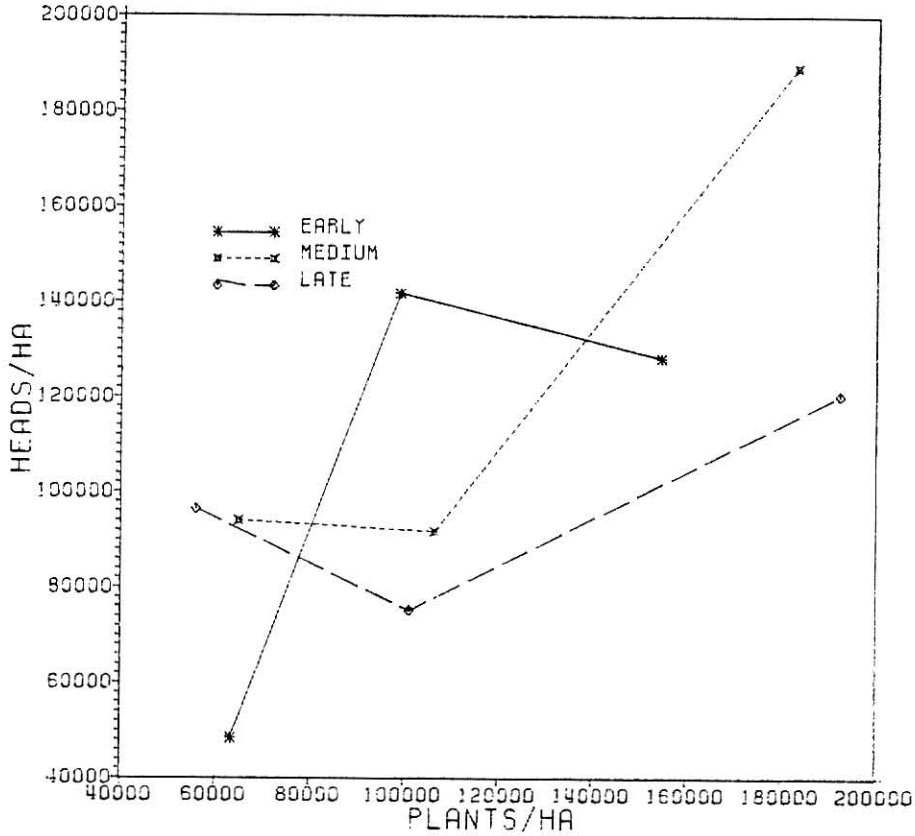

Figure 11. Interaction of Hybrid Maturity x Population on Number of heads/ha, Hutchinson 1980.

Parsons
1981

Grain sorghum yield at Parsons was affected by hybrid maturity, rate of planting, date of planting x hybrid maturity, and date of planting x hybrid maturity x rate of planting (Table A-10).

Medium maturity hybrid yield was significantly greater due to production of more seeds per panicle and heads per hectare (Table 5). The low population yielded significantly less grain as the result of fewer heads per hectare. Middle and high populations produced similar yields (Table 6).

Table 5. Hybrid maturity means for yield, seed weight, number of seeds, and number of heads/ha, Parsons 1981.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	2733	29.00	1184	88441
Medium	3587	20.43	2104	106206
Late	3272	25.32	1696	91933
LSD .05	283	1.30	164	12405

Table 6. Rate means for yield, seed weight, number of seeds, and number of heads/ha, Parsons 1981.

Rate (pl/ha)	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
45927	2676	27.50	2156	56621
91218	3350	24.59	1685	87814
173142	3566	22.67	1144	148146
LSD .05	283	1.30	164	12405

Yield of the medium and late maturity hybrids were equal at the early planting. As the season progressed, late maturity yields came closer to the early maturity hybrid yields. Early planting increased the yield of the late maturity hybrid. Early and late planting favored the medium maturity hybrid yield. Date of planting did not affect early maturity yields (Figure 12, Table A-11).

Favorable population varied among hybrids on a given date. Early hybrid yields were unchanged over populations (early date), but shifted toward higher yields at higher populations on the June and July dates. Medium maturity response was similar, however, low and high; low and middle population yields were equal on the late date of planting. Late maturity hybrid yields increased over populations (early date), were higher for the middle population (June date), and equal for low and high; middle and high populations (late planting), Table A-14.

At the low population, the medium maturity hybrid produced higher yields (July date), medium and late; late and early maturity hybrid yields were equal (June date), and no differences were observed among hybrids (April date). The middle population gave similar yields among hybrids (June and July dates), but varied on the early date of planting. At the high population, late maturity hybrid yield was greater (early date), medium maturity hybrid yields higher (June date), and medium and early; early and late maturity hybrid yields, were equal (late date). Yield of a hybrid maturity over dates of planting (population constant) did not vary except for the late maturity hybrid at the high population, which gave greater yield on the early date of planting (Table A-14).

Seed weight progressively increased (early maturity), and was significantly lower for the early planting (late and medium maturities) over dates of planting. Early maturity seed weights were higher (early and late dates), and equal to the late maturity (June date), Figure 13, Table A-11.

Seeds per panicle were unchanged (early hybrid), greater for the early planting (medium maturity hybrid), and progressively decreased over dates (late hybrid), Figure 14, Table A-11. Number of seeds per panicle progressively decreased (low population), and did not vary (middle and high populations) over dates of planting, early to late. Increasing population decreased number of seeds per panicle (Figure 15, Table A-13).

The early maturity produced an equal number of seeds per panicle for low and middle; middle and high populations. Medium maturity panicle size decreased progressively as population increased. Late maturity hybrid panicles were larger at the low and middle populations, decreasing in size at the high population (Figure 16, Table A-12).

The interactions of hybrid maturity x rate of planting (Figure 18, Table A-12) and date of planting x rate of planting (Figure 17, Table A-13) on number of heads per hectare show that heads per hectare increased as population increased. The medium maturity hybrid produced more heads per hectare at the high population, no differences occurred at the middle and low populations. Early planting resulted in more heads at the middle and high populations, with no difference at the low population over dates of planting.

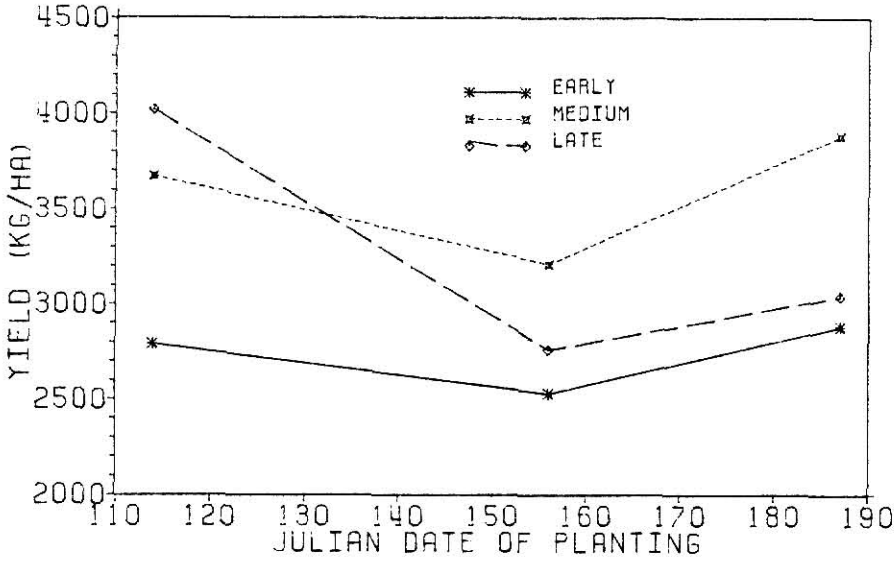

Figure 12. Interaction of Date x Hybrid Maturity on yield, Parsons 1981.

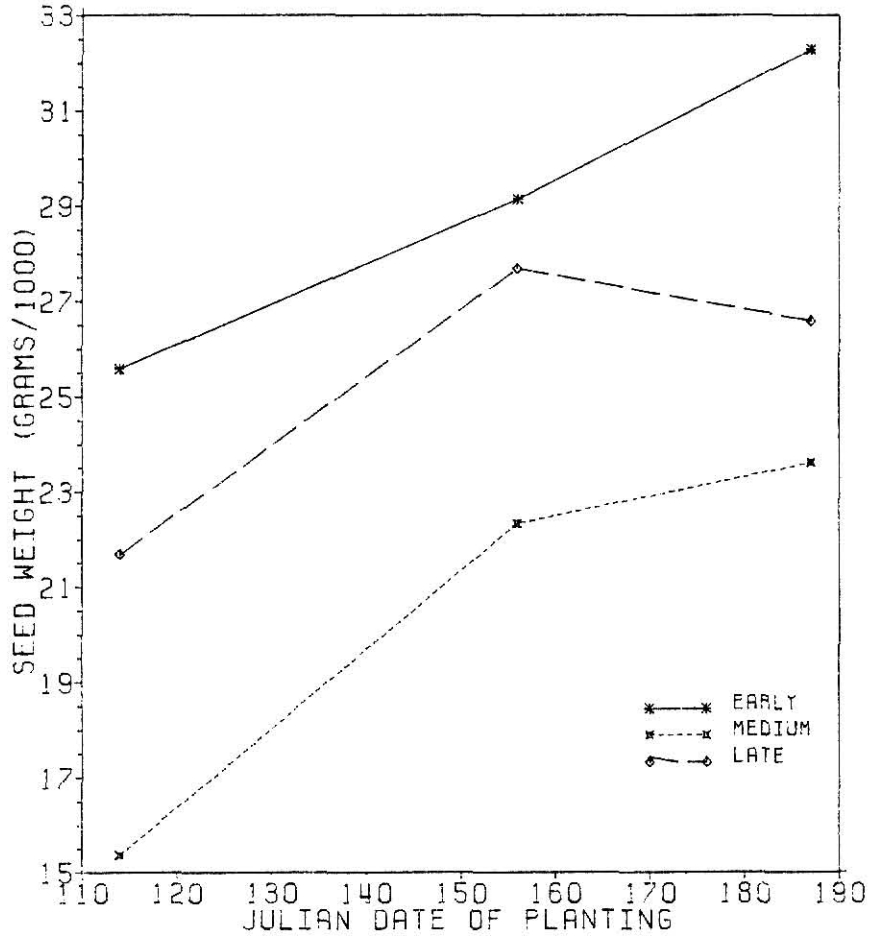

Figure 13. Interaction of Date x Hybrid Maturity on seed weight, Parsons 1981.

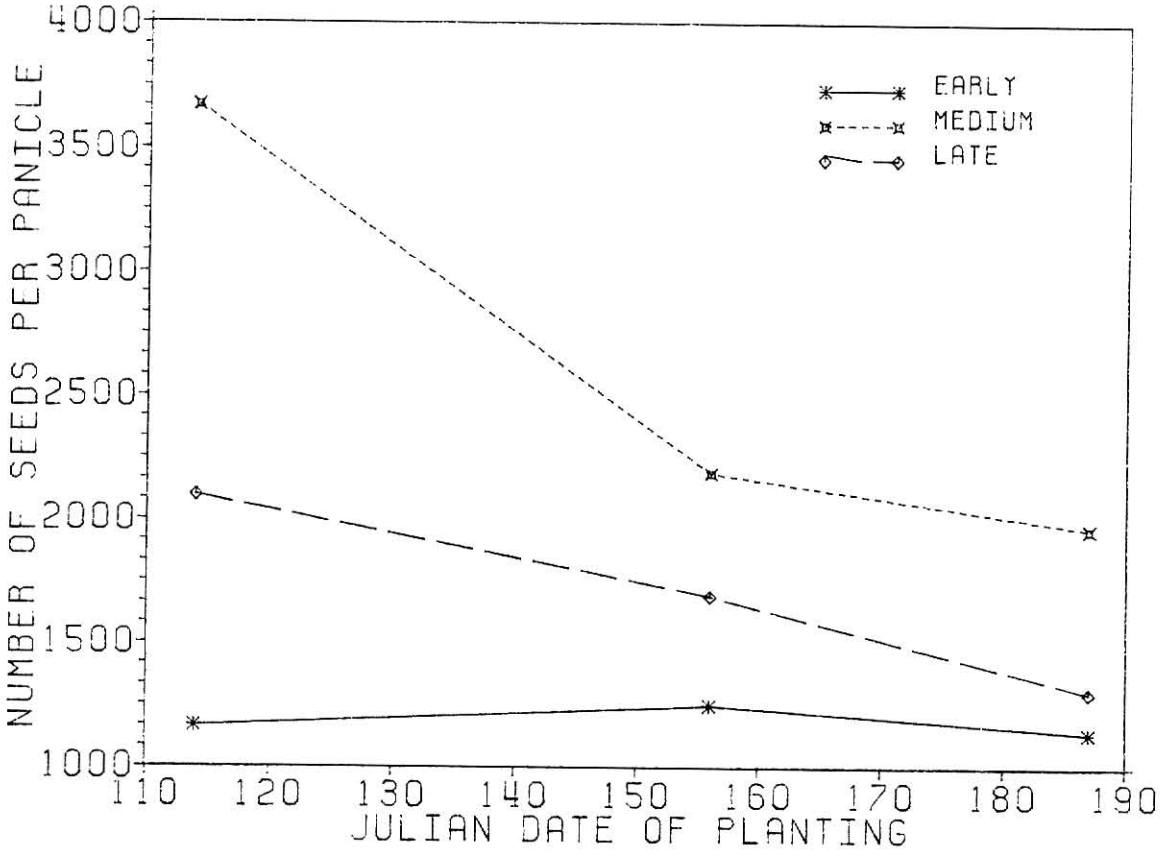

Figure 14. Interaction of Date x Hybrid Maturity on number of seeds per panicle, Parsons 1981.

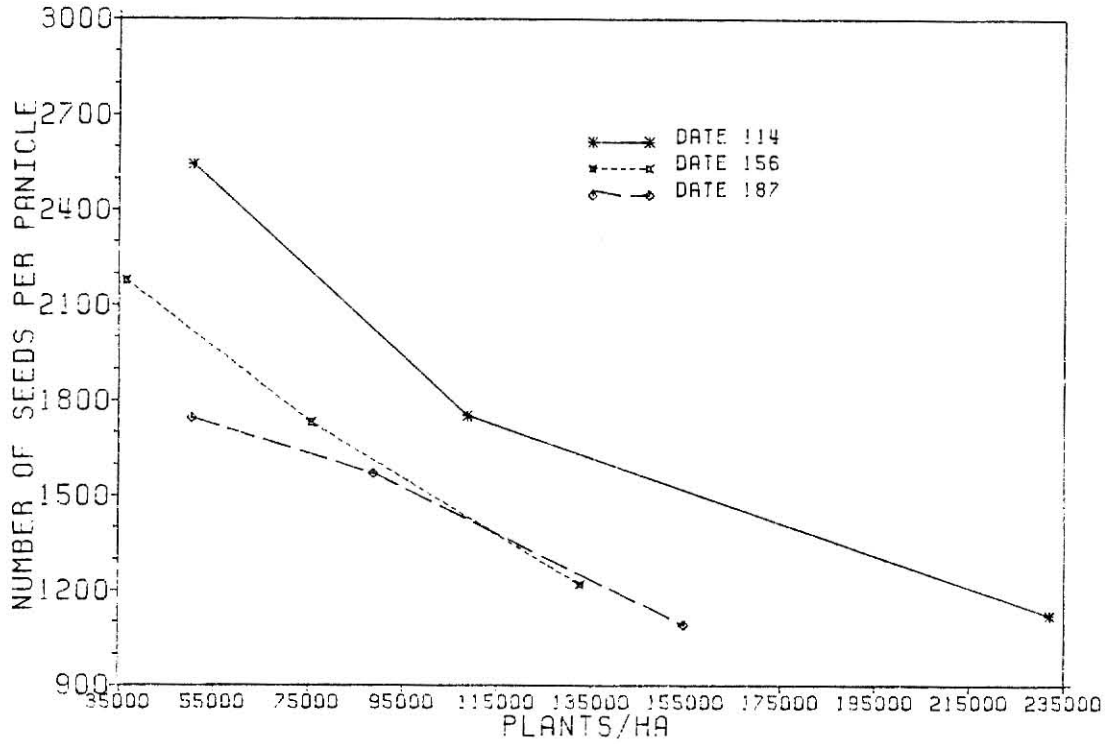

Figure 15. Interaction of Date x Population on number of seeds per panicle, Parsons 1981.

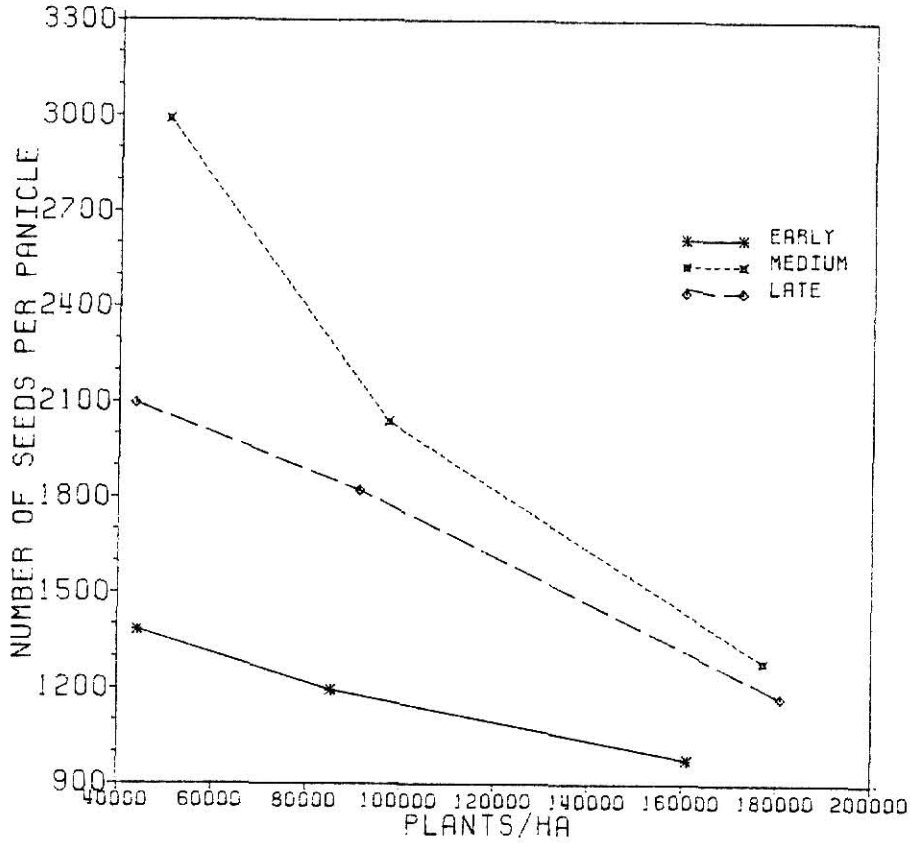

Figure 16. Interaction of Hybrid Maturity x Population on number of seeds per panicle, Parsons 1981.

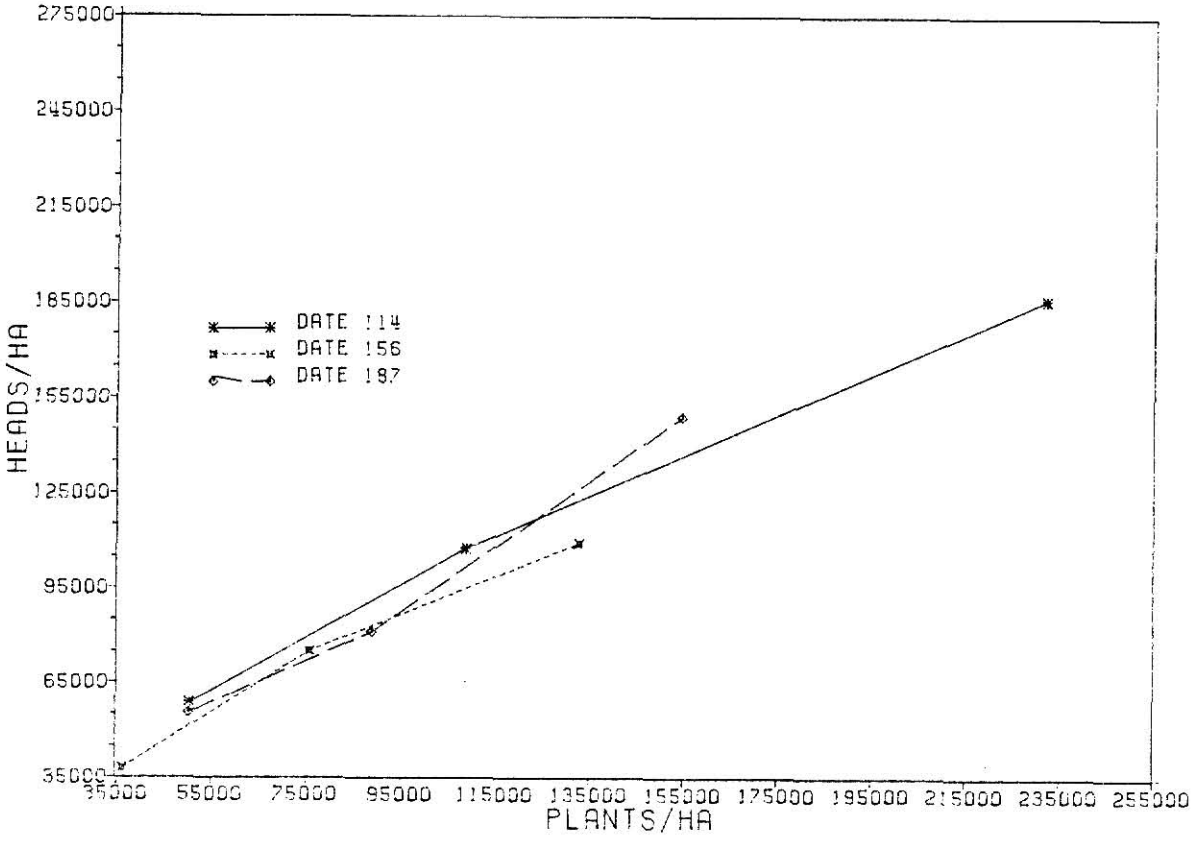

Figure 17. Interaction of Date x Population on number of heads/ha, Parsons 1981.

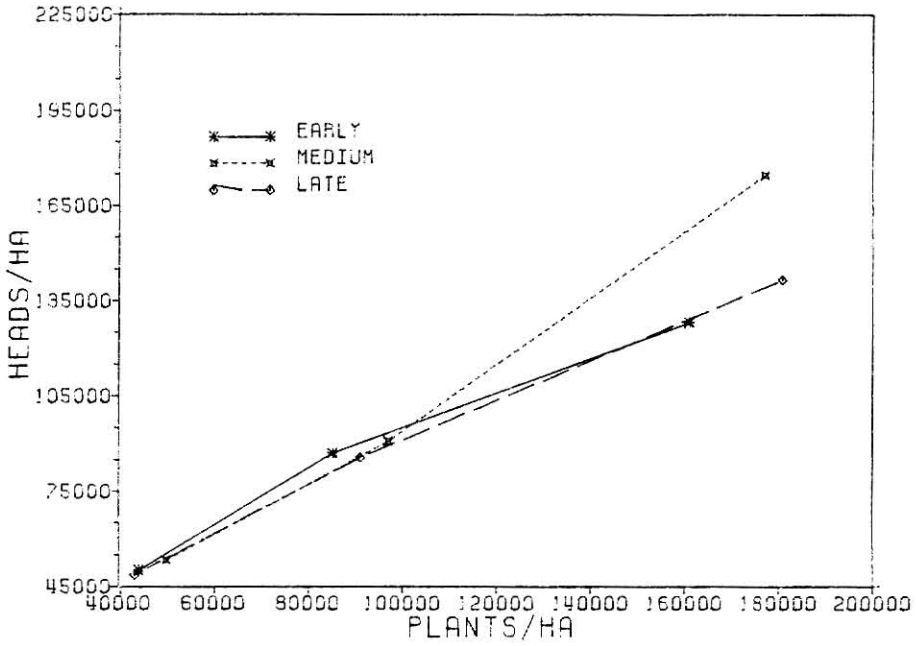

Figure 18. Interaction of Hybrid Maturity x Population on number of heads/ha, Parsons 1981.

Powhattan
1981

Grain sorghum yields at Powhattan were affected by hybrid maturity, and population. No other effects or interactions were observed (Table A-15).

The medium maturity gave greater yields than the late maturity. The early maturity produced the lowest yields (Table 7). As population increased there was a trend toward progressive increase in yield (Table 8).

Medium hybrid maturity yield was greater as a result of more seeds per panicle. The late maturity hybrid produced a similar number of heads/ha (as the medium maturity), and larger seeds, but smaller panicles. Early maturity hybrid yield was lower due to fewer seeds and heads (Table 7).

Larger seeds were produced by the low and middle populations, and number of seeds per panicle decreased with increasing population, however, the increase in number of heads/ha as population increased resulted in the higher yields of the high populations (Table 8).

Table 7. Hybrid maturity means for yield, seed weight, number of seeds per panicle, and number of heads/ha, Powhattan 1981.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	3500	23.29	1607	99123
Medium	5332	19.73	2624	118046
Late	4913	23.66	2140	109445
LSD .05				
Early/Medium	433	1.34	190	12884
Early/Late	436	1.35	191	12955
Medium/Late	385	1.19	169	11457

Table 8. Rate means for yield, seed weight, number of seeds, and number of heads/ha, Powhattan 1981.

Rate (pl/ha)*	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
49411	3956	22.75	2622	69742
96426	4891	22.40	2313	99644
205710	5287	21.09	1678	158726
LSD .05				
49411/96426	413	1.28	181	12266
49411/205710	413	1.28	181	12266
96426/205710	406	1.26	178	12066

*Based on stand counts taken for date 161, stand counts for dates 121, 177, and 188 could not be taken.

Two interactions on yield components were observed. The hybrid maturity x population interaction on number of seeds per panicle (Figure 19, Table A-16) shows a downward trend of panicle size as population increased, and this rate of change being dependent upon hybrid maturity.

The interaction of date of planting x population on number of heads/ha (Figure 20, Table A-17) reveals a similar trend over populations for the 1 May, 10 June, and 7 July plantings, and the differing trend of date 177 (June 26) between the middle and high populations.

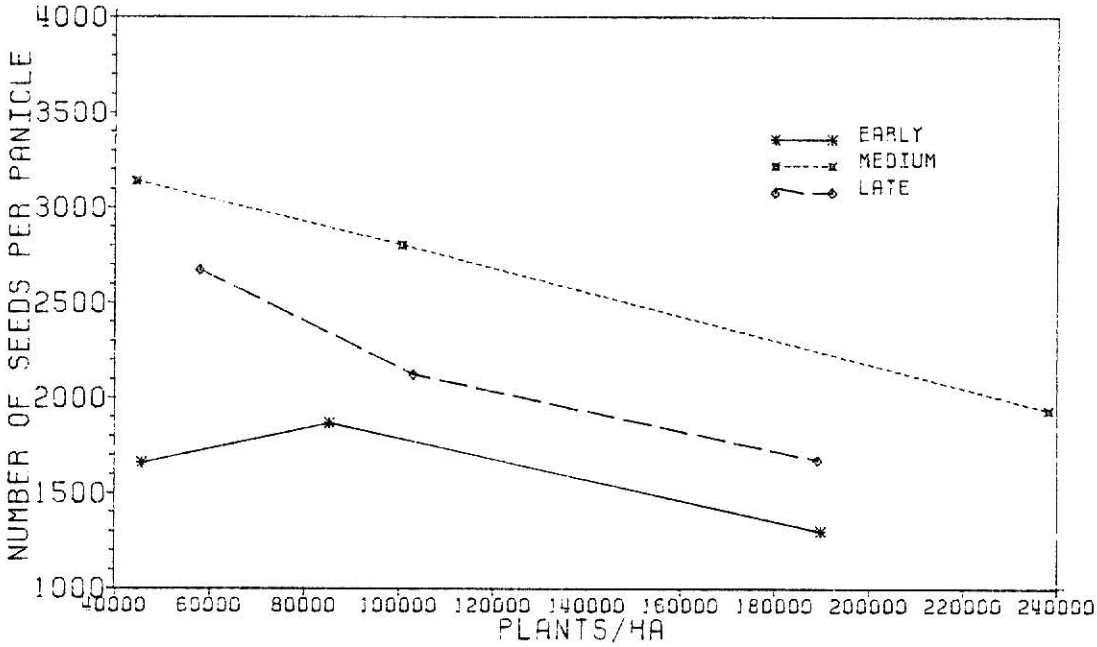

Figure 19. Interaction of Hybrid Maturity x Population on number of seeds per panicle, Powhattan 1981.

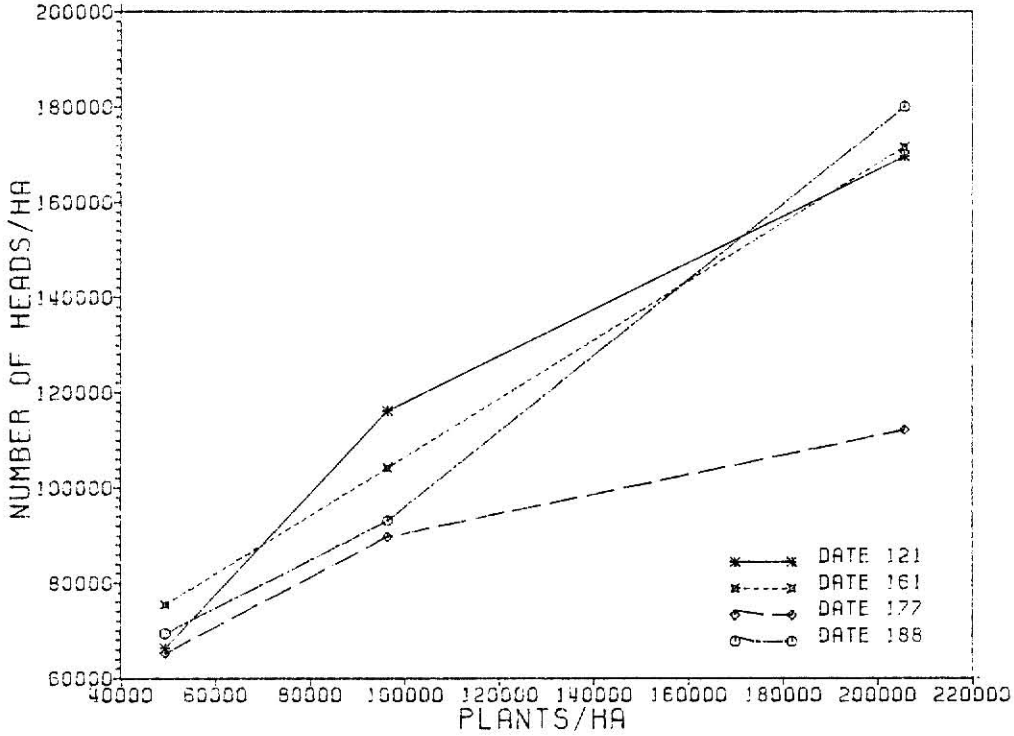

Figure 20. Interaction of Date x Population on number of heads/ha, Powhattan 1981.

St. John
1981

Yield of grain sorghum at St. John was affected by hybrid maturity. No other effects or interactions were significant on yield. (Table A-18).

Medium and late maturity yields were similar. Early maturity hybrid yield was significantly lower (Table 9).

Table 9. Hybrid means for yield, seed weight, number of seeds per panicle, and number of heads/ha, St. John 1981.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	3020	26.65	2183	54538
Medium	4402	21.59	3191	73876
Late	4149	23.96	2476	74312
LSD .05	466	0.99	329	10907

Table 10. Rate means for seed weight, number of seeds per panicle, and heads/ha, St. John 1981.

Rate (pl/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
26392	25.47	3222	47139
55814	23.89	2502	66605
90937	22.83	2126	88983
LSD .05	0.99	329	10907

Greater number of seeds per panicle resulted in the higher yield level of the medium maturity hybrid. Whereas the late maturity hybrid produced similar yields through larger seeds (Table 9). Number of heads/ha did not differ between medium and late maturity hybrids. The early maturity hybrid produced the largest seeds, but fewer seeds and heads, resulting in lower yields.

Seed size and number of seeds per panicle decreased as population increased, however, the production of more heads as rate increased led to no effect of population on yield (Table 10).

Although no interactions were observed to effect yield, several interactions were found among yield components. The interaction of date x hybrid on seed weight (Figure 21, Table A-19) shows the differential rate of seed weight decrease over dates for hybrid maturities.

The interaction of date x rate on seed weight (Figure 22, Table A-20) illustrates the varied rate response for dates of planting. The greatest rate of change in seed weight, over increasing population, occurring on date 167, the date of maximum yield for this study. Seed weights of the July planting were significantly lower.

The date of planting x hybrid maturity interaction on number of seeds per panicle (Figure 23, Table A-19) shows hybrid maturity response over dates. Readily apparent is the response of these hybrids to the change toward favorable conditions between dates 141 and 167.

Finally, the hybrid maturity x rate of planting interaction (Figure 24, Table A-21) on number of seeds per panicle, illustrate a typical decrease in number of seeds per panicle as population is increased. The greatest rate of change occurring in the medium maturity, which generally produced more seeds per panicle.

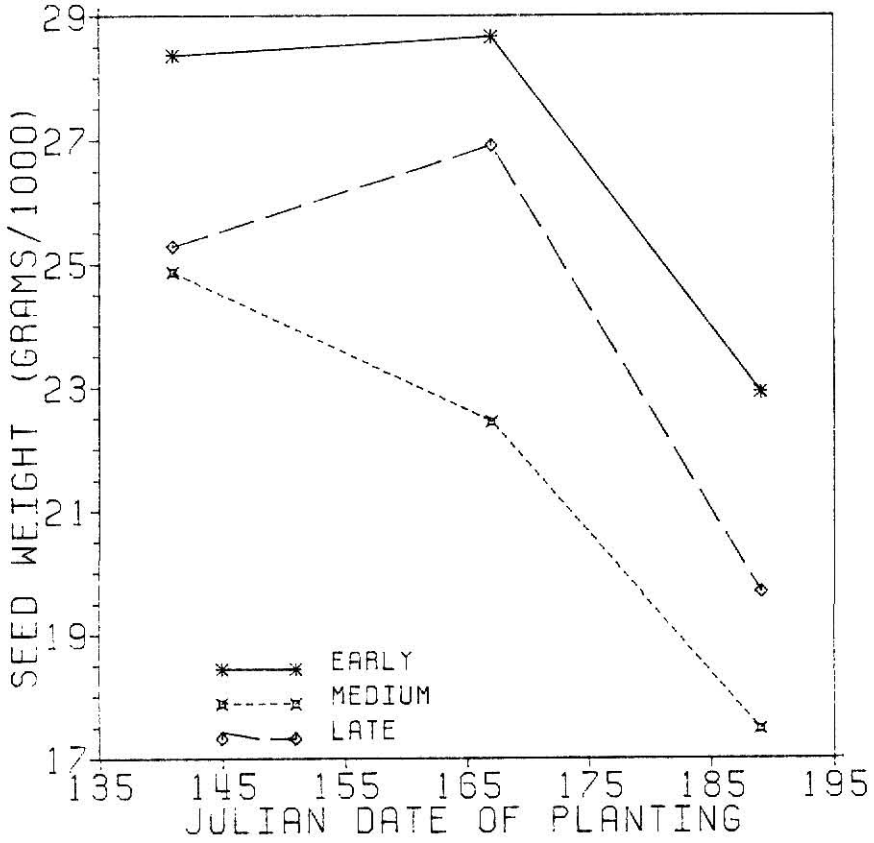

Figure 21. Interaction of date and hybrid on seed weight, St. John 1981.

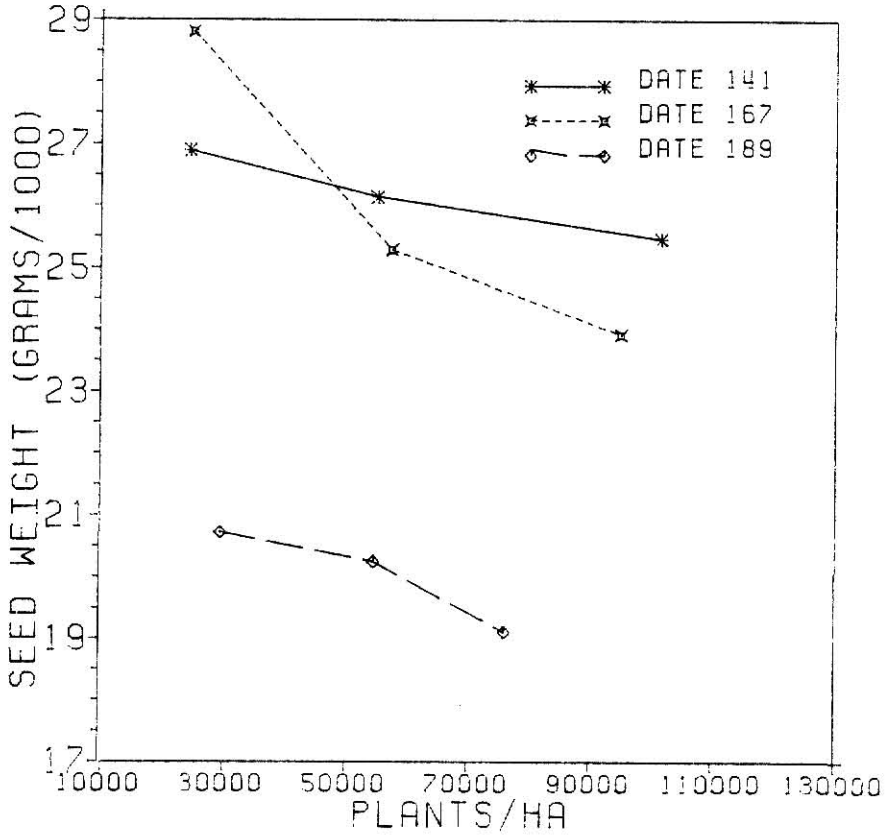

Figure 22. Interaction of date and population on seed weight, St. John 1981.

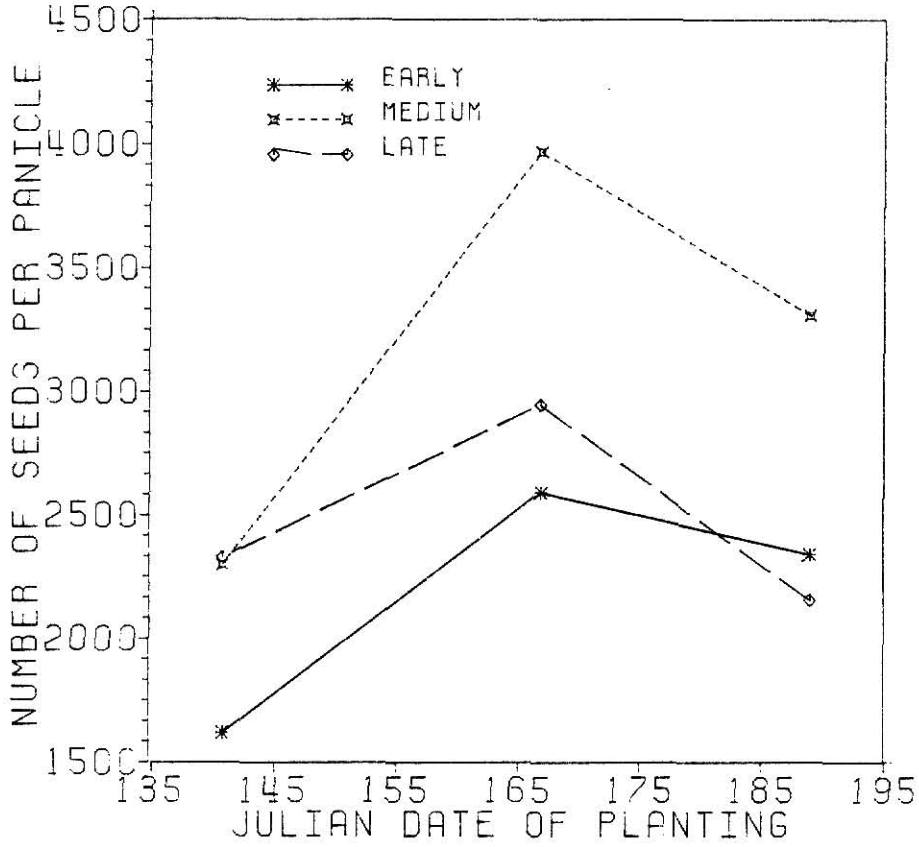

Figure 23. Interaction of date and hybrid on the number of seeds per panicle, St. John 1981.

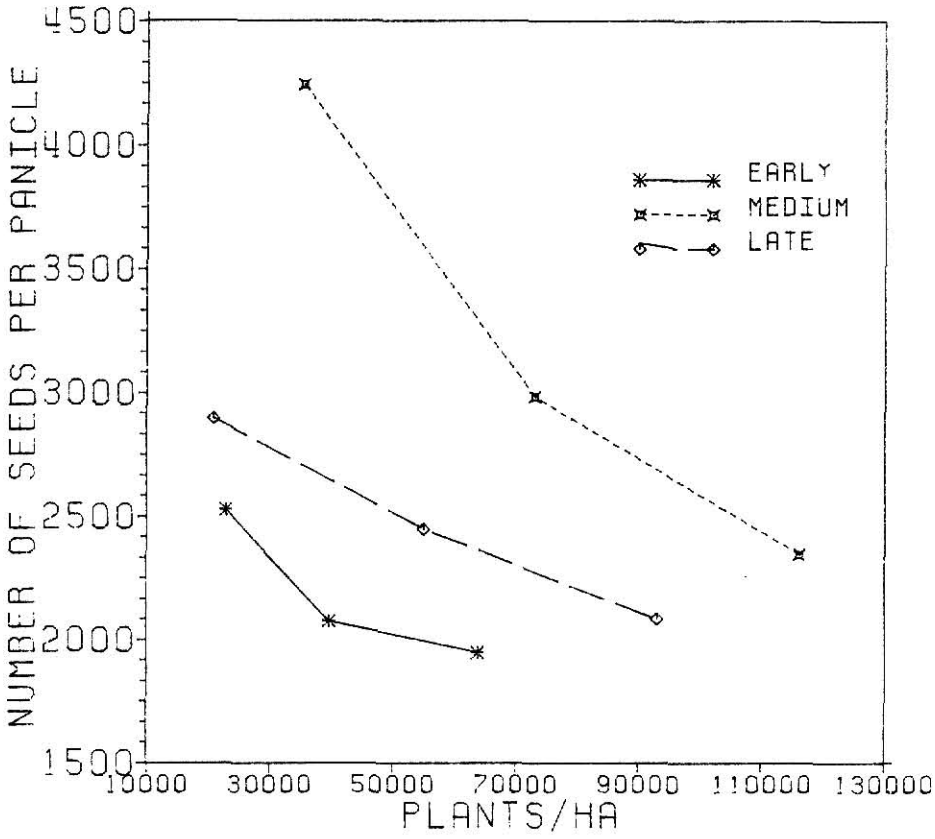

Figure 24. Interaction of hybrid and population on number of seeds per panicle, St. John 1981.

Minneola
1981

Sorghum yields at Minneola were affected by hybrid maturity. No other effects or interactions on yield were found significant (Table A-22).

Medium and late maturity yields were similar. Early maturity hybrid yield was significantly lower. Number of seeds per panicle determined hybrid maturity yields. The medium and late maturity hybrids had similar sized panicles and seeds. The early maturity hybrid produced large seeds but small panicles (Table 11).

Table 11. Hybrid maturity means for yield, seed weight, number of seeds per panicle, Minneola 1981.

Hybrid Maturity	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle
Early	4791	27.49	1908
Medium	5678	22.09	2968
Late	5536	22.35	2695
LSD .05	490	0.71	349

Table 12. Rate means for seed weight, number of seeds per panicle, and number of heads, Minneola 1981.

Rate (pl/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
22684	24.82	2882	83642
43615	23.79	2526	92672
77661	23.32	2162	113488
LSD .05	0.71	349	9197

Seed weight and number of seeds decreased with increasing population, however, the number of heads increased with a net result of no population effect on yield (Table 12).

The interaction of date x rate (Figure 25, Table A-24) and date x hybrid (Figure 26, Table A-23) on seed weight show a date dependent rate of decrease in seed weight, as population was increased and a hybrid dependent rate of seed weight decrease over dates of planting. The interaction of date of planting x hybrid maturity on number of seeds per panicle (Figure 27, Table A-23) shows the increase in panicle size between May and June dates of planting for the medium and late maturity hybrids. The early maturity hybrid showed no change over dates in number of seeds per panicle.

The interactions of date x rate (Figure 28, Table A-24), hybrid x rate (Figure 29, Table A-25), and date x rate x hybrid (Table A-26) on number of heads per hectare, all show that the increase in number of heads with increasing population is dependent upon hybrid maturity and date of planting. The interaction of date x hybrid on number of heads/ha (Figure 30, Table A-23) point out a reduction in number of heads on the June date of planting. This reduction being dependent upon hybrid maturity.

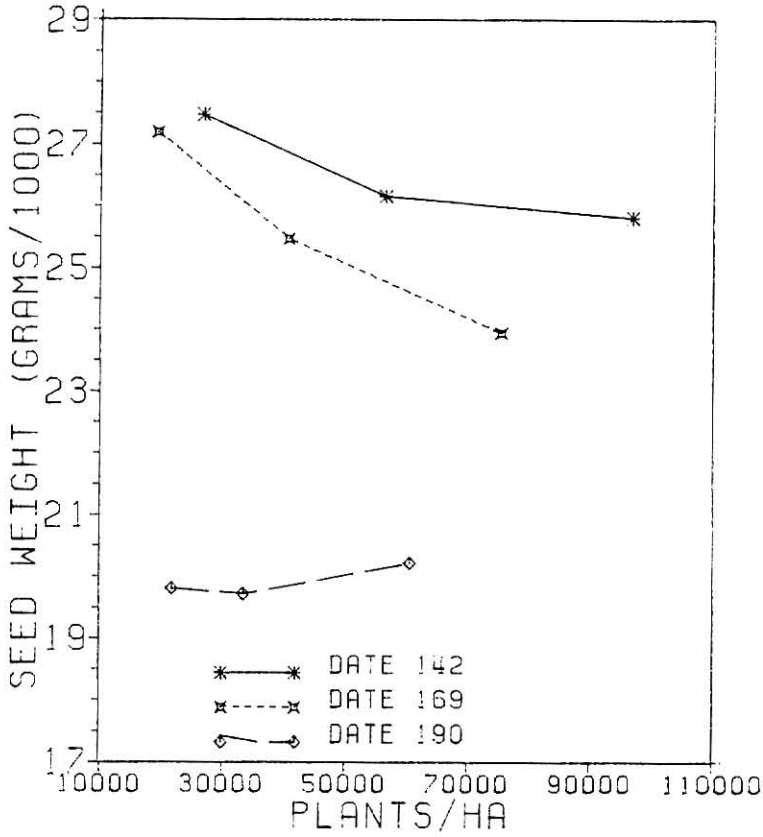

Figure 25. Interaction of Date x population on seed wt., Minneola 1981.

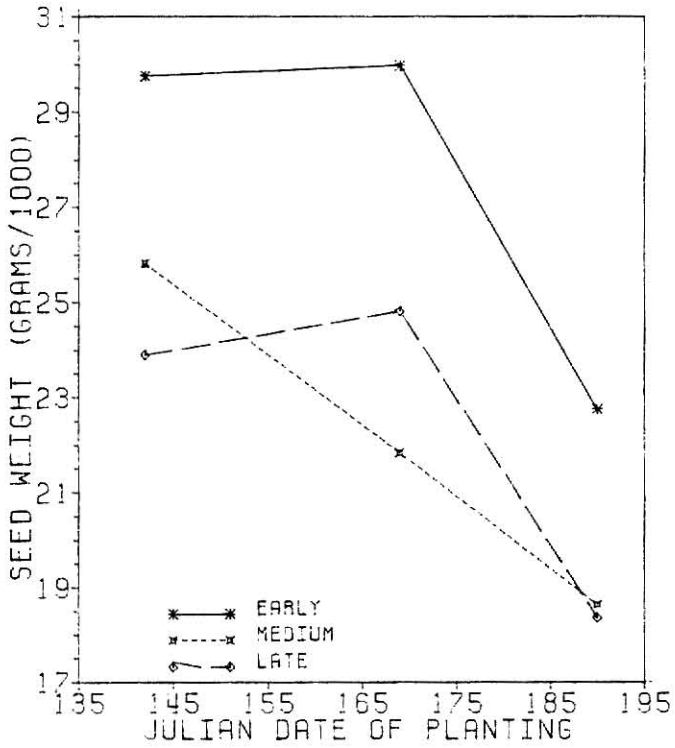

Figure 26. Interaction of Date and Hybrid on seed weight, Minneola 1981.

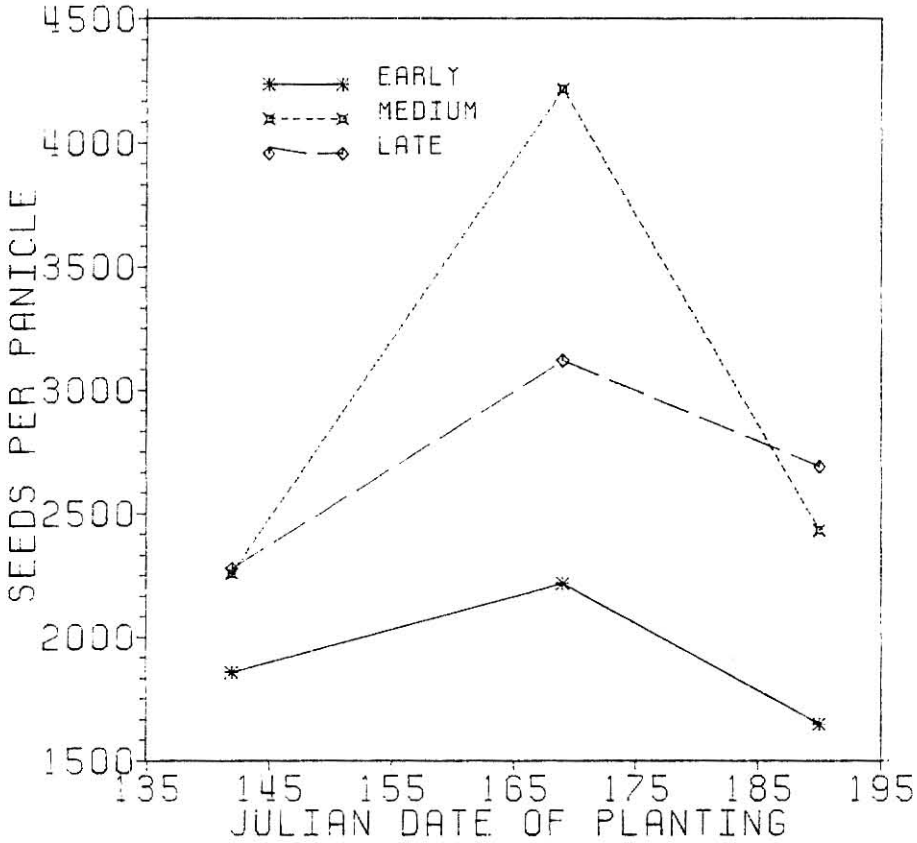

Figure 27. Interaction of Date x Maturity on seeds/panicle, Minneola 1981.

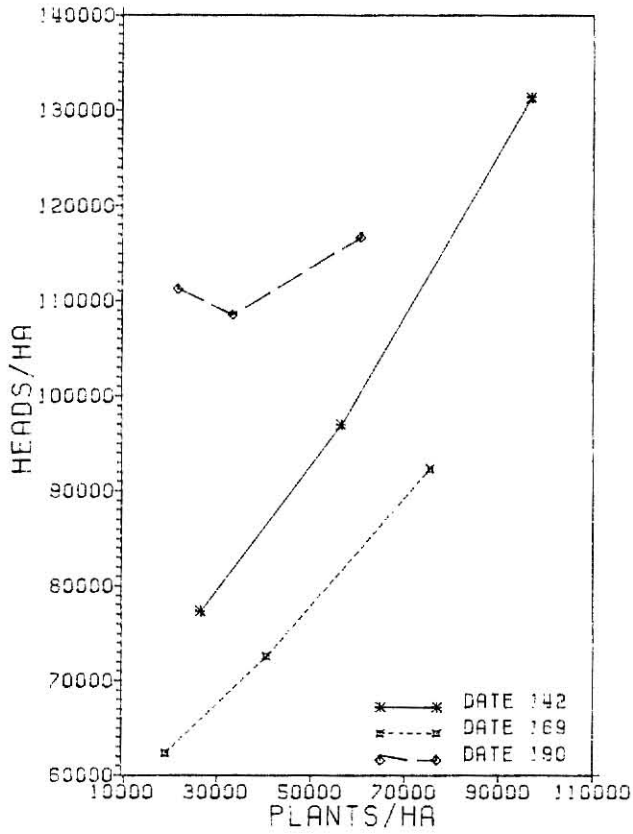

Figure 28. Interaction of Date x population on heads/ha, Minneola 1981.

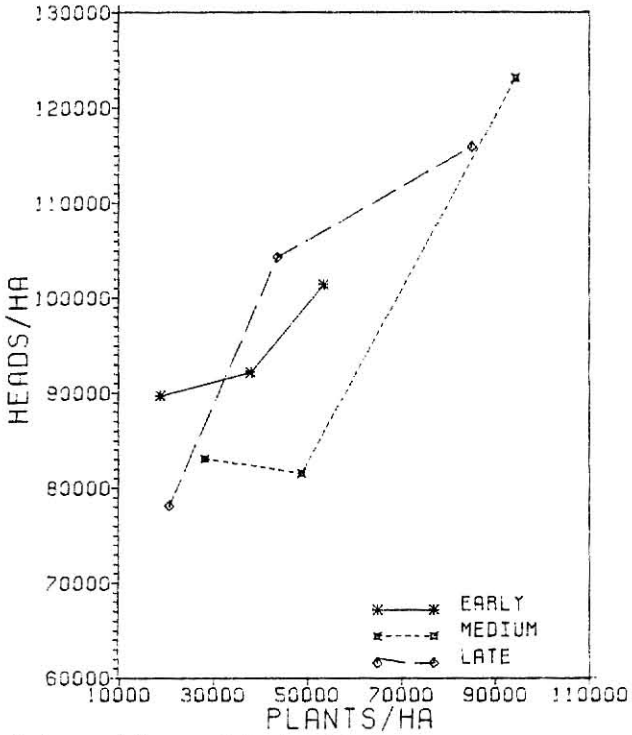

Figure 29. Interaction of Maturity x population on heads/ha, Minneola 1981.

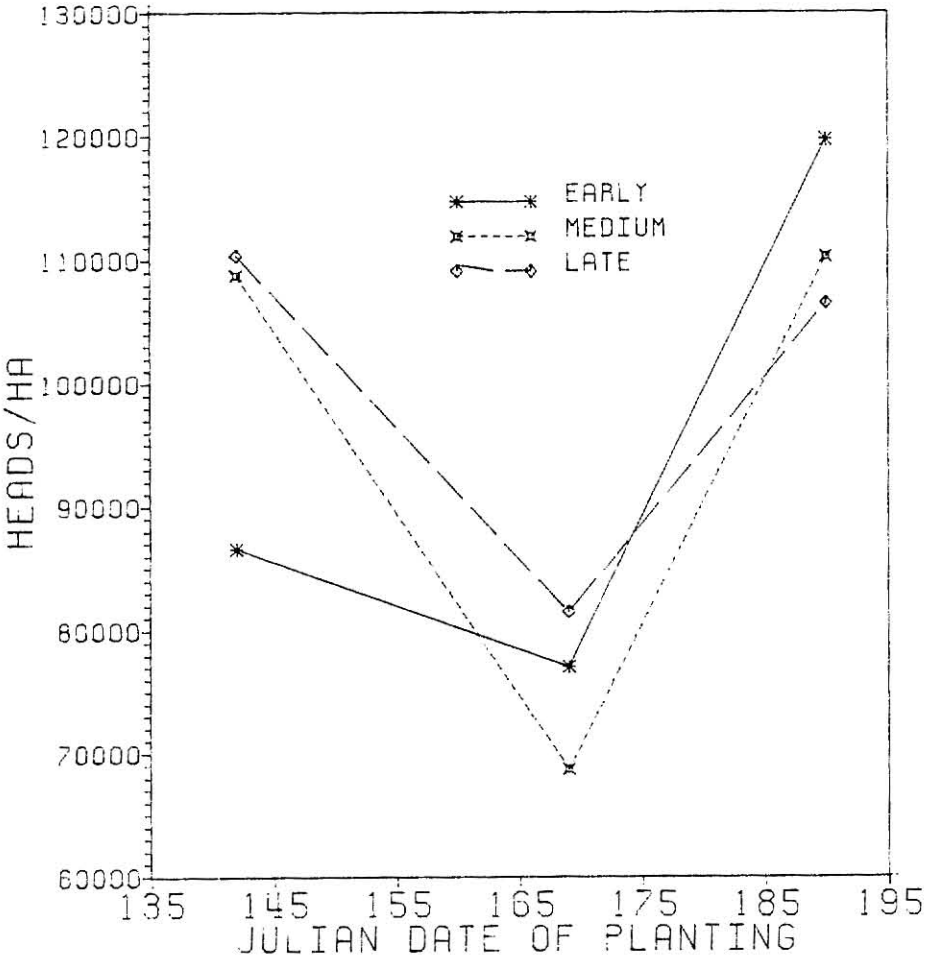

Figure 30. Interaction of Date and Hybrid on heads/ha, Minneola 1981.

SORGF MODEL RESULTS

The modeled results (by location) are presented as bar graphs of actual and modeled yields (kg/ha) for each hybrid maturity (early, medium, late), population (low, L; middle, M; high, H) and relative planting date.

The modeled results are:

Manhattan 1980, Figures 31 to 33

Hutchinson 1980, Figures 34 and 35

Parsons 1981, Figures 36 to 38

Powhattan 1981, Figures 39 to 42

St. John 1981, Figures 43 to 45

Minneola 1981, Figures 46 to 48

Previous population, hybrid maturity, and date of planting studies modeled are listed in the appendix as follows:

Manhattan 1976/Praeger study

Table A-27

Manhattan 1977 and 1978/Jaiyesimi studies

Tables A-28 and A-29

Manhattan 1978/Bunck study

Table A-30

Manhattan and Hutchinson 1979/Schaffer study

Tables A-31 and A-32

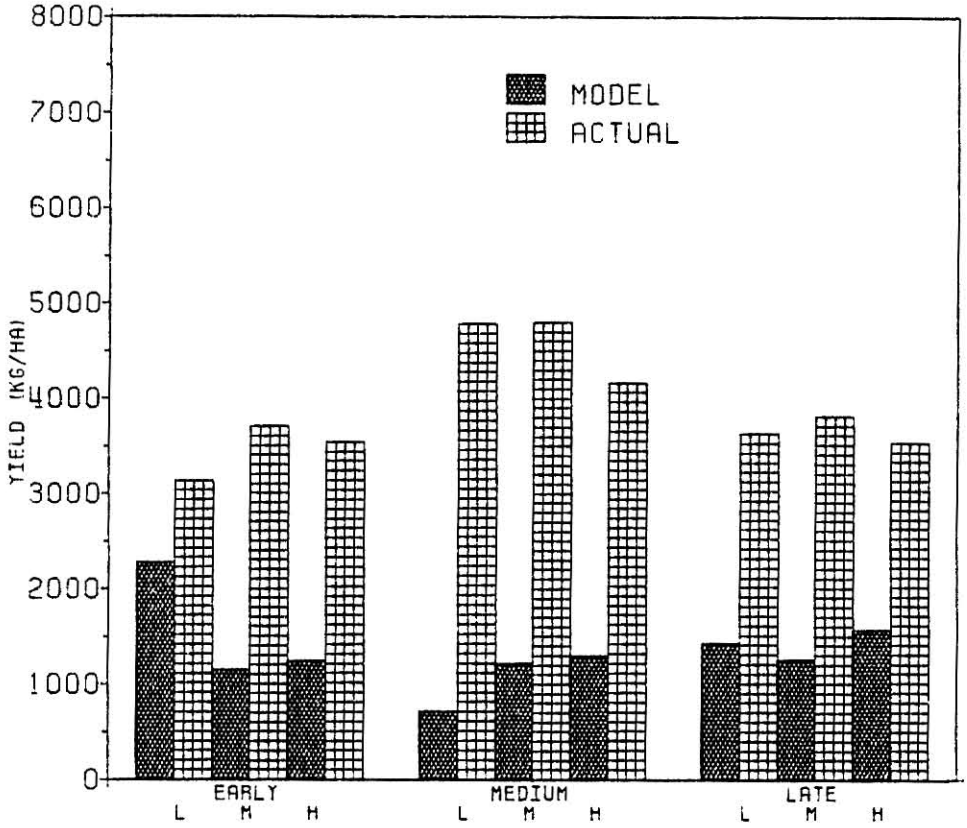

Figure 31. Manhattan Date 1 (May 7) Model and Actual Yields (kg/ha).

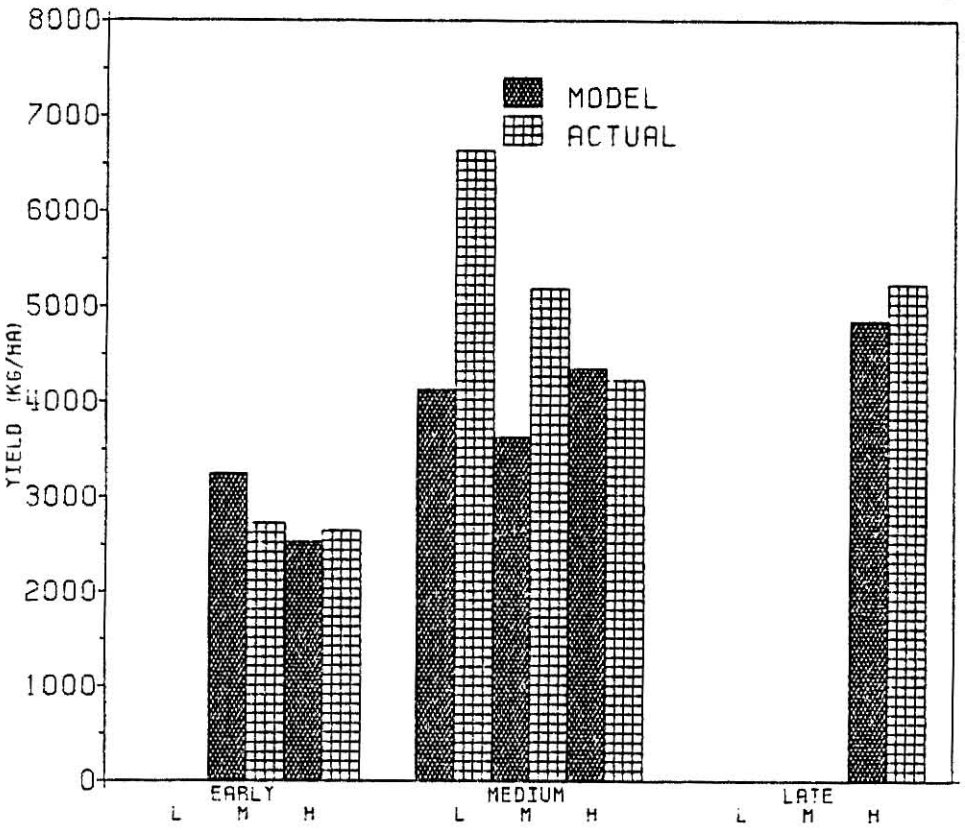

Figure 32. Manhattan Date 2 (June 6) Model and Actual Yields (kg/ha).

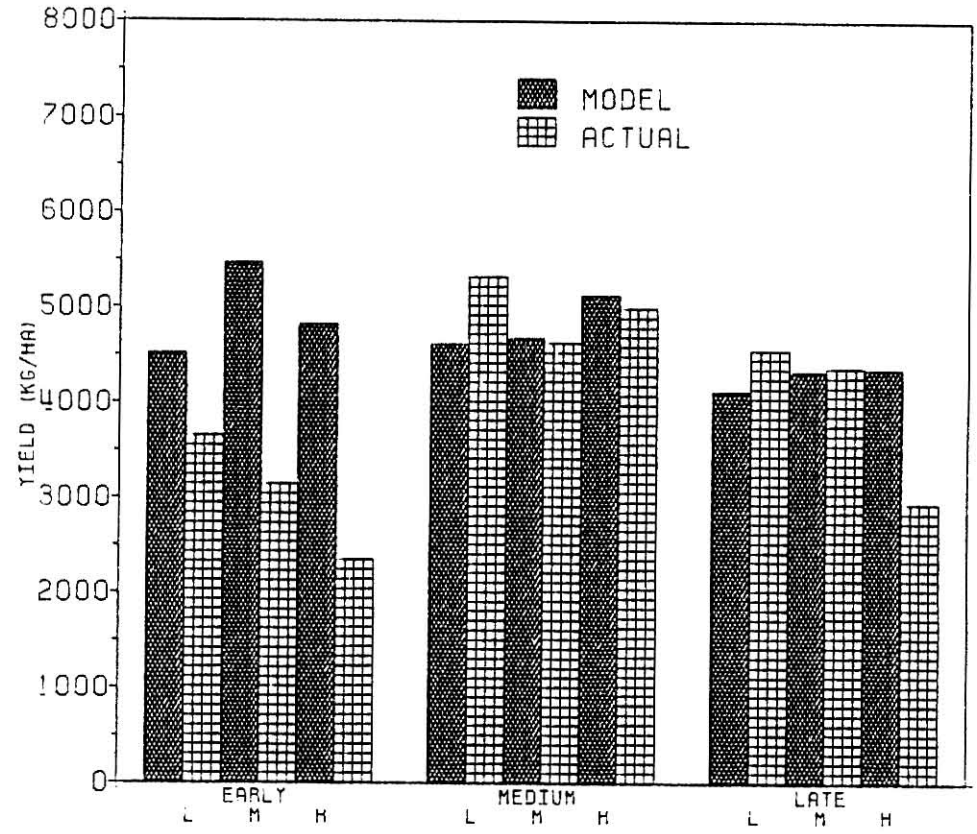

Figure 33. Manhattan Date 3 (June 27) Model and Actual Yields (kg/ha).

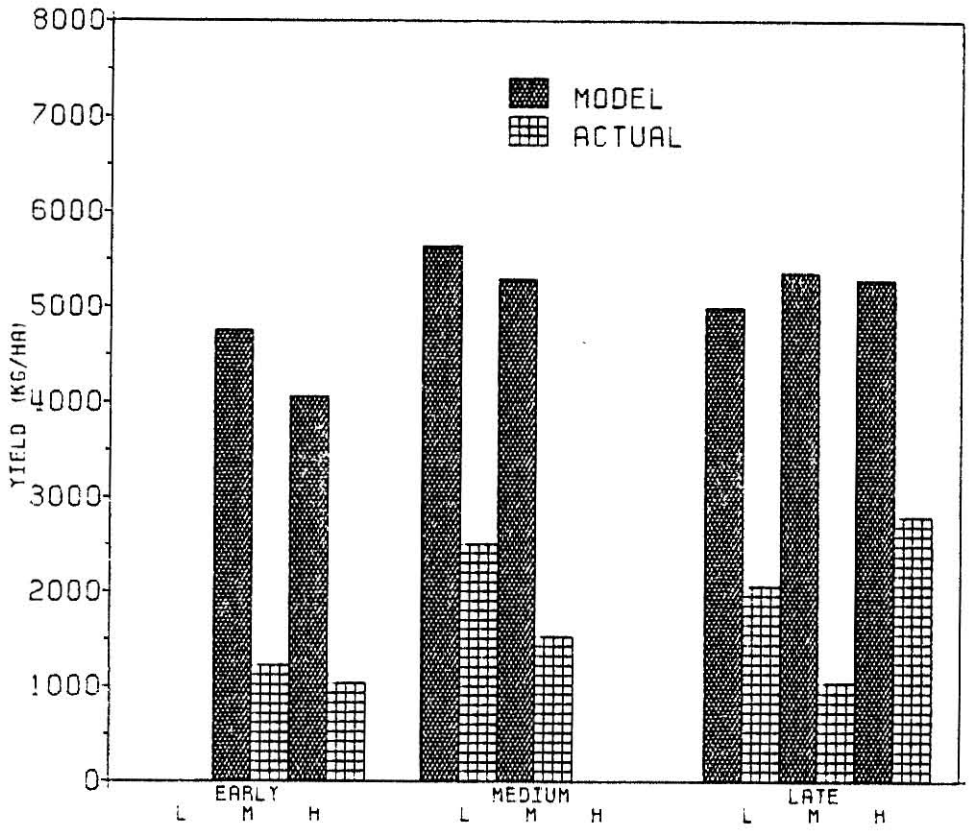

Figure 34. Hutchinson Date 2 (June 5) Model and Actual Yields (kg/ha).

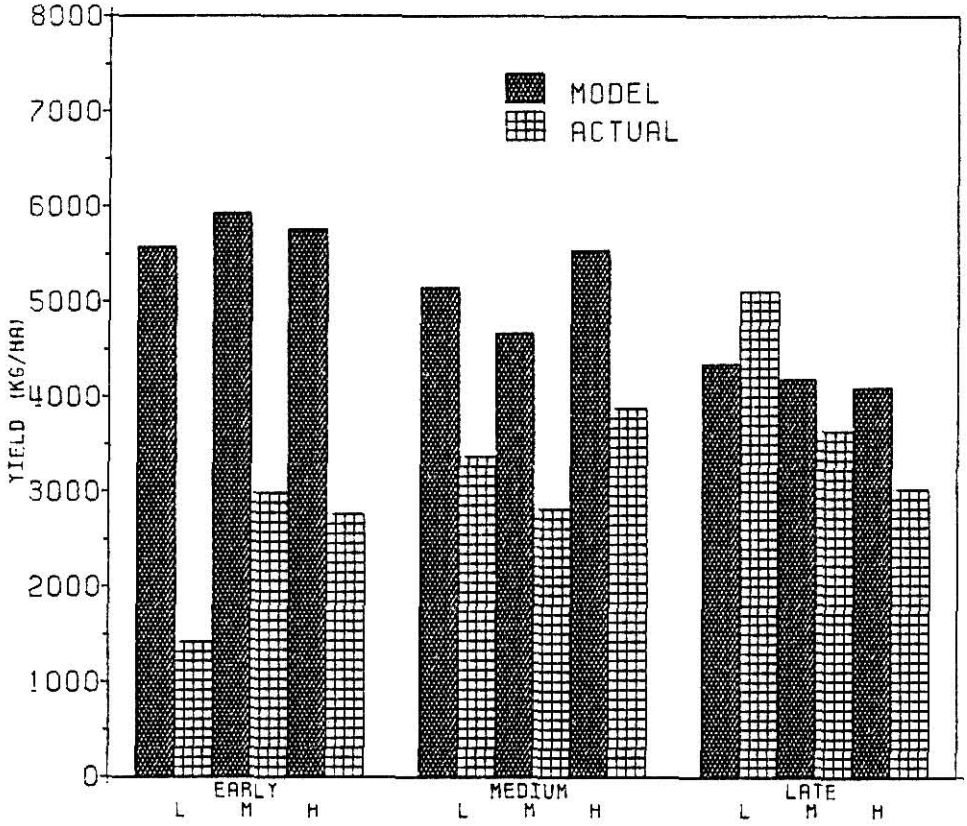

Figure 35. Hutchinson Date 3 (June 30) Model and Actual Yields (kg/ha).

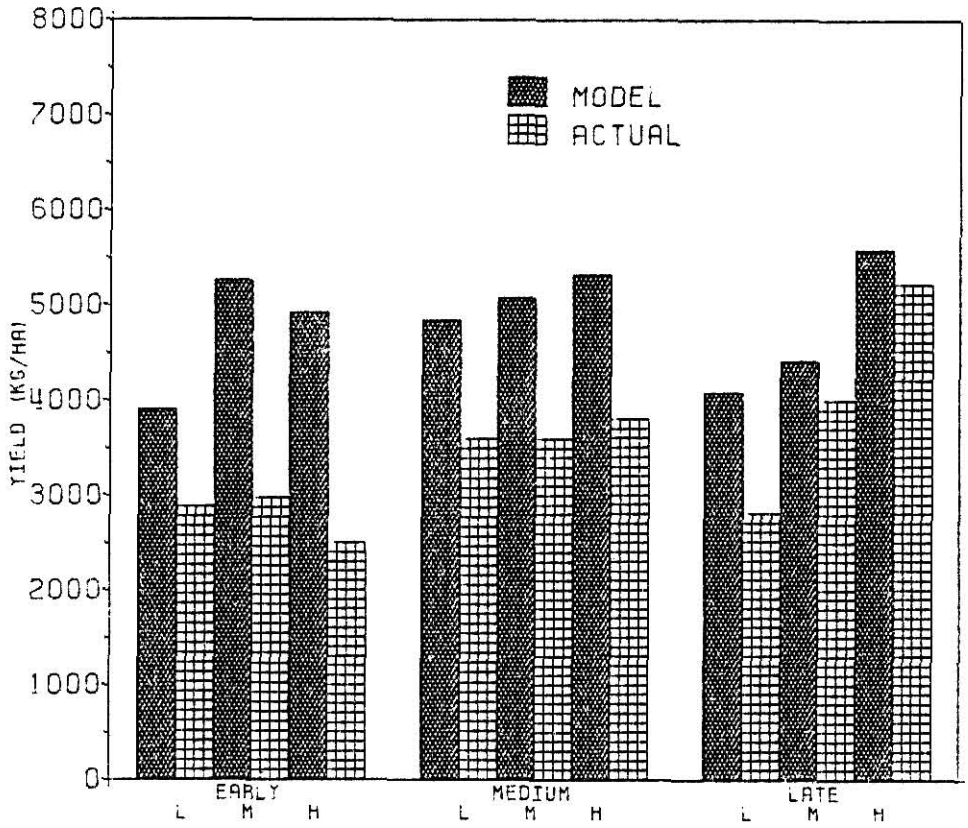

Figure 36. Parsons Date 1 (April 24) Model and Actual Yields (kg/ha).

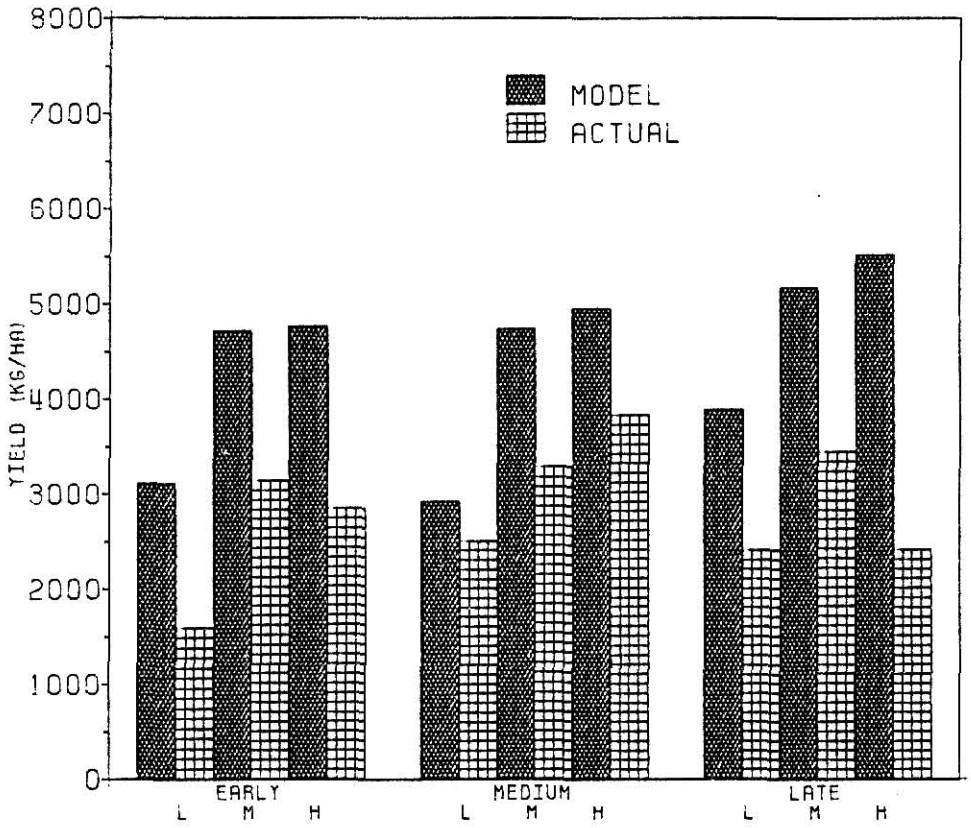

Figure 37. Parsons Date 2 (June 5) Model and Actual Yields (kg/ha).

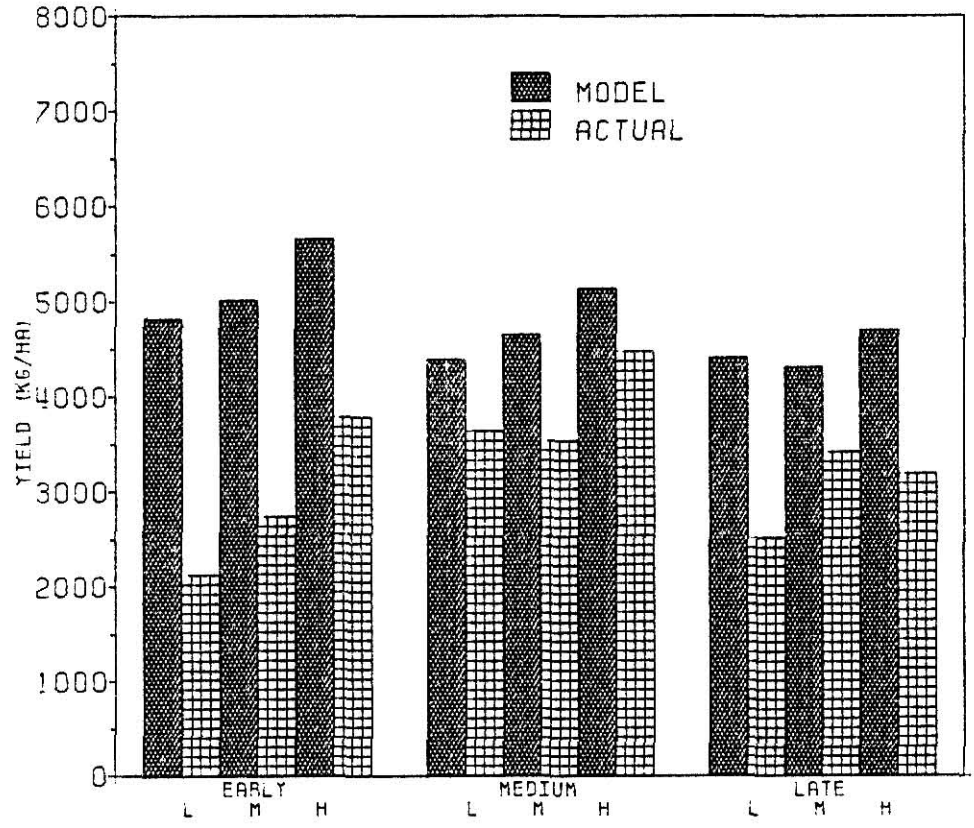

Figure 38. Parsons Date 3 (July 6) Model and Actual Yields (kg/ha).

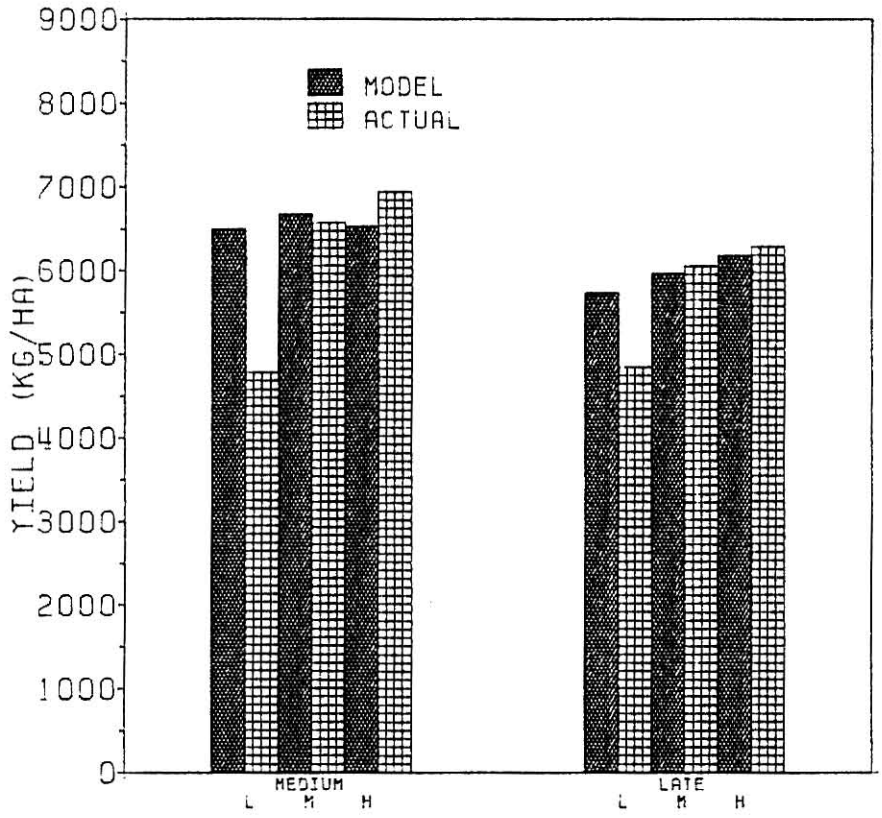

Figure 39. Powhattan Date 1 (May 1) Model and actual yields (kg/ha).

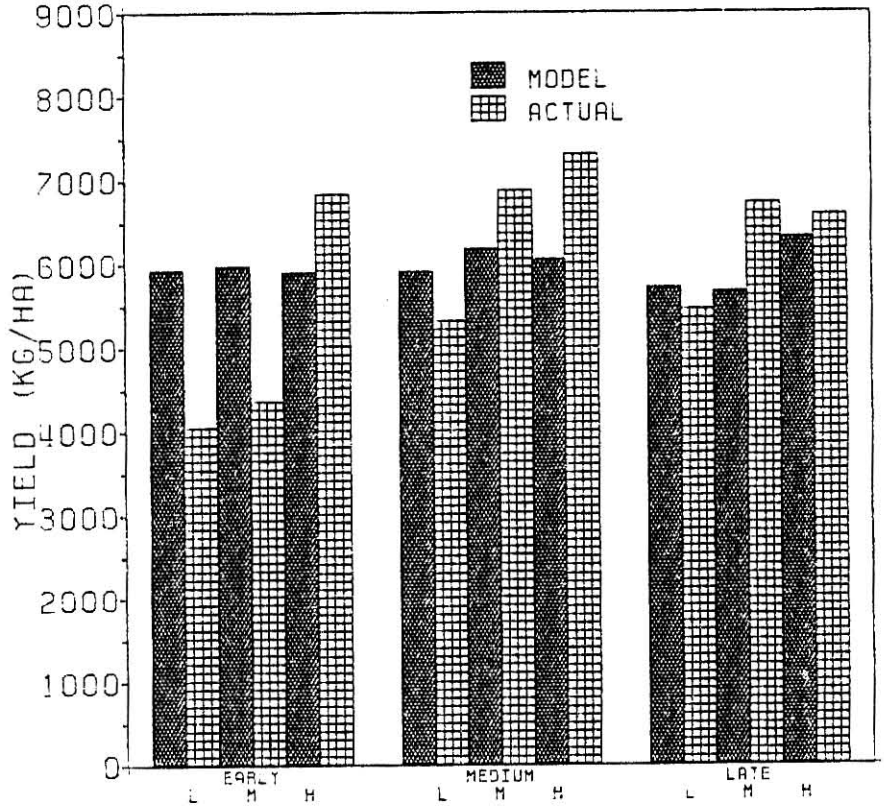

Figure 40. Powhattan Date 2 (June 10) Model and actual yields (kg/ha).

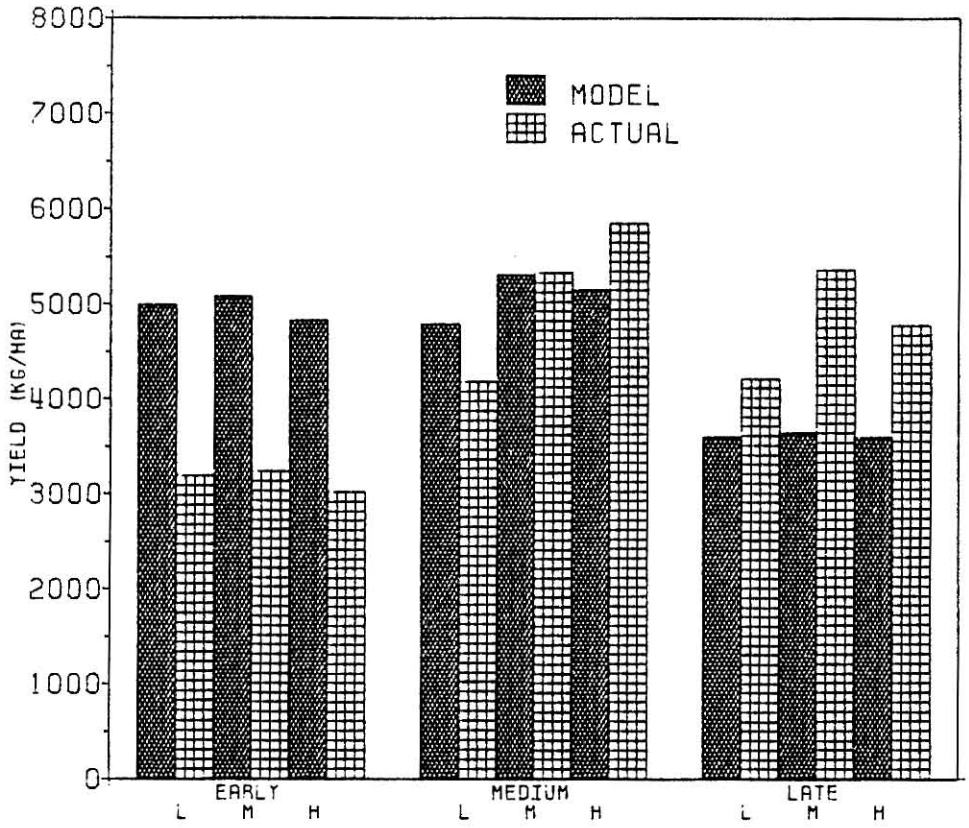

Figure 41. Powhattan Date 3 (June 26) Model and actual yields (kg/ha).

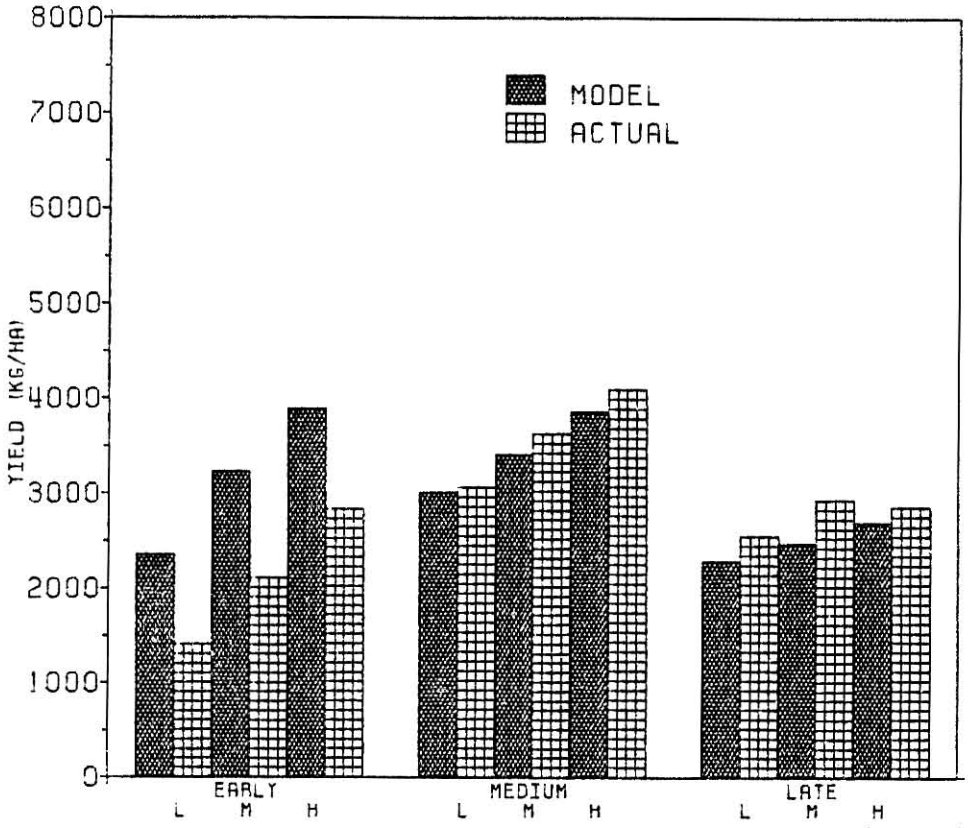

Figure 42. Powhattan Date 4 (July 7) Model and actual yields (kg/ha).

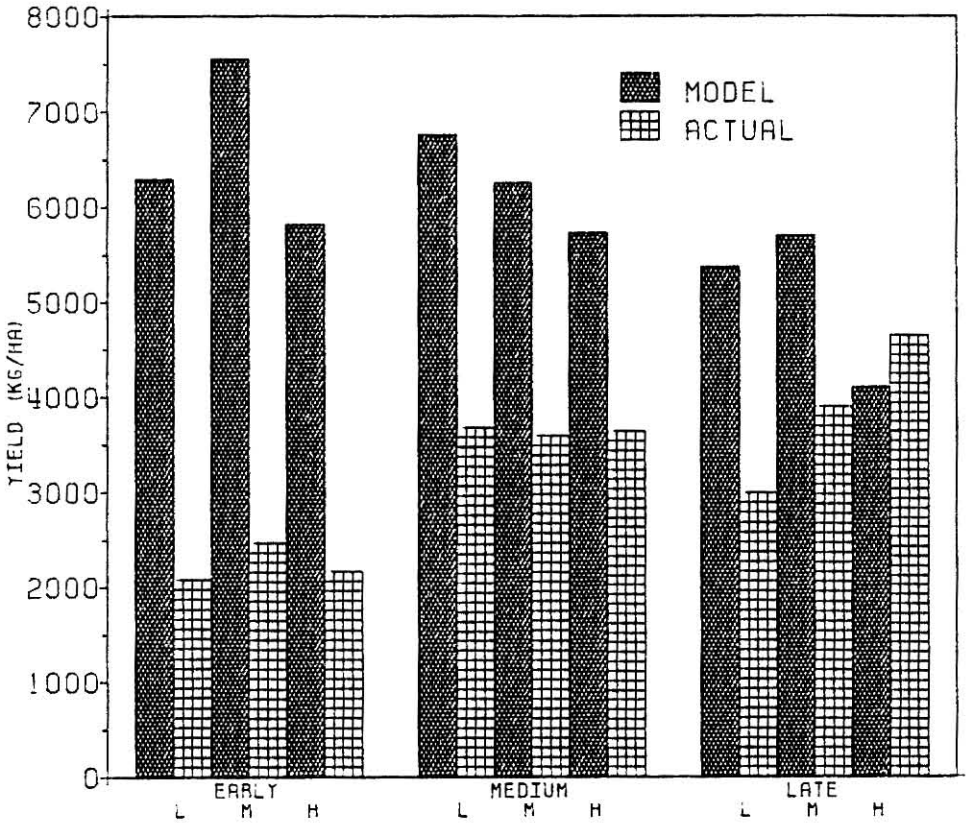

Figure 43. St. John Date 1 (May 21) Model and actual yields (kg/ha).

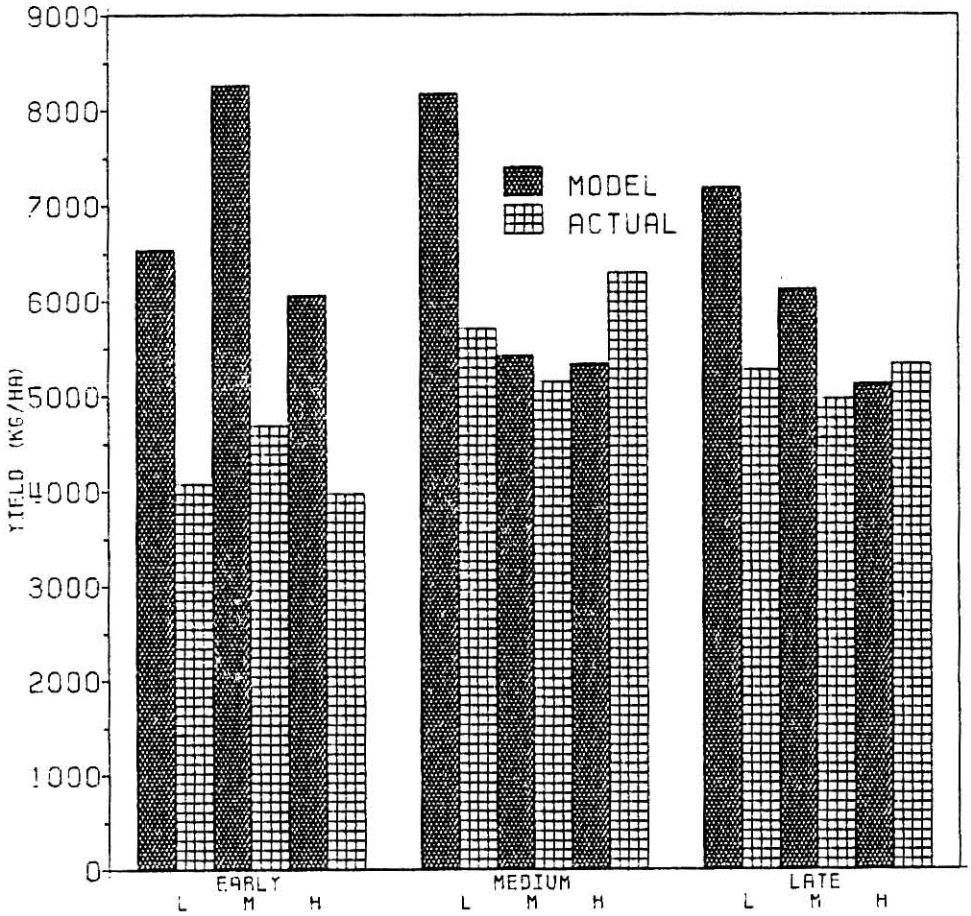

Figure 44. St. John Date 2 (June 16) Model and actual yields (kg/ha).

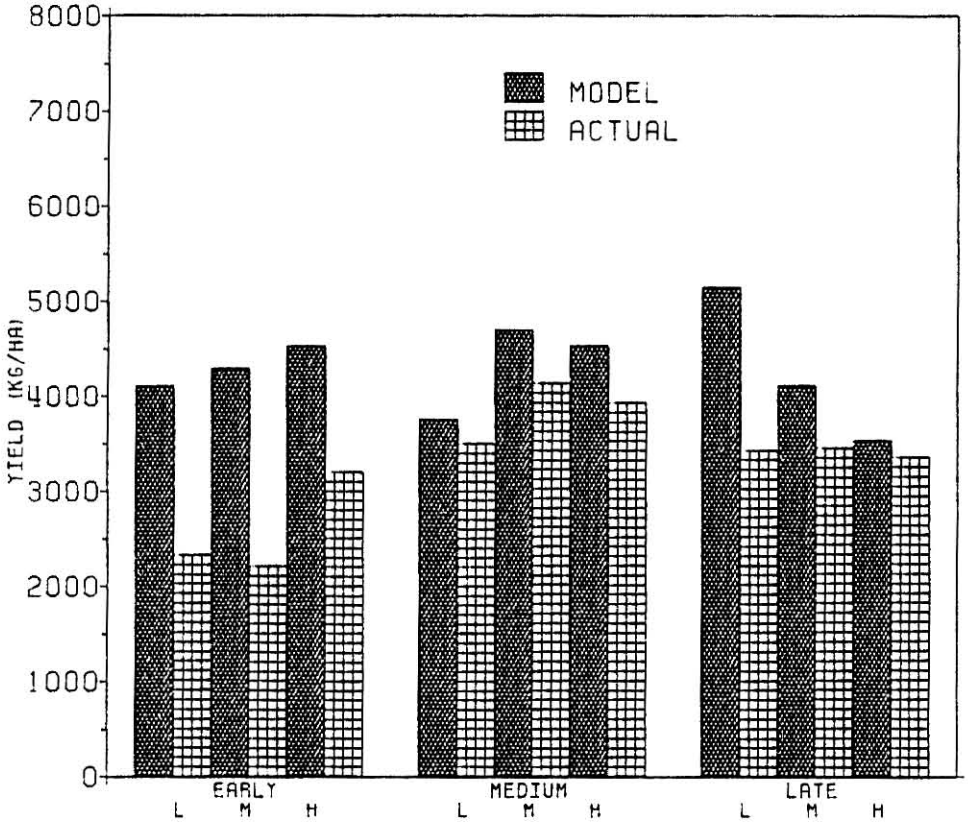

Figure 45. St. John Date 3 (July 8) Model and actual yields (kg/ha).

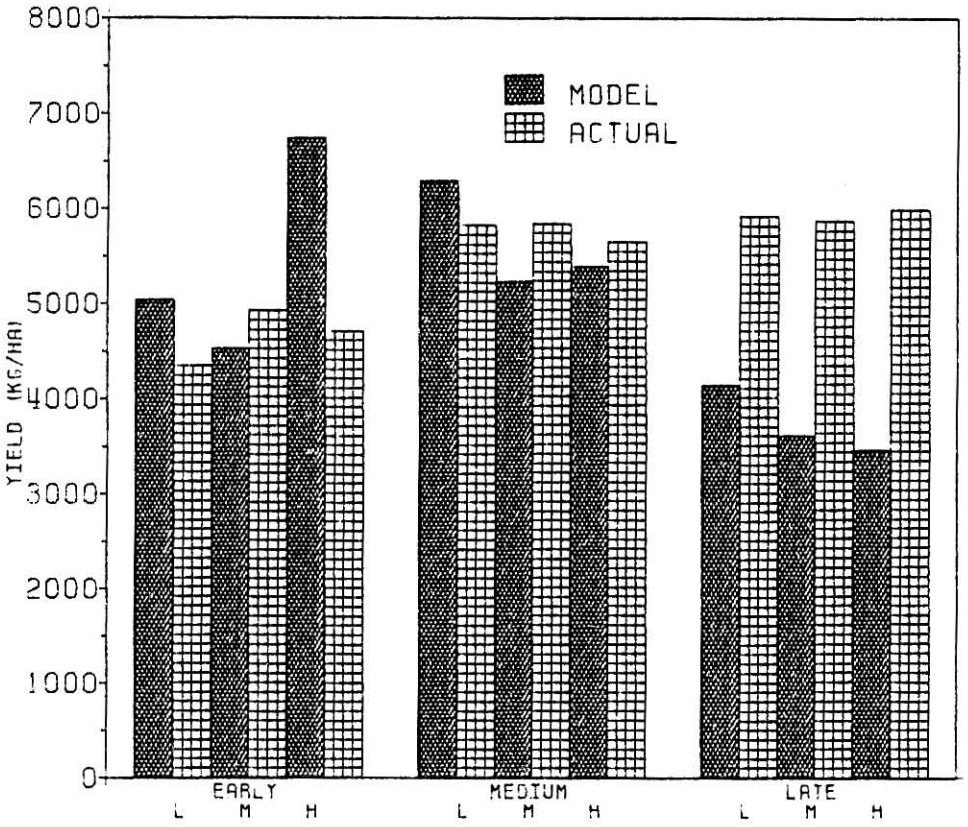

Figure 46. Minneola Date 1 (May 22) Model and actual yields (kg/ha).

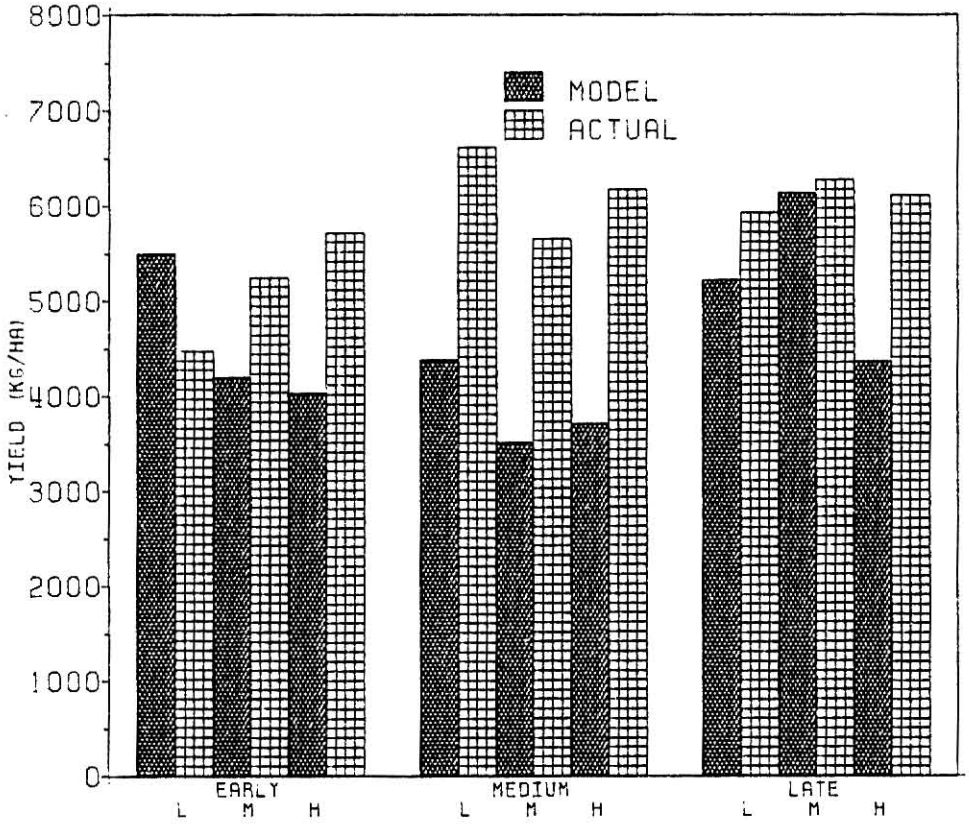

Figure 47. Minneola Date 2 (June 18) Model and actual yields (kg/ha).

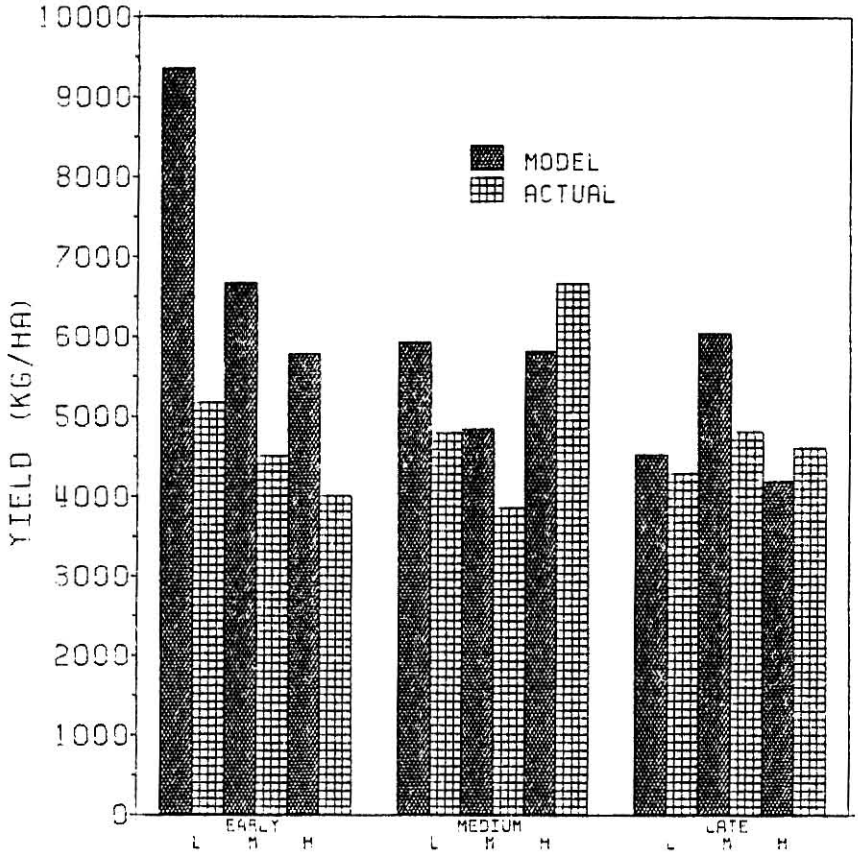

Figure 48. Minneola Date 3 (July 9) Model and actual yields (kg/ha).

DISCUSSION

Actual Data

The years of 1980 and 1981 were climatic opposites. Very hot, dry conditions prevailed in 1980. Conversely 1981 was a year of abundant timely precipitation and moderate temperatures, for most locations in Kansas. An exception in 1981 was the Parsons experiment field.

Interactions between the variables of this study on yield, occurred at locations where precipitation became limiting during the growing season. Locations at which weather was moderate (Powhattan, Figure A-5; St. John, Figure A-6; Minneola, Figure A-7) in 1981 showed no interactions between factors on yield. Findings indicate that the medium and late maturities yielded greater than the early maturity hybrid. Yield was unaffected by population (St. John and Minneola), and favored by high populations (Powhattan).

Yield components under these conditions were affected typically. Seed weight and number of seeds per panicle decreased, and number of heads per hectare increased, with increasing population. The early maturity hybrid produced small panicles with large seeds. The medium maturity hybrid produced large panicles with small seeds. The late maturity hybrid produced seeds and panicles which were between these extremes. Medium and late maturity hybrids generally produced more heads/ha. Seed weight tended to decrease over dates, the rate of this decrease was hybrid maturity dependent. The medium maturity hybrid showed a greater rate of decrease of seed weight. Number of seeds per panicle tended to be greater on the recommended date of planting. Number of heads per hectare, as affected by date, was location dependent for Powhattan, St. John, and Minneola.

Interactions of population, date of planting, and hybrid maturity on yield occurred at those locations (Manhattan, Hutchinson, 1980, and Parsons, 1981) where precipitation and temperature were important factors in production. Manhattan and Hutchinson climatic conditions (Figures A-2, A-3) show a period of little precipitation and high average air temperatures from mid-June to mid-August. Manhattan temperatures remained high thereafter, but precipitation became more frequent. Hutchinson continued in drought after brief rains in mid-August. An average air temperature above 26.7 C at heading adversely affects grain sorghum yields (38). At Manhattan and Hutchinson this temperature was exceeded for prolonged periods during the growing season. Parsons underwent a period of precipitation deficit (Figure A-4) from early July to late September. Temperatures, however, were not extreme.

Stress at Manhattan affected the grain filling period of the first date, and early grain fill of the second date of planting. At Huchinson all dates were affected by stress. The first date of planting was lost, in part, as a result of extreme stress. The Parsons second date of planting experienced stress conditions during grain filling.

Under these conditions there was a trend toward a medium maturity yield advantage. Optimum population varied for hybrid maturities. The Manhattan (1980) data is inconclusive regarding population and date effects on yield. Hutchinson (1980) and Parsons (1981) show that the late maturity tended to favor a lower population than the medium maturity hybrid. Generally yield of the early and recommended dates of planting were most affected under stress.

Analysis of the components of yield reveals early maturity hybrid seed weight was adversely influenced under stress conditions (Manhattan

and Hutchinson). Medium and late maturity hybrids suffered less reduction in seed weight due to stress. Number of seeds per panicle varied for dates and hybrid maturities, and was not consistent between locations where stress occurred, however number of seeds per panicle varied little for the early maturity hybrid over dates of planting. Increasing population decreased number of seeds per panicle. Number of heads per hectare increased with increasing population. The rate of this increase was hybrid maturity dependent (Hutchinson and Parsons).

In summary, under stress conditions number of seeds per panicle and seed weight appear to be more important to yield than number of heads. Under favorable conditions number of seeds per panicle and number of heads per hectare appear to be more important to yield than seed weight. Hybrids which can vary number of seeds per panicle in response to environmental conditions, both adverse and favorable, and maintain seed weight under stress appear to be best suited to optimum yield. Under favorable conditions number of heads produced per hectare will determine if yield is increased, or is unchanged, over increasing populations. Seed weight is little affected under favorable conditions.

DISCUSSION

Model Results

Modeling sorghum yields with SORGF gave inconsistent results, as can be seen from the actual and model yields which are ploted for the six locations of this study in Figure 49. Table 13 lists the overall statistics for model and actual data. Although the overall statistics

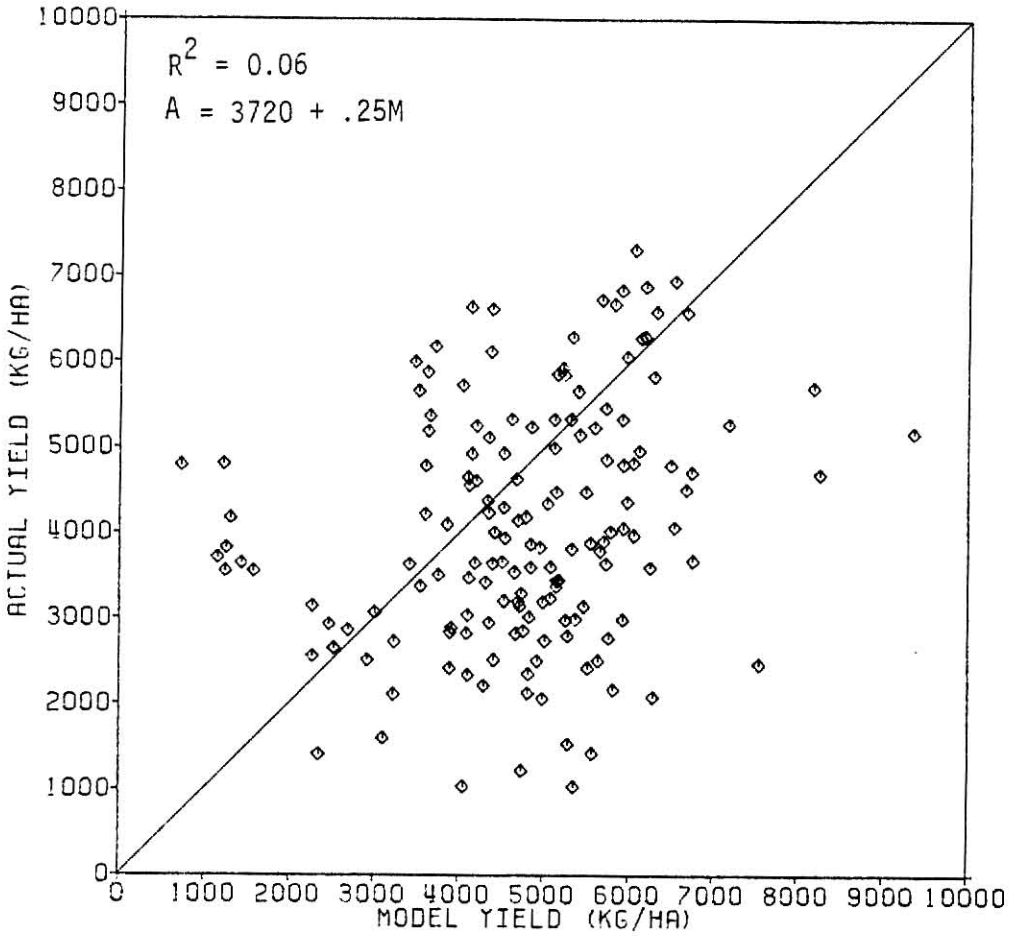

Figure 49. Model and actual yield comparison to a one-to-one line.

Table 13. Comparison of model and actual yield statistics.

	Mean	Standard deviation	Variance	C.V.
Model yield	4756	1415	2001658	29.748
Actual yield	4066	1407	1977910	34.608

show close agreement, a one-to-one relationship does not exist between model and actual yields.

Large differences between model and actual yields occurred at Hutchinson and Manhattan (1980) reflecting an inability to model stress situations. At Hutchinson SORGF yields were reduced by moisture stress. In spite of this, modeled yields were higher than actual. SORGF models temperature stress effects on photosynthesis but does not model the effects of high temperature stress at heading. An effect which may have led to the further reduction in yield seen in the actual data. In contrast Manhattan was under modeled. SORGF modeled moisture stress during grain fill, based on climatic data, however, it appears the actual yields were not affected by a moisture deficit. Other model runs (Tables A-27 to A-30) show Manhattan is perhaps the poorest modeled location for this reason. A possible source of error is unaccounted for lower profile soil moisture.

St. John date one differences between actual and model yields are the probable result of inadequate nitrogen in the actual study. SORGF assumes good fertility.

Other trends were noticeable from model and actual comparisons (bargraphs). SORGF generally over modeled early maturity yields (Parsons, St. John, Date 1; St. John, Date 2; all locations Date 3; Powhattan, Date 4). The actual data shows substantial variation in number of seeds per panicle and seed weight among hybrids. Parsons and Hutchinson are examples where seed weight and number of seeds per panicle show independent behavior for hybrid maturities. Therefore assuming common behavior of these factors between hybrids is an over-simplification. As such hybrid yield differences, in particular early maturity hybrid yields, might be better modeled by SORGF

if components of yield (seed weight and number of seeds per panicle) for hybrids can be differentiated.

No consistent error over dates of planting is apparent. Modeling yield components might also improve the date to date variability.

SORGF handled population response well. Differences between modeled and actual yields did not occur more frequently at any single population.

The tiller step that was added was intended to account for tiller yield in some way other than as a member of a total population of heads. This approach created some problems. If the main head yield was not modeled correctly then neither was tiller head yield. Likewise the relationship between main and tiller heads is not well understood at this point. Addition of the tiller step resulted in more variable modeled yield when main culm and tiller number were used compared to the use of head counts as input. The suitability of this method is examined graphically in Figures 50 and 51. Ploted are data from Praeger's (1976) and Jaiyesimi's (1977 and 1978) Manhattan studies (Tables A-27, 28, 29). Modeled yields reduced by moisture stress, where none was evident from actual yields, were not included in these figures. It can be seen that modeled and actual tiller yield were less variable than modeled and actual main culm yields primarily as the result of the concentration of tiller yields between 0 to 2000 kg/ha. The range of main culm yield is four-fold this concentration in tiller yield. As a result greater differences between model and actual main culm yields are expected to occur.

One location, Powhattan 1981, was modeled well. Most likely as the result of the nature of the interactions, and lack of interactions, which occurred there. The interaction of date of planting x population on number of heads/ha is accounted for directly as input. Number of seeds per panicle decreased, over populations, for hybrids leading to reduction in head size.

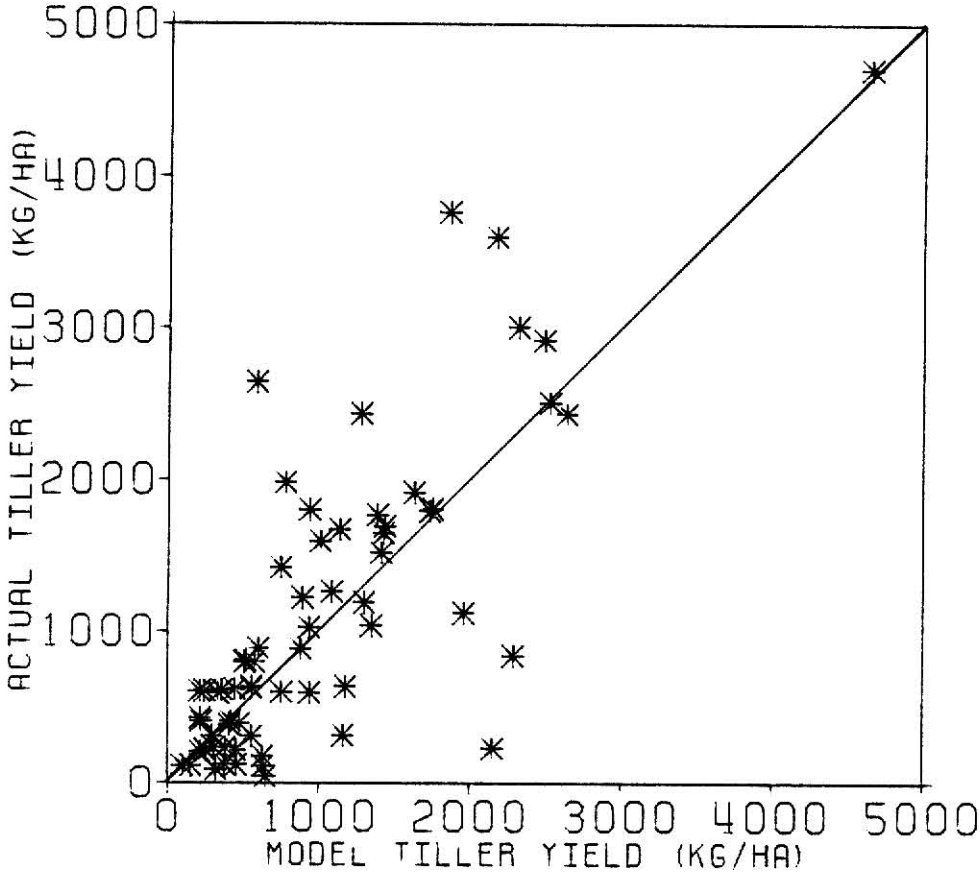

Figure 50. Model and actual tiller yields (kg/ha).

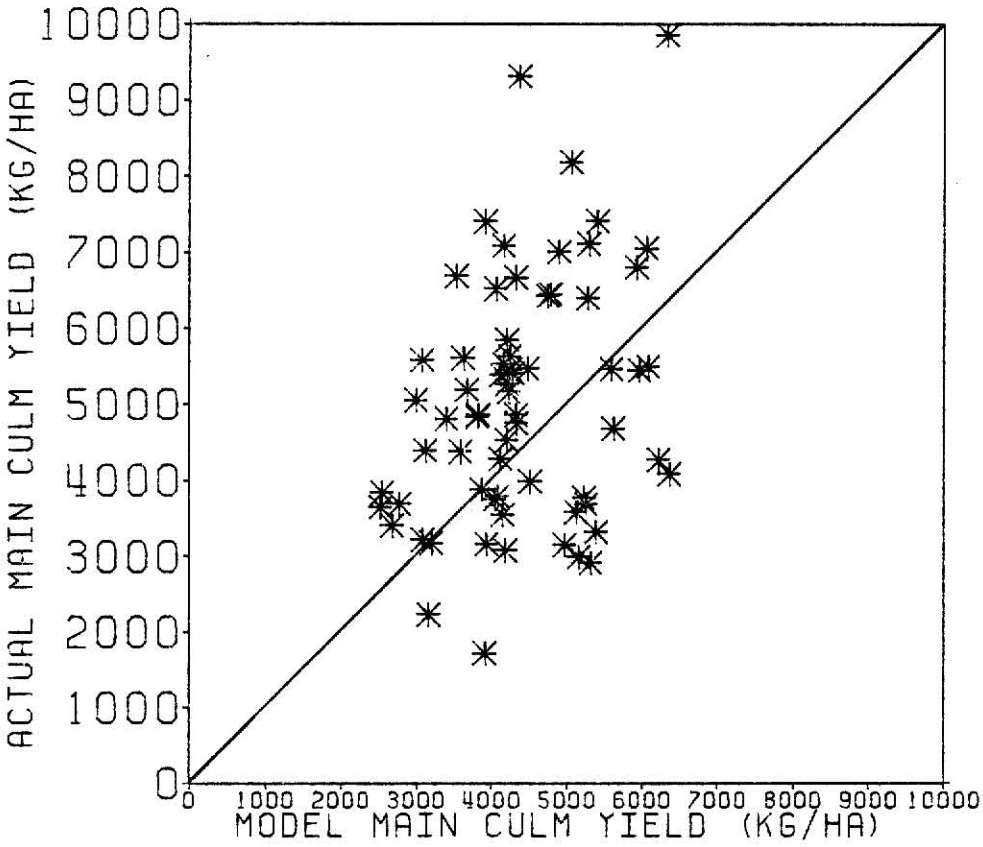

Figure 51. Model and actual main culm yields (kg/ha).

The model generally gives this response.

Days to half-bloom were recorded for Parsons, St. John (1981), and Manhattan (1980). Modeled and actual days to half-bloom were compared (Figure 52). The difference in fit is due to the Manhattan 1980 results for which leaf areas and leaf number were not recorded, and were assumed from other data.

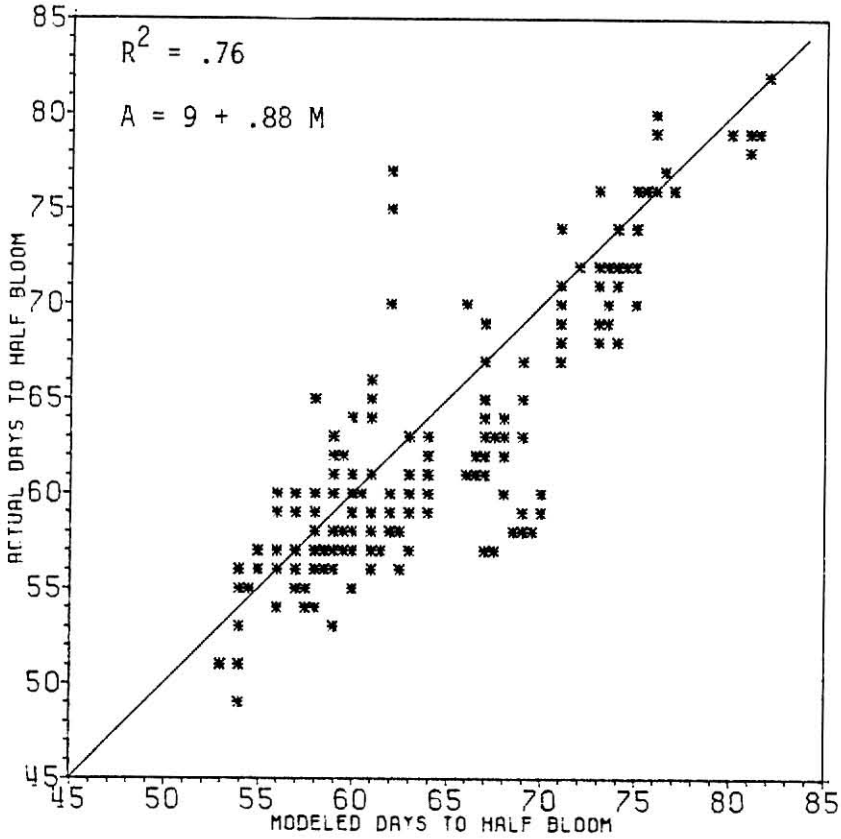

Figure 52. Model and actual days to half bloom.

Other studies modeled include the Bunck/Schaffer (1978), Schaffer (1979) Manhattan studies, and the Schaffer (1979) Hutchinson study. Actual yields of the Bunck/Schaffer study were poorly modeled as the result of simulated moisture stress during grain fill, a condition which apparently did not occur in the field (Table A-30). The Schaffer studies in 1979 gave some consistent trends. Basically model accuracy improved

over populations (low to high), and dates and maturities (early to late), Tables A-31 and A-32.

CONCLUSIONS

Data from this study are not conclusive but indicate some important trends, and effects. With regards to the objectives:

1) To study the effects of rate of planting, date of planting, and hybrid maturity on yield of grain sorghum:

Results are similar to those found previously. The early maturity hybrid, under conventional methods, yields lower than the late and medium maturity hybrids. Population response under favorable conditions shows both no increase in yield over populations, and increase in yield with increasing population, depending upon location. Date effects were not well established.

Stress during the growing season will affect the optimum population for maximum grain production. Under stress, optimum population was lower than under favorable conditions, and also was hybrid maturity dependent.

Importantly, the early maturity hybrid shows no advantage, under stress, to production with medium and late maturity hybrids. The medium maturity hybrid tended to produce more favorable yields.

Early and recommended dates of planting passed through periods of greatest stress when conditions were unfavorable. Evidence is not substantial enough to recommend late planting when deficient precipitation conditions are expected to occur.

Aspects of yield components reveal that number of heads and number of seeds produced most determine yield (favorable conditions). Under stress seed weight may be adversely affected, increasing its importance to yield. Therefore, hybrids with an ability to change number of seeds per panicle, in response to environment, and maintain seed weight and

head production are best adapted for optimum yield. Because the early maturity hybrid shows little ability to adjust number of seeds per panicle in response to environment, and suffers a loss in seed weight under stress conditions, (as an apparent method of compensation during stress) it is least adapted to grain production under conventional methods.

2) To determine how closely the model response approximates the actual response, and if the model might be used to develop replant guidelines:

Overall SORFG response was inconsistent. Population effects were modeled well, date effects were variable, and early hybrid maturity yields were frequently over modeled.

The Powhattan location gave the closest agreement between model and actual yields. Probably due to a lack of non-modeled interactions (interactions involving aspects of yield components not handled by the model) at this location.

Not enough data has been taken to determine the phenological response of SORGF, however, good agreement was obtained between actual and modeled days to half-bloom. At this time SORGF is not ready to be used in formulating replant guidelines.

3) To determine areas for improvement in SORGF:

Stress response of the model needs to be examined, in particular, high temperature stress effects on yield. Based on conflicting data from Manhattan and Hutchinson, it is difficult to determine if water stress effects are being modeled accurately.

Some basic understanding of the relationships of tillers to the plant community, their initiation, development, and contribution to yield, would be a desirable addition to SORGF. Emphasis should be on

contribution to yield. Hybrid and date effects might be better modeled if the aspects of seed weight and number of seeds per panicle were modeled in SORGF rather than the current combination of these factors into head weight.

ACKNOWLEDGEMENTS

Special thanks to: Acco Paymaster Seed Co.

Garst and Thomas Hybrid Corn Co.

Dekalb Agresearch Inc.

for their material and financial contributions.

to: Committe Members

R. L. Vanderlip

E. T. Kanemasu

G. A. Milliken

for their helpful suggestions for improvement of this thesis.

to: The many groups and individuals who made this study possible

Lynn Parsons
Neal Christensen
Jim Schaffer
Julius Okonkwo
Segun Agunbiade
Harmut Stutzel
Brian Graul
Steve Bieghler
Marvin Lundquist
Jim Ball
Mark Claassen
Ken Kelley
Ray Lamond
Clarence Swallow
Eldon Slagle
Walter Moore
Jac Morgan
Alice, Larry and The Computing Center
Janet

LITERATURE CITED

1. Arkin, G. F., R. L. Vanderlip, and J. T. Ritchie. 1976. A dynamic grain sorghum growth model. Trans. of ASAE 19:622-630.
2. _____, C. W. Richardson, and S. J. Maas, 1978. Forecasting grain sorghum yields using probability functions. Trans. of ASAE 21:874-877.
3. _____, J. T. Ritchie, and S. J. Maas, 1978. A model for calculating light interception by a grain sorghum canopy. Trans. of ASAE 21:303-308.
4. Atkins, R. E., V. H. Reich, and J. J. Kern. 1968. Performance of short stature grain sorghum hybrids at different row and plant spacings. Agron. J. 60:515-518.
5. Blum, A. 1970. Effect of plant density and growth duration on grain sorghum yield under limited water supply. Agron. J. 62:333-336.
6. _____. 1972. Effect of planting date on water use and its efficiency in dryland grain sorghum. Agron. J. 64:775-778.
7. Bond, J. J., T. J. Army, and O. R. Lehman. 1964. Row spacing, plant population and moisture supply as factors in dryland grain sorghum production. Agron. J. 56:3-6.
8. Brown, P. L., and W. D. Shrader. 1959. Grain yields, evapotranspiration and water use efficiency of grain sorghum under different cultural practices. Agron. J. 51:339-343.
9. Bunck, J. H. 1979. Effect of planting date on leaf number and total leaf area of hybrid grain sorghum (Sorghum bicolor (L.) Moench). M.S. Thesis. Kansas State University.
10. Dalton, L. G. 1967. A positive regression of yield on maturity in grain sorghum. Crop Sci. 7:271.
11. Foale, M. A. and D. B. Coates. 1980. Yield of two grain sorghum cultivars at four populations. Sorghum Newsletter 23:46.

12. Gerakis, P. A. and C. Z. Tsangarakis. 1969. Response of sorghum, sesame, and groundnuts to plant population density in the central Sudan. Agron. J. 61:872-875.

13. Grimes, D., and J. Musick. 1960. Effect of plant spacing, fertility and irrigation managements on grain sorghum production. Agron. J. 52:647-650.

14. Hegde, B. R., D. J. Major, D. B. Wilson and K. K. Krogman. 1976. Effects of row spacing and population density on grain sorghum production in southern Alberta. Can. J. Plt. Sci. 56:31-37.

15. Jaiyesimi, S. T. 1979. Yield and tillering response of grain sorghum (Sorghum bicolor (L.) Moench) hybrids to planting date and density. Ph.D. Dissertation. Kansas State University.

16. Karchi, R. E. and Y. Rudich. 1966. Effects of row width and seedling spacing on yield and its components in grain sorghum grown under dry-land conditions. Agron. J. 58:602-604.

17. Karper, R. E. 1929. The contrast in response of kafir and milo to variations in spacing. Agron. J. 21:344-354.

18. Maas, S. J. and G. F. Arkin. 1978. User's guide to SORFG, a dynamic grain sorghum growth model with feedback capacity. Research center program and model documentation no. 78-1. Texas Agr. Exp. Stat., College Station.

19. _____, _____, 1980. Sensitivity analysis of SORGF, a grain sorghum model. Trans. of ASAE. 23:671-675.

20. Myers, R. J. K. and M. A. Foale. 1980. Row spacing and population density in Australian grain sorghum production. J. Aust. Inst. Agri. Sci. 4:214-220.

21. _____, _____. 1981. Row spacing and population density in grain sorghum--a simple analysis. Fld. Crops Res. 4:147-154.

22. Nelson, C. E. 1952. Effects of spacing and nitrogen applications on yield of grain sorghums under irrigation. Agron. J. 44:303-305.

23. Olson, T. C. 1971. Yield and water use by different populations of dryland corn, grain sorghum and forage sorghum in the western corn belt. Agron. J. 63:104-106.

24. Painter, C. G. and R. W. Leamer. 1953. The effects of moisture, spacing, fertility and their interrelationships on grain sorghum production. Agron. J. 45:261-264.

25. Pauli, A. W., F. C. Stickler, and J. R. Lawless. 1964. Developmental phases of grain sorghum (Sorghum vulgare, Pres.) as influenced by variety, location and planting date. Crop Sci. 4:10-13.

26. Phillips, L. J. and M. J. T. Norman. 1962. The influence of inter-row and intra-row spacing and inter-row cultivation on the yield of grain sorghum at Katherine, N. T. Aust. J. Exp. Agric. Anim. Husb. 2:204-208.

27. Porter, K. B., M. E. Jensen, and W. H. Sletten. 1960. The effect of row spacing, fertilizer and planting rate on the yield and water use of irrigated grain sorghum. Agron. J. 52:431-434.

28. Praeger, H. A., Jr. 1977. Field experimental conditions related to tillering and its contribution to yield of grain sorghum (Sorghum bicolor (L.) Moench). Ph.D. Dissertation. Kansas State University.

29. Quinby, J. R. 1967. The maturity genes of sorghum. Advances in Agronomy. 19:267-305.

30. _____, and R. E. Karper. 1945. The inheritance of three genes that influence time to floral initiation and maturity date in milo. Agron. J. 37:916-936.

31. Rao, V. R., M. Ramachandram, M. S. Rama, and M. Rao. 1976. Plant density and geometry in relation to varietal differences and seasonal variations in rainfall for increasing and stabilizing production levels of winter sorghum in drylands. Ind. J. Agric. Sci. 46: 554-566.

32. Robinson, R. G., L. A. Bernat, W. W. Nelson, R. L. Thompson, and J. R. Thompson. 1964. Row spacing and plant population for grain sorghum in the humid north. Agron. J. 56:189-191.

33. Schaffer, J. A. 1980. The effect of planting date and environment on the phenology and modeling of grain sorghum (Sorghum bicolor (L.) Moench). Ph.D. Dissertation. Kansas State University.

34. Sieglinger, J. B. 1926. The spacings of grain sorghums. Agron. J. 18:525.

35. Stickler, F. C. 1964. Grain sorghum yields from 20 and 40-inch rows at various stand densities in Kansas. Kansas Agric. Exp. Stat. Bul. 474.

36. _____, and H. H. Laude. 1960. Effect of row spacing and plant population on performance of corn, grain sorghum and forage sorghum. Agron. J. 52:275-277.

37. _____, A. W. Pauli. 1961. Influence of data of planting on yield and yield components of grain sorghum. Agron. J. 53:20-22.

38. _____, _____. 1963. Yield and yield components of grain sorghum as influenced by date of planting. Kansas Agric. Exp. Stat. Tech. Bul. 130.

39. _____, A. W. Pauli, H. H. Laude, H. D. Wilkins, and J. L. Mings. 1961. Row width and plant population studies with grain sorghum at Manhattan, Kansas. Crop Sci. 1:297-300.

40. _____, and S. Wearden. 1965. Yield and yield components of grain sorghum as affected by row width and stand density. Agron. J. 58:371-376.

41. _____, and M. A. Younis. 1966. Plant height as a factor affecting responses of sorghum to row width and stand density. Agron. J. 58:371-376.

42. Stinson, D. L., G. F. Arkin, T. A. Howell, C. W. Richardson, and J. R. Williams. 1981. Modeling grain sorghum ratoon cropping and associated runoff and sediment losses. Trans. of ASAE. 24:631-635.

43. Vanderberry, H. and C. Ruckman. 1979. Kansas field crops from planting to harvest. Kansas Crop and Livestock Reporting Service.

44. Vanderlip, R. L. 1972. How a sorghum plant develops. Coop. Ext. Serv. Kansas State University. C-447.

45. _____, and G. F. Arkin. 1977. Simulating accumulation and distribution of dry matter in grain sorghum. Agron. J. 69:917-923.

46. Welch, N. H., E. Burnett, and H. V. Eck. 1966. Effect of row spacing, plant population and nitrogen fertilization on dryland grain sorghum production. Agron. J. 58:160-163.

APPENDIX A

Table A-1. Analysis of Variance for yield and yield components, Manhattan 1980.

Source of variation	d.f.	Mean Squares: Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Date	2	1516892	3.7355	17478	3315643125
Error (a)	6	1089013	3.3103	51019	1223869061
Hybrid	2	15254622**	9.0125*	617225**	5737938285**
Rate	2	5168243**	18.2416**	3498349**	44626709232**
Hybrid x Rate	4	220111	2.1176	187862*	1885258459
Date x Hybrid	4	1327090*	32.1185**	152215*	995091409
Date x Rate	4	1448485*	1.2107	58189	1892742862
Date x Hybrid x Rate	5	637754	1.6596	71819	1675650935
Error (b)	37	490752	2.3041	54417	868455991

**Significant at the 1% level.

*Significant at the 5% level.

Table A-2. Interaction of date of planting and hybrid maturity on yield, seed weight, and number of seeds per panicle, Manhattan 1980.

Hybrid Maturity	Julian Date of Planting								
	127			157			178		
	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle
Early	3463	21.44	1044	2690	16.35	966	3047	23.67	979
Medium	4587	21.64	1381	5372	22.66	1367	4940	20.44	1435
Late	3667	23.61	1051	5233	21.00	1094	3957	21.75	1402

LSD (.05) Comparison	Date 127			Date 157			Date 178		
	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle
Early/medium	669	1.45	223	809	1.75	264	689	1.49	230
Early/late	669	1.45	223	1555	3.37	518	669	1.45	223
Medium/late	669	1.45	223	1505	3.26	501	689	1.49	230

Comparison	Early Maturity Hybrid			Medium Maturity Hybrid			Late Maturity Hybrid		
	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle	Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds per panicle
127/157	882	1.81	268	768	1.58	234	1666	3.42	507
127/178	745	1.53	227	768	1.58	234	745	1.53	227
157/178	882	1.81	268	790	1.62	241	1666	3.42	507

Table A-3. Interaction of date of planting and rate of planting on yield, Manhattan 1980.

Julian Date of Planting					
127		157		178	
Rate (pl/ha)*	Yield (kg/ha)	Rate (pl/ha)*	Yield (kg/ha)	Rate (pl/ha)*	Yield (kg/ha)
83721	3855	86472	6636 †	85097	4409
144957	4110	202796	3707	173877	4046
247335	3753	345348	3869	296342	3430

* Based on dates 127 and 157, no counts for date 178.

† Based only on Medium Maturity yield.

LSD .05

Comparison	Yield (kg/ha)		
Relative Population	Date 127	Date 157	Date 178
Low/Middle	669	1037	690
Low/High	669	1004	690
Middle/High	669	860	669
	Low Population	Middle Population	High Population
Date			
127/157	1054	881	833
127/178	768	745	745
157/178	1070	882	833

Table A-4. Interaction of hybrid maturity and rate of planting on number of seeds per panicle, Manhattan 1980.

Early		Medium		Late	
Rate (pl/ha)*	Number of seeds/ panicle	Rate (pl/ha)*	Number of seeds/ panicle	Rate (pl/ha)*	Number of seeds/ panicle
73914	1254	94186	2114	75349	1675
166485	1071	169212	1329	157874	1214
286971	734	287581	812	284441	833

* Based on dates 127 and 157, no counts for date 178.

LSD .05

Comparisons	Number of seeds per panicle		
Relative Population	Early Maturity	Medium Maturity	Late Maturity
Low/Middle	249	236	273
Low/High	255	230	263
Middle/High	230	230	263
Hybrid	Low Population	Middle Population	High Population
Early/Medium	255	230	230
Early/Late	273	249	245
Medium/Late	255	255	238

Table A-5. Analysis of variance for yield and yield components, Hutchinson 1980.

Source of Variation	d.f.	Mean Squares: Yield (kg/ha)	Seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Date	1	10393713	7.2776	3180410	780462828
Error (a)	4	138309	.6300	9984	124385073
Hybrid	2	3870955**	50.0033**	831771**	3191366375**
Rate	2	677974	16.5243*	162509**	3616695083**
Hybrid x Rate	4	2792799**	3.4178	257660**	5555565729**
Date x Hybrid	2	991714	89.2361**	345405**	2042999394
Date x Rate	2	587120	5.1697	180079*	450300522
Date x Hybrid x Rate	2	781844	.5915	171198**	168062911
Error (b)	16	514731	4.0217	29182	572995204

**significant at the 1% level
*significant at the 5% level

Table A-6. Interaction of hybrid maturity and rate of planting on yield, number of seeds per panicle, and number of heads/ha, Hutchinson 1980.

Early				Medium				Late			
Rate (pl/ha)	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha
63508	1420	878	48275	65015	2853	1686	93941	55973	3892	1691	96329
99030	2545	643	141727	106565	2495	1827	91658	101183	2600	1540	75153
154465	2333	667	128191	182990	3879	1286	189187	192319	2973	1223	120362

LSD .05

	Early Maturity			Medium Maturity			Late Maturity		
Comparison Relative Rate	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha	Yield (kg/ha)	Number of seeds/ panicle	Number of heads/ ha
Low/Middle	1317	314	43948	1020	243	34042	962	229	32095
Low/High	1317	314	43948	1111	264	37060	1020	243	34042
Middle/High	1076	256	35884	1162	277	38759	1020	243	34042
Hybrid	Low Population			Middle Population			High Population		
Early/Medium	1273	303	42458	1076	256	35884	1162	277	38759
Early/Late	1273	303	42458	1020	243	34042	1076	256	35884
Medium/Late	1020	243	34042	1020	243	34042	1162	277	38759

Table A-7. Interaction of date of planting and hybrid maturity on seed weight and number of seeds per panicle, Hutchinson 1980.

Hybrid Maturity	Julian Date of Planting 156 Seed wt. (g/1000)	156 Number of seeds/ panicle	181 Seed wt. (g/1000)	181 Number of seeds/ panicle
Early	19.00	515	28.78	746
Medium	22.63	885	15.50	2007
Late	26.75	913	19.64	1832

LSD .05

Comparisons Hybrid	156 Seed wt. (g/1000)	156 Number of seeds/ panicle	181 Seed wt. (g/1000)	181 Number of seeds/ panicle
Early/Medium	3.68	314	2.13	181
Early/Late	3.56	303	2.07	176
Medium/Late	2.85	243	2.07	176

Date	Early Maturity Seed wt. (g/1000)	Early Maturity Number of seeds/ panicle	Medium Maturity Seed wt. (g/1000)	Medium Maturity Number of seeds/ panicle	Late Maturity Seed wt. (g/1000)	Late Maturity Number of seeds/ panicle
156/181	3.22	279	2.49	216	2.27	197

Table A-8. Interaction of date of planting and rate of planting on number of seeds/panicle, Hutchinson 1980.

Julian Date of Planting			
156		181	
Rate (pl/ha)	Number of seeds/ panicle	Rate (pl/ha)	Number of seeds/ panicle
71043	1034	53820	1925
107641	587	100704	1693
182990	809	173422	1089

LSD .05

Comparison Relative Rates	Number of seeds per panicle	
	156	181
Low/Middle	242	183
Low/High	303	183
Middle/High	314	171

Date	Low Population	Middle Population	High Population
156/181	207	212	276

Table A-9. Interaction of date of planting, rate of planting, and hybrid maturity on number of seeds per panicle, Hutchinson 1980

Date of Planting	Hybrid Maturity	Rate (pl/ha)	Number of seeds
156	Early	--	481
156	Early	182990	550
156	Medium	72478	990
156	Medium	99030	571
156	Late	68890	1100
156	Late	111947	649
156	Late	--	1068
181	Early	63508	878
181	Early	99030	697
181	Early	144957	706
181	Medium	53821	2730
181	Medium	109076	2245
181	Medium	182990	1286
181	Late	47362	2086
181	Late	94007	2135
181	Late	192319	1274

LSD .05 Between Dates 156 and 198.

Comparisons	Seeds per panicle
Hybrid Maturity	Low Population
Medium/Medium	305
Late/Late	305
	Middle Population
Early/Early	386
Medium/Medium	386
Late/Late	305
	High Population
Early/Early	386
Late/Late	386

Table A-9. Interaction of date of planting, rate of planting, and hybrid maturity on number of seeds per panicle, Hutchinson 1980 (continued).

LSD .05

Date 156

Comparison	Relative Rate	Number of seeds per panicle Early Maturity Hybrid
	Middle/High	512
		Medium Maturity Hybrid
	Low/Middle	418
		Late Maturity Hybrid
	Low/Middle	362
	Low/High	444
	Middle/High	444

Date 181

		Early Maturity Hybrid
	Low/Middle	362
	Low/High	331
	Middle/High	331
		Medium Maturity Hybrid
	Low/Middle	296
	Low/High	296
	Middle/High	296
		Late Maturity Hybrid
	Low/Middle	296
	Low/High	296
	Middle/High	296

Table A-9. Interaction of date of planting, rate of planting, and hybrid maturity on number of seeds per panicle, Hutchinson 1980 (continued).

Date 156

Comparison	Number of seeds per panicle
Hybrid Maturity	Low Population
Medium/Late	331
	Middle Population
Early/Medium	512
Early/Late	444
Medium/Late	444
	High Population
Early/Late	512

Date 181

	Low Population
Early/Medium	362
Early/Late	331
Medium/Late	331
	Middle Population
Early/Medium	296
Early/Late	296
Medium/Late	296
	High Population
Early/Medium	296
Early/Late	296
Medium/Late	296

Table A-10. Analysis of variance for yield and yield components, Parsons 1981.

Source of Variation	d.f.	Mean Squares: Yield (kg/ha)	Seed wt (g/1000)	Seeds/ panicle	Heads/ ha
Date	2	3042588	339.3338	811817	12711816622
Error (a)	6	1096986	7.0157	343373	502959236
Hybrid	2	5031523**	498.6476**	5739068**	2391681096**
Rate	2	5821620**	159.8084**	6919415**	65405293650**
Hybrid x Rate	4	421785	11.9027	1026120**	1428257812*
Date x Hybrid	4	1132357**	15.7064*	379849**	961522514
Date x Rate	4	544311	4.5477	376822**	2201290901**
Date x Hybrid x Rate	8	1212857**	5.1754	85341	591394841
Error (b)	48	268383	.6308	89982	513962283

** Significant at the 1% level

* Significant at the 5% level

Table A-11. Interaction of date of planting and hybrid maturity on yield, seed weight, and number of seeds per panicle, Parsons 1981.

Maturity	Julian Date of Planting								
	114			156			187		
	Yield (kg/ha)	seed wt. (g/1000)	Number of seeds/ panicle	Yield (kg/ha)	seed wt. (g/1000)	Number of seeds/ panicle	Yield (kg/ha)	seed wt. (g/1000)	Number of seeds/ panicle
Early	2788	25.58	1163	2529	29.14	1248	2883	32.28	1140
Medium	3669	15.36*	3669	3209	22.33	2187	3883	23.61	1964
Late	4018	21.68	2095	2758	27.69	1690	3040	26.58	1303

LSD .05 Yield: Hybrid within date: 491 kg/ha

Hybrid between dates: 611 kg/ha

Seed weight: Hybrid within date: 2.25 g

Hybrid between dates: 2.35 g

Number of seeds per panicle: Hybrid within date: 284 seeds

Hybrid between date: 349 seeds

* Low seed weight due to lodging during grain fill, caused by excessive wind.

Table A-12. Interaction of hybrid maturity and rate of planting on number of seeds per panicle and number of heads/ha, Parsons 1981.

Hybrid Maturity								
Early			Medium			Late		
Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha
44252	1382	50041	50113	2990	53262	43415	2095	48558
85276	1194	87070	97116	2039	90737	91256	1821	85634
161222	976	128212	177249	1283	174618	180957	1172	141608

LSD .05

Across hybrids or rates: number of seeds per panicle: 284 seeds

number of heads per hectare: 21485 heads/ha

Table A-13. Interaction of date of planting and rate of planting on number of heads/ha, and number of seeds per panicle, Parsons 1981.

Julian Date of Planting								
114			156			187		
Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha	Rate (pl/ha)	Number of seeds/ panicle	Number of heads/ ha
50711	2544	58652	36598	2177	37874	50472	1746	55335
108837	1752	107481	75827	1730	74950	88983	1571	81010
232026	1122	186099	132757	1219	109236	154644	1091	149103

LSD .05 Between dates: Number of seeds per panicle: 349

Number of heads per hectare: 21968

Within dates: Number of seeds per panicle: 284

Number of heads per hectare: 21485

Table A-14. Interaction of rate of planting, date of planting, and hybrid maturity on yield, Parsons 1981.

Date of Planting	Maturity	Rate (pl/ha)	Yield (kg/ha)
114	Early	48080	2885
114	Early	103335	2977
114	Early	200930	2502
114	Medium	60279	3596
114	Medium	117688	3600
114	Medium	231069	3813
114	Late	43774	2820
114	Late	105488	4006
114	Late	264079	5229
156	Early	39468	1594
156	Early	67096	3143
156	Early	130246	2850
156	Medium	36598	2507
156	Medium	81807	3288
156	Medium	136345	3832
156	Late	33728	2411
156	Late	78578	3446
156	Late	131681	2417
187	Early	45209	2125
187	Early	85395	2740
187	Early	152491	3786
187	Medium	53462	3636
187	Medium	91854	3534
187	Medium	164332	4479
187	Late	52744	2511
187	Late	89701	3418
187	Late	147109	3190

LSD .05 Within date: 850 kg/ha

Between dates: 1388 kg/ha

Table A-15. Analysis of variance for yield and yield components, Powhattan 1981.

Source of Variation	d.f.	Mean Squares: Yield (kg/ha)	Seed wt. (g/1000)	Seeds/panicle	Heads/ha
Date	3	48742354	866.7965	1748658	4172976505
Error (a)	8	169613	5.5146	219172	298676103
Hybrid	2	16220699**	276.7293**	81333171**	3131230993**
Rate	2	14253798**	29.5657**	4987555**	56323384658**
Hybrid x Rate	4	1248144	7.1095	667078**	616162638
Date x Rate	6	802473	7.5306	217178	2085014746**
Date x Hybrid and Date x Hybrid x Rate	15	483662	6.0272	286430*	372745455
Error (b)	53	655331	6.2807	126132	579168349

**significant at the 1% level

*significant at the 5% level

Table A-16. Interaction of hybrid maturity and rate of planting on number of seeds per panicle, Powhattan 1981.

Early		Medium		Late	
Rate* (pl/ha)	Number of seeds/ panicle	Rate* (pl/ha)	Number of seeds/ panicle	Rate* (pl/ha)	Number of seeds/ panicle
45748	1659	44537	3138	57947	2671
85395	1868	100728	2801	103156	2121
189808	1300	238233	1934	189089	1673

LSD .05	Early Hybrid	Medium Hybrid	Late Hybrid
Comparison Relative Rates	Seeds per panicle		
Low/Middle	369	291	297
Low/High	369	291	297
Middle/High	356	291	291

Hybrids	Low Population	Middle Population	High Population
Early/Medium	339	344	297
Early/Late	325	325	291
Medium/Late	325	325	291

*Based on date 161 stand counts.

Table A-17. Interaction of date of planting and rate of planting on number of heads/ha, Powhattan 1981.

Rate (pl/ha)*	Julian Date of Planting			
	121	161	177	188
49411	66259	75428	65254	69369
96426	116061	104133	89701	93050
205710	169594	171588	112126	180040

LSD .05

Comparisons

	Date 121	Date 161	Date 177	Date 188
Relative Rates		Heads per hectare		
Low/Middle	27866	22753	26066	22753
Low/High	27866	22753	26066	22753
Middle/High	27866	22753	24133	22753

	Low Population	Middle Population	High Population
Dates			
121/161	24969	24969	24969
121/177	27352	25585	25585
121/188	24969	24969	24969
161/177	24969	23020	23020
161/188	22333	22333	22333
177/188	24969	23020	23020

*Based on stand counts for date 161.

Table A-18. Analysis of variance, for yield and yield components, St. John 1981, Mean Squares.

Source of variation	Degrees of Freedom	Yield (kg/ha)	Seed Weight (g/1000 seeds)	Number of Seeds/panicle	Number of Heads/ha
Date	2	28621415	330.4089	7987559	240346014
Error (a)	6	1319950	10.4090	194439	266132054
Hybrid	2	14601096**	172.6254**	7268656**	3443255966**
Rate	2	1025239	47.6145**	8379644**	1838055641**
Hybrid x Rate	4	123631	1.3679	1168464*	569233279
Date x Hybrid	4	518748	10.0803*	1121176*	124331718
Date x Rate	4	148254	10.1534*	284402	581455665
Date x Hybrid x Rate	8	844156	3.4081	201660	189330697
Error (b)	48	724291	3.2790	362382	397361011

** Significant at the 1% level

* Significant at the 5% level

Table A-19. Interaction of date and hybrid on seed weight and number of seeds. St. John 1981.

Hybrid	Julian Date of planting					
	141		167		189	
	seed wt. (g/1000)	Number of seeds/ panicle	seed wt. (g/1000)	Number of seeds/ panicle	seed wt. (g/1000)	Number of seeds/ panicle
Early	28.36	1616	28.66	2590	22.92	2342
Medium	24.86	2297	22.44	3968	17.47	3309
Late	25.28	2327	26.91	2944	19.69	2157

LSD .05 for seed weights: Hybrids over dates 2.03 g, Hybrid within a date 1.72 g. LSD .05 for number of seeds: Hybrids over dates 563 seeds, Hybrid within a date 571 seeds.

Table A-20. Interaction of date and population on seed weights. St. John 1981.

Julian Date of planting					
141		167		189	
Rate (pl/ha)	seed wt. (g/1000)	Rate (pl/ha)	seed wt. (g/1000)	Rate (pl/ha)	seed wt. (g/1000)
24518	26.89	24997	28.81	29661	20.72
55136	26.14	57528	25.29	54777	20.25
101541	25.47	95083	23.92	76186	19.11

LSD .05 for seed weights: Rates over dates 2.03 g. Rates within dates 1.72 g.

Table A-21. Interaction of hybrid and rate on number of seeds per panicle. St. John 1981.

Hybrid Maturity					
Early		Medium		Late	
Rate (pl/ha)	Number of seeds/ panicle	Rate (pl/ha)	Number of seeds/ panicle	Rate (pl/ha)	Number of seeds/ panicle
22844	2527	35402	4244	20930	2896
39588	2075	72957	2984	54897	2448
63747	1947	116133	2346	92930	2084

LSD .05 for number of seeds per panicle: Across hybrids or rates 571 seeds.

Table A-22. Analysis of variance for yield and yield components, Minneola 1981.

Mean Squares

Source of variation	Degrees of freedom	Yield (kg/ha)	Seed Weight (g/1000 seeds)	Number of Seeds/panicle	Number of Heads/ha
Date	2	7749740	340.0980	8943663	9520894240
Error (a)	6	1044102	.9252	389559	859487174
Hybrid	2	6128188**	250.2693**	8173306**	179605361
Rate	2	692847	15.9290**	3499720**	6325559577**
Hybrid x Rate	4	1059854	3.2195	797339	1194063894**
Date x Hybrid	4	974297	18.5621**	1987710**	1100590778**
Date x Rate	4	391685	7.7149**	263530	1332891637**
Date x Hybrid x Rate	8	1520209	1.7693	860418	781300606*
Error (b)	48	797853	1.6639	407727	282555110

** Significant at the 1% level

* Significant at the 5% level

Table A-23. Interaction of date and maturity on seed weight, number of seeds per panicle, and number of heads/ha. Minneola 1981.

Maturity	Julian Date of Planting								
	142			169			190		
	seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha	seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha	seed wt. (g/1000)	Number of seeds/ panicle	Number of heads/ ha
Early	29.75	1858	86591	29.97	2218	77073	22.75	1649	119698
Medium	25.81	2257	108757	21.83	4216	68715	18.64	2432	110256
Late	23.89	2277	110352	24.81	3119	81488	18.36	2689	106525

LSD .05, Seed weight between dates: 1.21 g.

Seed weight within date (between hybrids): 1.22 g.

Number of seeds per panicle between dates: 618 seeds.

Number of seeds per panicle within dates (between hybrids): 605 seeds.

Number of heads/ha between dates: 18701 heads/ha.

Number of heads/ha within dates (between hybrids): 15930 heads/ha.

Table A-24. Interaction of date and rate on seed weight and number of heads. Minneola 1981.

Julian Date of Planting								
142			169			190		
Rate (pl/ha)	seed wt. (g/1000)	Number of heads/ ha	Rate (pl/ha)	seed wt. (g/1000)	Number of heads/ ha	Rate (pl/ha)	seed wt. (g/1000)	Number of heads/ ha
26791	27.47	77342	19375	27.19	62336	21887	19.81	111246
56571	26.16	96956	40784	25.47	72558	33488	19.72	108502
96877	25.81	131402	75468	23.94	92332	60638	20.22	116731

LSD .05, Seed weights between dates: 1.21 g.
Seed weights within date (between rates): 1.22 g.
Number of heads/ha between dates: 18701 heads.
Number of heads/ha within date (between rates): 15930 heads.

Table A-25. Interaction of hybrid and rate on number of heads. Minneola 1981.

Early		Medium		Late	
Rate (pl/ha)	Number of heads/ ha	Rate (pl/ha)	Number of heads/ ha	Rate (pl/ha)	Number of heads/ ha
18897	89718	28325	83067	20811	78139
38153	92173	48917	81552	43774	104292
53581	101422	94365	123109	85036	115933

LSD .05, Between rates, between hybrids, and between rates and hybrids: 15930 heads/ha.

Table A-26. Interaction of Rate, Date and Hybrid on number of heads/ha. Minneola 1981.

Date of Planting	Rate (pl/ha)	Maturity	Number of heads/ha
142	21169	Early	65541
142	43774	Early	82286
142	62432	Early	111947
142	34086	Medium	74153
142	67815	Medium	102379
142	122352	Medium	149741
142	25116	Late	92332
142	58126	Late	106206
142	105847	Late	132518
169	16146	Early	64585
169	35522	Early	73674
169	63867	Early	92810
169	22246	Medium	58318
169	48080	Medium	60279
169	81448	Medium	87548
169	19734	Late	64106
169	38751	Late	83721
169	81090	Late	96638
190	19375	Early	139029
190	35163	Early	120558
190	34445	Early	99508
190	28704	Medium	116731
190	30857	Medium	81999
190	79296	Medium	132040
190	17581	Late	77980
190	34445	Late	122950
190	68173	Late	118644

LSD .05, Between dates: 43457 heads
Within dates: 27592 heads

Table A-27. Praeger's Manhattan Data 1976.

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main culm	Tiller	Main culm	Tiller
May 10, 1976 Planting					
PV-705	47360	855	244	5819	1658
PV-705	70179	674	122	6101	984
PV-705	73193	663	82	7923	1262
PV-705	74485	657	114	6955	910
C42Y	34444	1132	502	3412	1583
C42Y	45207	882	209	6377	1779
C42Y	47360	851	259	4623	1764
C42Y	60277	714	111	5428	754
May 14, 1976 Planting					
PV-705	47360	1196	89	6077	385
PV-705	51666	1105	294	6893	1179
PV-705	55971	1044	52	6613	496
PV-705	71040	901	75	7433	593
PV-705	76637	871	86	7495	600
PV-705	83096	843	180	7199	1631
C42Y	30138	2365	588	3207	1015
C42Y	40902	2857	183	6814	86
C42Y	49513	2316	446	4386	1034
C42Y	55971	1997	150	4417	626
C42Y	60277	1856	526	5556	2071

Table A-27. Praeger's Manhattan Data 1976 (continued).

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culm	Tiller	Main Culm	Tiller
June 2, 1976 Planting					
PV-705	47360	847	48	3852	119
PV-705	58124	594	109	5419	559
PV-705	60277	600	43	7310	269
PV-705	66735	486	117	4868	747
C42Y	30138	1408	734	2883	1977
C42Y	43055	961	443	4235	2044
C42Y	49513	799	255	4265	1517
C42Y	53818	717	55	4864	420
C42Y	65874	562	124	5352	929
C42Y	68888	539	120	5652	1056
June 11, 1976 Planting					
PV-705	53818	1542	119	4359	298
PV-705	54679	1534	102	5818	396
PV-705	64582	1280	144	3935	125
PV-705	68887	1267	163	6082	159
PV-705	90415	1375	180	6682	843
PV-705	101179	1381	45	8198	218
C42Y	43055	1232	114	4391	665
C42Y	51666	1029	55	5028	132
C42Y	61568	924	116	5889	626
C42Y	62429	923	127	5002	562
C42Y	68888	775	116	4959	473

Table A-27. Praeger's Manhattan Data (continued).

July 1, 1976 Planting					
Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culm	Tiller	Main Culm	Tiller
PV-705	52957	1496	133	3835	109
PV-705	61568	1455	47	4010	27
PV-705	66735	1443	32	4862	122
PV-705	68888	1440	142	4151	432
PV-705	77498	1437	170	4289	472
PV-705	82262	1438	179	4852	341
C42Y	44346	3089	1298	3214	1189
C42Y	55971	2780	556	3688	632
C42Y	60277	2683	445	3402	614
C42Y	67596	2548	409	3834	380
C42Y	68888	2531	217	3642	422

Table A-28. Jaiyesimi's Data, Manhattan 1977.

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yield (kg/ha)	
		Main Culm	Tiller	Main Culm	Tiller
May 3, 1977 Planting					
PV-705	45190	3867	2286	3880	838
PV-705	51640	3825	509	4860	795
PV-705	58100	3814	556	4831	305
PV-705	83920	4206	1175	5849	633
PV-705	86070	4244	155	5628	110
PV-705	101140	4477	295	5468	307
C42Y+	38730	4187	2526	3078	2506
C42Y+	40890	4147	4653	3544	4704
C42Y+	43040	4046	2488	3752	2919
C42Y+	79620	4209	1138	5269	1667
C42Y+	81770	4245	322	5456	84
C42Y+	83920	4278	1434	5406	1690
C42Y+	172150	5276	255	6400	206
C42Y+	174300	5291	254	7112	213
May 17, 1977 Planting					
PV-705	43040	5314	1960	2913	1120
PV-705	45190	5257	777	3679	1977
PV-705	53800	5227	1347	3767	1037
PV-705	75320	5387	649	3316	40
PV-705	94680	5593	384	5464	231
PV-705	96830	5616	475	4679	390
PV-705	159240	6223	940	4268	593
PV-705	178600	6364	453	4080	213

Table A-28. Jaiyesimi's Data, Manhattan 1977 (continued).

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yield (kg/ha)	
		Main Culm	Tiller	Main Culm	Tiller
May 17, 1977 Planting (continued)					
C42Y+	32280	3167	1731	2230	1789
C42Y+	43040	5156	1427	2993	1646
C42Y+	45190	4971	882	3149	881
C42Y+	79620	4324	1085	4859	1260
C42Y+	88230	4332	935	4750	1024
June 6, 1977 Planting					
PV-705	43040	5124	630	3580	173
PV-705	154930	6060	1161	7051	312
PV-705	159240	6085	459	5493	116
C42Y+	172150	6341	307	9850	231
June 29, 1977 Planting					
PV-705	43040	308	57	1581	116
PV-705	150630	338	26	3728	116
PV-705	172150	343	41	4540	231
C42Y+	103290	3913	381	1716	116
C42Y+	172150	4204	101	4525	107

Table A-29. Jaiyesimi's Data, Manhattan 1978.

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culms	Tiller	Main Culms	Tiller
April 27, 1978 Planting					
RS-626	38749	4512	1411	3982	1517
RS-626	51666	4080	2171	3787	3597
RS-626	60277	4119	1752	4281	1803
RS-626	64582	4162	747	5530	1418
RS-626	94720	4742	1629	6425	1911
RS-626	103331	4895	636	7009	108
RS-626	111942	5061	937	8178	1798
RS-626	133470	5407	601	7407	885
RS-626	180830	5929	419	6799	404
RS-626	185135	5965	556	5445	620
C42Y+	34444	3408	1008	4807	1590
C42Y+	43055	3127	1858	4391	3762
C42Y+	55971	3004	1277	5052	2433
C42Y+	64582	3085	1385	5580	1764
C42Y+	68888	3204	755	3173	595
C42Y+	86109	3538	518	6688	805
C42Y+	107637	3920	248	7407	603
C42Y+	129164	4230	359	5164	610
C42Y+	142080	4374	586	9311	2641
C42Y+	198052	4784	216	6445	203
May 15, 1978 Planting					
RS-626	38749	3936	2638	3158	2430
RS-626	68888	3591	2153	4376	226
RS-626	73193	3629	893	5606	1219

Table A-29. Jaiyesimi's Data, Manhattan 1978 (continued).

Hybrid	Population (pl/ha)	Model Yields (kg/ha) Main Culms	Model Yields (kg/ha) Tiller	Actual Yields (kg/ha) Main Culms	Actual Yields (kg/ha) Tiller
May 15, 1978 Planting (continued)					
RS-626	77498	3678	2317	5185	3005
RS-626	129164	4062	575	6521	795
RS-626	137775	4123	337	5383	589
RS-626	142080	4163	223	7088	403
RS-626	163608	4324	215	6666	602
C42Y+	34444	2689	1789	3891	2399
C42Y+	38749	2361	1266	5369	1965
C42Y+	43055	2245	552	4622	1606
C42Y+	60277	2139	1061	4852	2578
C42Y+	73193	2219	1364	4063	3111
C42Y+	77498	2252	1241	5319	2912
C42Y+	116248	2384	216	6924	702
C42Y+	124859	2452	496	6616	1399
C42Y+	133470	2491	415	8292	864
May 30, 1978 Planting					
RS-626	34444	3084	2964	2178	2769
RS-626	38749	2761	2590	2667	2667
RS-626	43055	2456	1057	2894	1364
RS-626	77498	1895	970	4276	1920
RS-626	86109	1938	993	4411	1531
RS-626	137775	2134	175	5536	514
RS-626	150691	2162	309	5557	803
RS-626	266939	2122	42	6197	102

Table A-29. Jaiyesimi's Data, Manhattan 1978 (continued).

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culms	Tiller	Main Culms	Tiller
		May 30, 1978 Planting (continued)			
C42Y+	38749	888	565	3209	1833
C42Y+	68888	668	458	4550	2813
C42Y+	73193	662	244	4645	1224
C42Y+	77498	661	469	4612	4722
C42Y+	124859	814	165	5530	612
C42Y+	133470	826	161	6088	1509
C42Y+	150691	851	99	6420	696
		June 9, 1978 Planting			
RS-626	34444	1682	870	2847	1672
RS-626	38749	1596	571	3529	1211
RS-626	73193	1063	174	5796	811
RS-626	77498	1053	124	6176	932
RS-626	146386	1216	64	8074	409
RS-626	210968	1381	121	5358	409
C-42Y+	34444	1638	1030	3072	1916
C-42Y+	38749	1498	502	3382	985
C-42Y+	73193	1598	328	4463	903
C-42Y+	77498	1506	356	4877	821
C-42Y+	129164	1243	211	8253	1227
C-42Y+	146386	1463	231	6601	1021
C-42Y+	193746	1852	42	7953	206

Table A-29. Jaiyesimi's Data, Manhattan 1978 (continued).

Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culms	Tiller	Main Culms	Tiller
June 23, 1978 Planting					
RS-626	38749	2636	1458	2922	1191
RS-626	77498	1218	192	3709	413
RS-626	81804	1177	357	3858	644
RS-626	146386	1057	139	4372	727
C-42Y+	38749	2698	1507	3492	1118
C-42Y+	68888	2051	878	4195	1263
C-42Y+	73193	2021	414	5383	839
C-42Y+	81804	1997	379	4917	1254
C-42Y+	137775	2015	249	6139	771
C-42Y+	154997	2147	219	6937	208
C-42Y+	163608	2175	108	5747	419
July 6, 1978 Planting					
RS-626	38749	2458	247	2275	269
RS-626	77498	2339	368	3059	864
RS-626	81804	2329	177	2879	216
RS-626	133470	2342	325	4283	433
RS-626	142080	2354	252	2832	431
RS-626	146386	2356	311	4447	650
C-42Y+	34444	1920	142	2209	207
C-42Y+	38749	1923	258	3177	118
C-42Y+	73193	1879	77	2108	214
C-42Y+	77498	1873	147	2936	217
C-42Y+	124859	1875	54	3860	108

Table A-29. Jaiyesimi's Data, Manhattan 1978 (continued).

July 6, 1978 Planting (continued)					
Hybrid	Population (pl/ha)	Model Yields (kg/ha)		Actual Yields (kg/ha)	
		Main Culms	Tiller	Main Culms	Tiller
C-42Y+	129164	1875	159	2507	215
C-42Y+	142080	1888	202	3997	434
C-42Y+	150691	1891	147	4037	433
C-42Y+	215273	1969	85	3190	214

Table A-30. Bunck's Data, Manhattan 1978.

Hybrid	Model Yield (kg/ha)	Actual Yield (kg/ha)
	April 26 Planting	
NB-505	6805	5688
RS-626	6706	6889
RS-671	3987	7264
RS-702	3515	5820
	May 11 Planting	
NB-505	5563	4475
RS-626	6587	7142
RS-671	4496	6029
RS-702	1370	5901
	May 29 Planting	
NB-505	4416	5441
RS-626	4720	5901
RS-671	2736	6685
RS-702	1123	6933

Table A-30. Bunck's Data, Manhattan 1978 (continued).

Hybrid	Model Yield (kg/ha)	Actual Yield (kg/ha)
	June 9 Planting	
NB-505	1688	4679
RS-626	1653	5356
RS-671	1263	5211
RS-702	1086	5558
	June 23 Planting	
NB-505	1423	3177
RS-626	1302	3211
RS-671	1371	2883
RS-702	1930	3204
	July 6 Planting	
NB-505	2264	2654
RS-626	2140	4471
RS-671	2513	2958
RS-702	2397	877

Modeled runs based on target population of this study; 120,500.

Table A-31. Schaffer's Data, Manhattan 1979.

Date of Planting			
April 27, 1979			
Population	Hybrid	Model yield (kg/ha)	Actual Yield
59741	NB-505	9222	4048
128093	NB-505	7305	4554
188372	NB-505	7546	5705
48797	RS-626	9525	5782
85575	RS-626	7836	5299
177608	RS-626	6554	5732
39289	RS-671	10156	6627
97953	RS-671	6951	6318
173303	RS-671	6688	6527
62863	RS-702	9349	6183
103874	RS-702	7544	6387
248113	RS-702	6886	5647
May 17, 1979			
76425	NB-505	8326	4743
152850	NB-505	6178	5374
310545	NB-505	6910	5388
64584	RS-626	7690	5255
114638	RS-626	6306	6249
226046	RS-626	6686	6526
62970	RS-671	7061	5990
138319	RS-671	6179	6771
242731	RS-671	6763	6173
68890	RS-702	8479	6279
118943	RS-702	6732	6338

Table A-31. Schaffer's Data, Manhattan 1979 (continued).

Population	Hybrid	Model yield (kg/ha)	Actual Yield
		Date of Planting	
		May 17, 1979 (continued)	
283634	RS-702	7599	6174
		June 1, 1979	
57587	NB-505	5743	3692
90418	NB-505	4980	4694
180299	NB-505	5544	5211
55435	RS-626	11587	6296
107103	RS-626	7947	5551
195369	RS-626	7672	6054
61863	RS-671	7868	5695
95262	RS-671	7277	6257
193216	RS-671	7760	6839
56512	RS-702	8710	6714
106565	RS-702	7125	6526
181913	RS-702	6250	6607
		June 15, 1979	
55974	NB-505	8256	3320
82346	NB-505	8423	3433
167920	NB-505	7438	4293
47362	RS-626	9170	2985
89343	RS-626	7634	4064
178146	RS-626	6864	4889
54897	RS-671	9707	2608
87189	RS-671	7216	4139
171687	RS-671	6943	5184

Table A-31. Schaffer's Data, Manhattan 1979 (continued).

Date of Planting			
June 15, 1979 (continued)			
Population	Hybrid	Model yield (kg/ha)	Actual Yield
51668	RS-702	5593	4975
91495	RS-702	4961	5793
165767	RS-702	5278	5821

Table A-32. Schaffer's Data, Hutchinson 1979.

May 8, 1979			
Population (pl/ha)	Hybrid	Model Yield (kg/ha)	Actual Yield
85575	NB-505	9095	4420
156618	NB-505	9025	3927
255109	NB-505	9663	4133
63508	RS-626	7212	5381
114638	RS-626	6958	5440
207209	RS-626	7870	5072
48976	RS-671	8276	5372
119482	RS-671	7982	5465
205056	RS-671	7814	5363
67814	RS-702	6552	5457
115176	RS-702	6047	5249
250803	RS-702	6385	5383
June 14, 1979			
55435	NB-505	10545	3357
94724	NB-505	7688	4256
175993	NB-505	7399	4349
53820	RS-626	10373	3764
121634	RS-626	7029	5235
215283	RS-626	7567	4941
53282	RS-671	7838	4213
97953	RS-671	6105	4058
203442	RS-671	6766	4521
54897	RS-702	5803	3466

Table A-32. Schaffer's Data, Hutchinson 1979.

June 14, 1979 (continued)			
Population (pl/ha)	Hybrid	Model Yield (kg/ha)	Actual Yield
106027	RS-702	3894	3573
183528	RS-702	4316	3977
July 11, 1979			
43057	NB-505	3860	3016
74810	NB-505	1959	2757
139395	NB-505	1485	2356
48977	RS-626	3043	2617
108180	RS-626	1572	2044
209362	RS-626	1829	1854
50053	RS-671	2673	2774
95801	RS-671	1594	2070
179223	RS-671	1737	1601
40365	RS-702	3137	2151
94724	RS-702	1464	2344
168458	RS-702	1799	1777

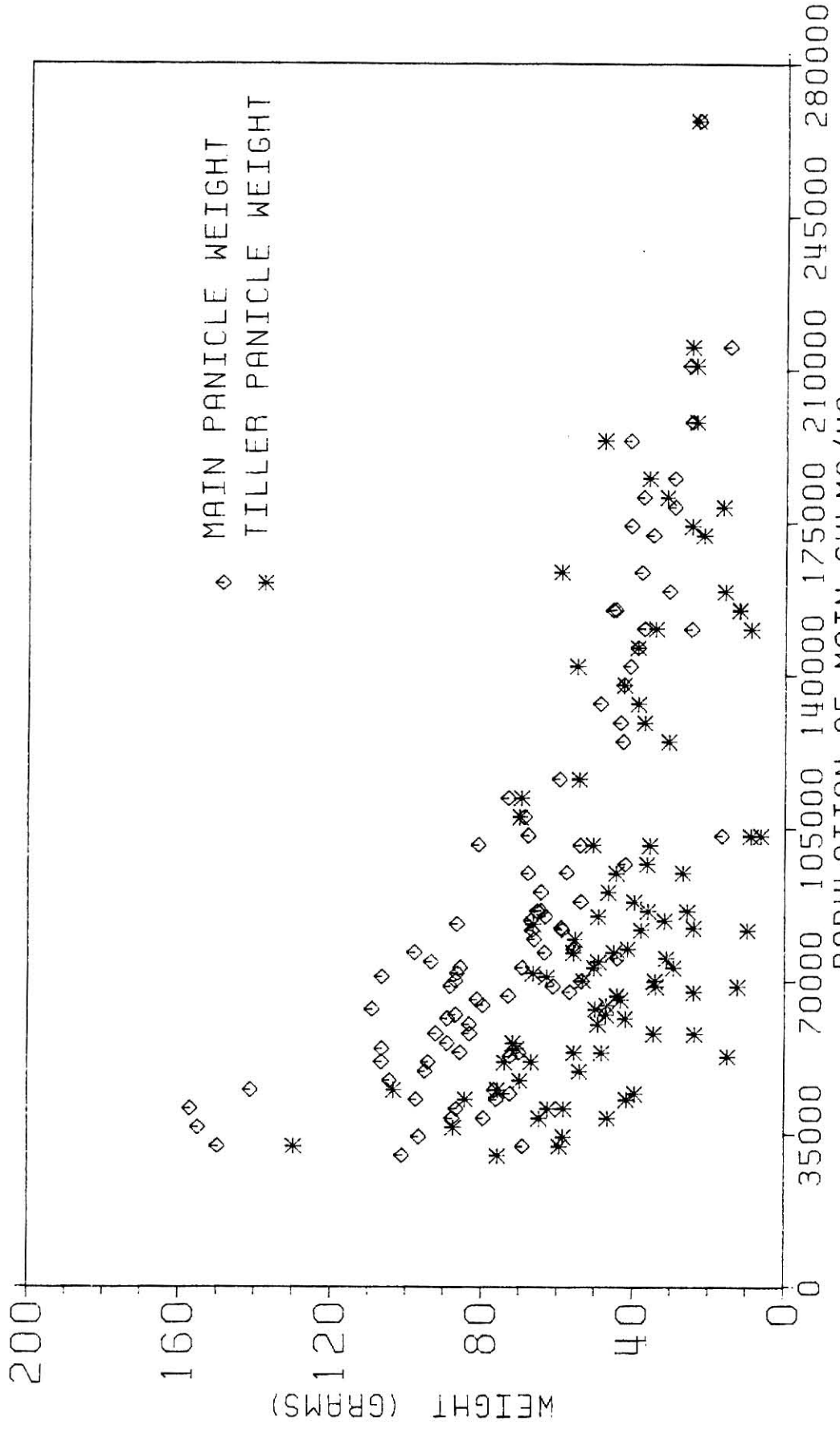

Figure A-1. Relationship of main heads and tiller heads over main culm population.

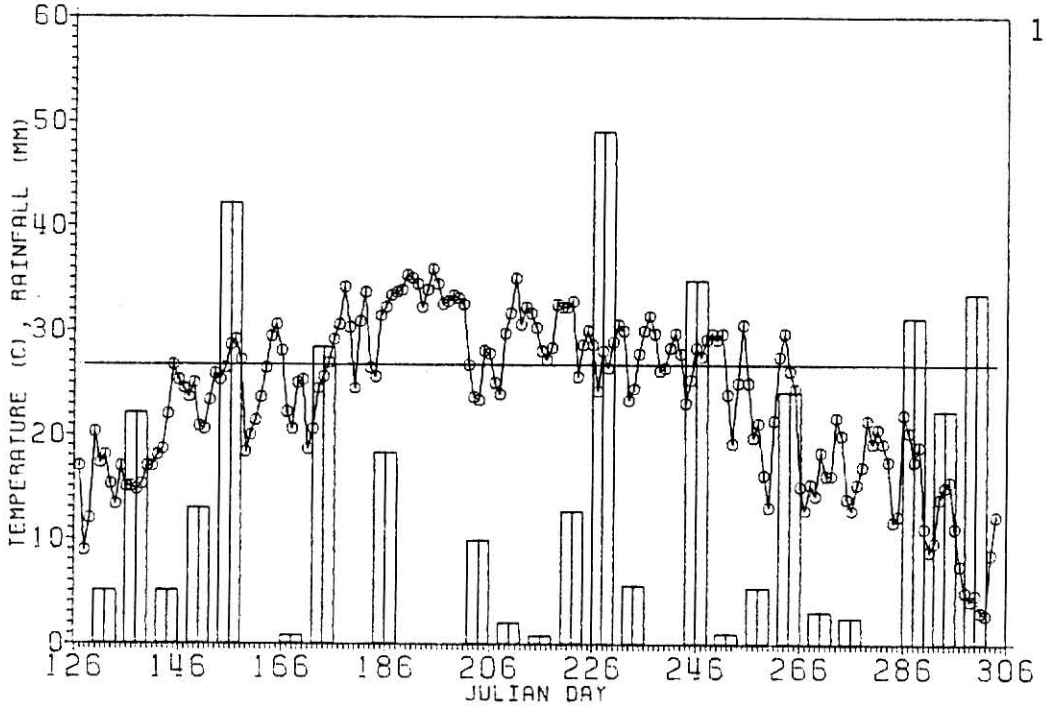

Figure A-2. Manhattan 1980 climatic data summary. Average daily air temperature (symbols and line), rainfall (bars), and 26.7C line.

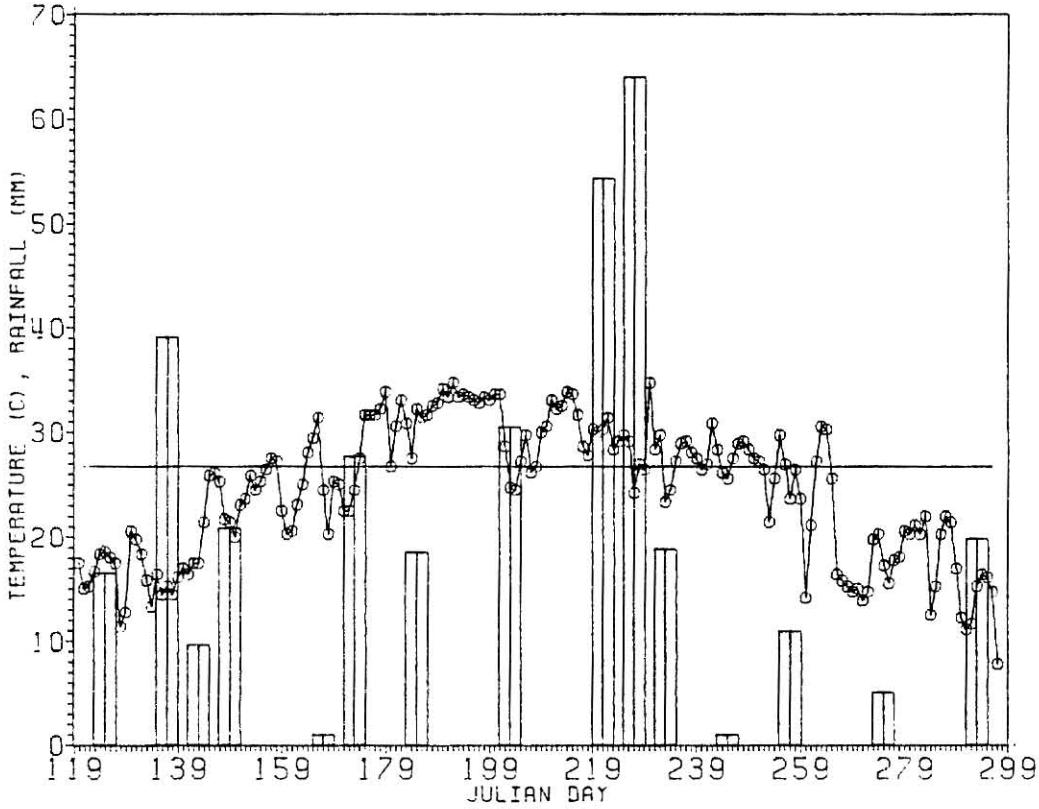

Figure A-3. Hutchinson 1980 climatic data summary. Average daily air temperature (symbols and line), rainfall (bars), and 26.7C line.

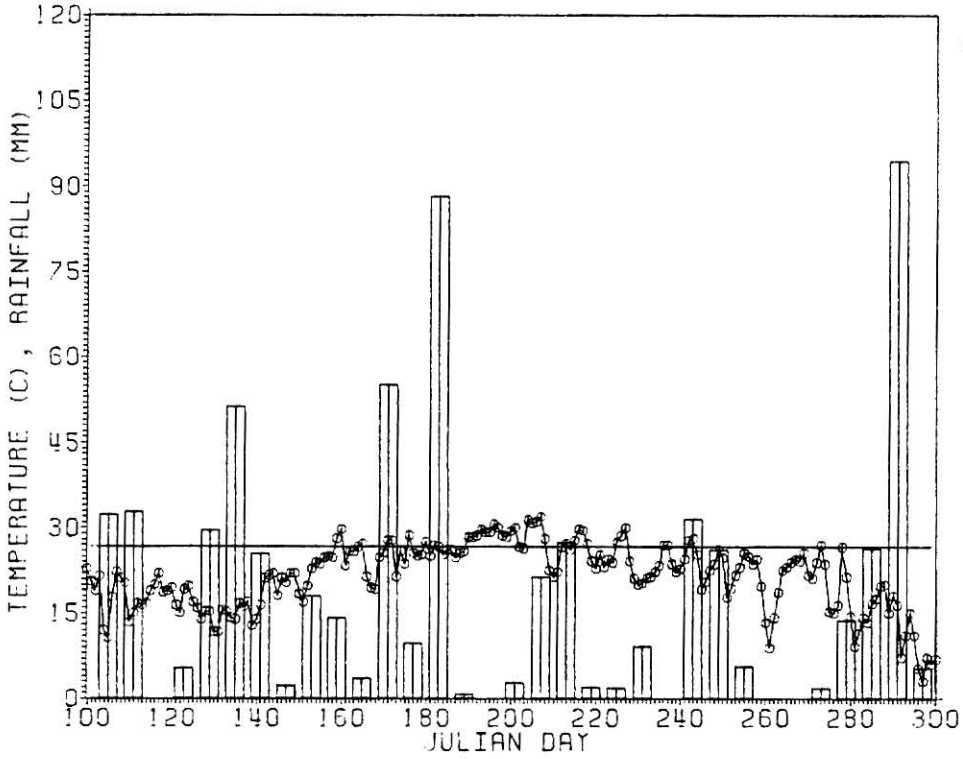

Figure A-4. Parsons 1981 climatic data summary. Average daily air temperature (symbols and line), rainfall (bars), and 26.7C line.

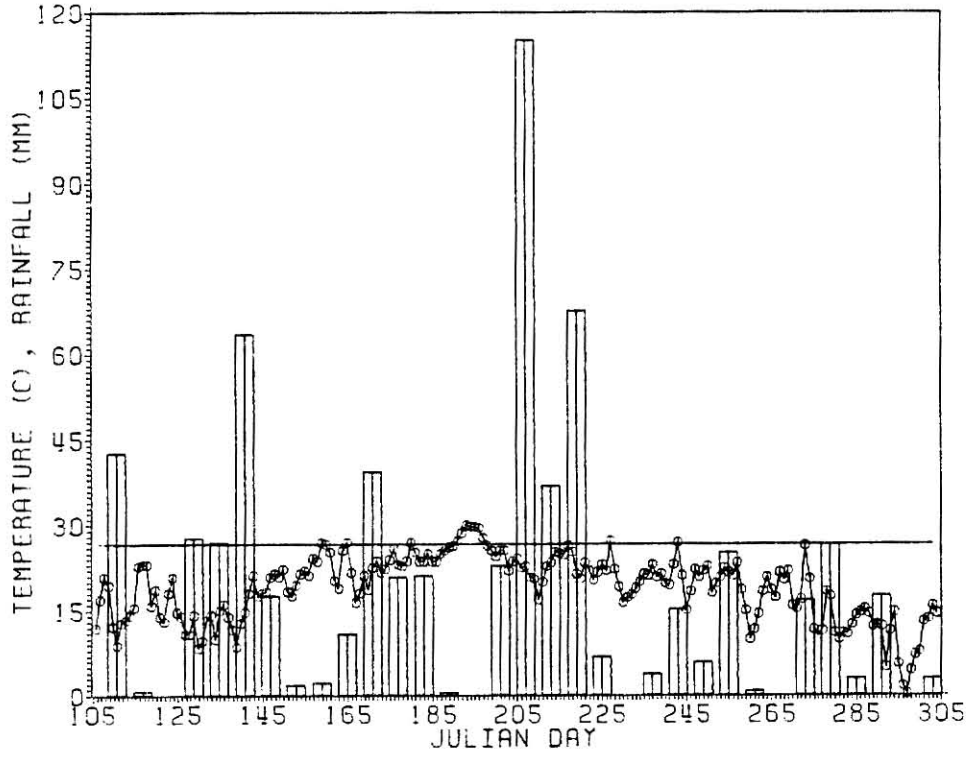

Figure A-5. Powhattan 1981 climatic data summary. Average daily air temperature (line and symbols), rainfall (bars), and 26.7C line.

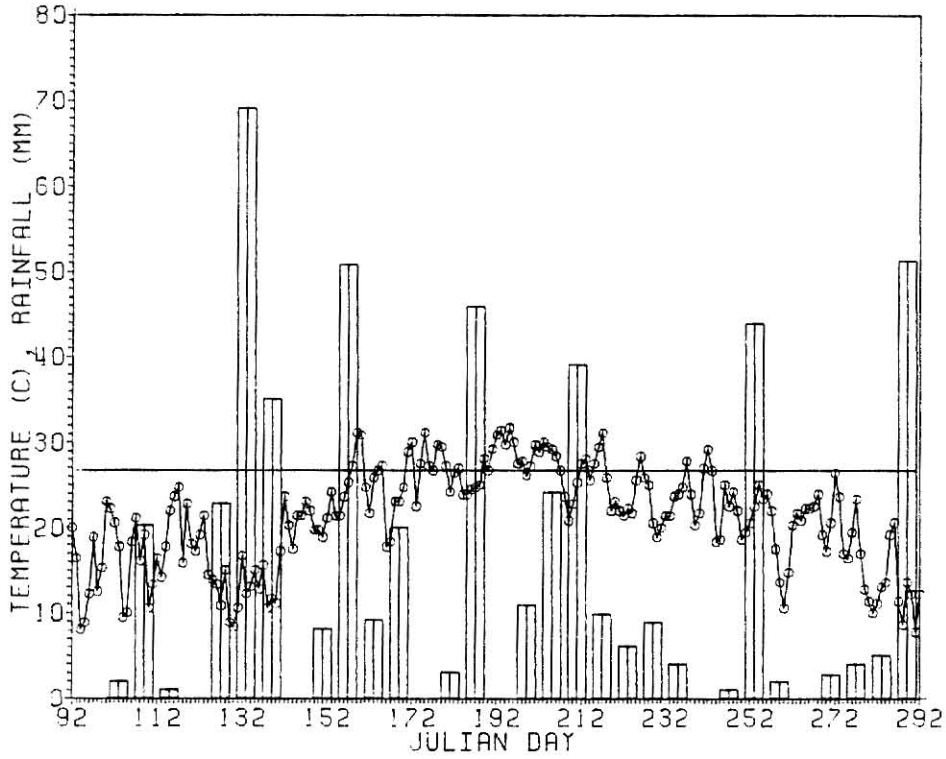

Figure A-6. St. John 1981 climatic data summary. Average air temperature (line and symbols), rainfall (bars), and 26.7C line.

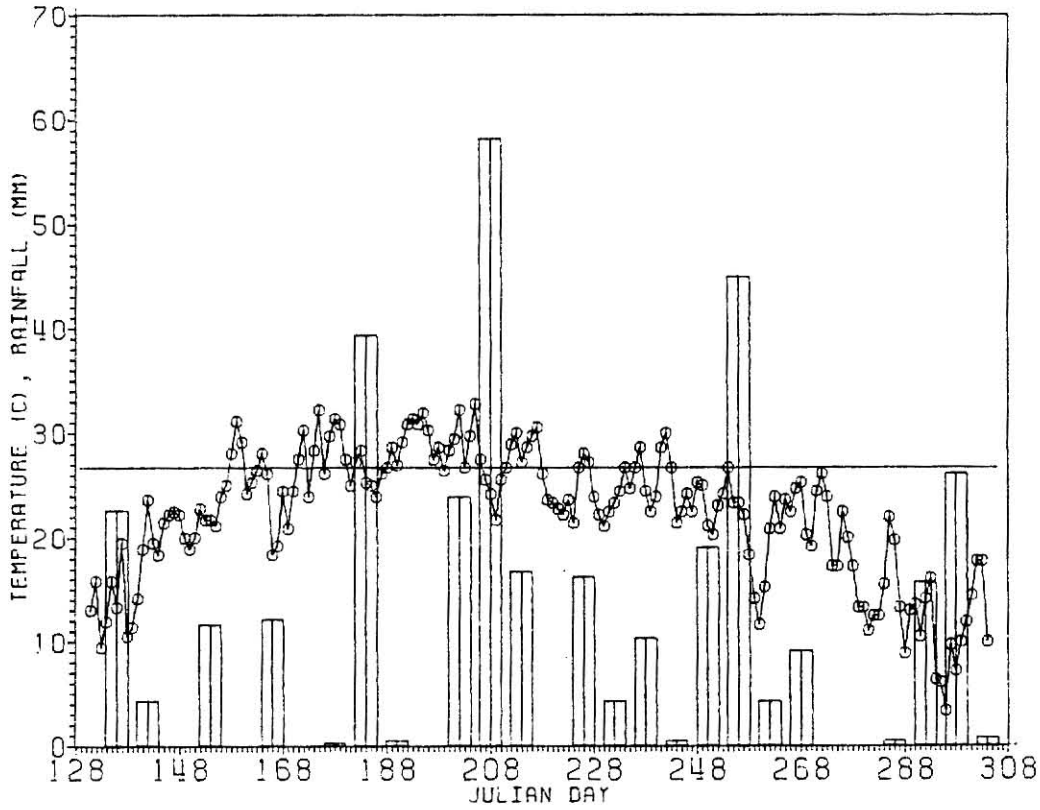

Figure A-7. Minneola 1981 climatic data summary. Average air temperature (symbols and line), rainfall (bars), and 26.7C line.

APPENDIX B

Table B-0. SORGHUM MODEL INPUT

	Columns	Format	Variable Name	Variable
Card 1	1-80	20A4	TITLE	Title desired on output
Card 2	1-4	I4	KI	Number of days of climatic data provided
	5-8	I4	N	Number of leaves produced by the plant
	9-12	I4	MO	Month in which planted
	13-16	I4	ND	Data on which planted
	17-20	I4	IYD	Year of planting
	21-25	F5.1	ROSPZ	Row spacing, cm
	26-35	F10.0	P	Plant population, plants/hectare
	36-40	F5.2	LAT	Latitude
	41-45	F5.2	SW	Initial extractable soil water content, cm
	46-50	F5.2	UL	Extractable soil water capacity, cm
	53-55	A3	UNITS	Units in which climatic data punched MET or ENG
	56-60	F5.2	SDEPTH	Seedling depth, cm
	61-65	F5.2	U	Stage 1 evaporation, cm
	66-70	F5.2	CONA	Slope of stage 2 evaporation, cm/day
	71-76	F6.0	TILLER	Number of tillers
	77-80	I4	IFREQ	Frequency of printing output data, days
Card 3	1-7	F7.2	XMAX(1)	Maximum area of first leaf, cm^2
	8-14	F7.2	XMAX(2)	Maximum area of second leaf, cm^2
	:			
	64-70	F7.2	XMAX(10)	Maximum area of tenth leaf, cm^2
Card 4	1-7	F7.2	XMAX(11)	Maximum area of eleventh leaf, cm^2
	:	F7.2	XMAX(N)	Maximum area of last (flag) leaf, cm^2

Card 5 1-80 20A4 FMT Format for reading climatic data

Climatic data

One card per day, punched according to the previous format. Data for each day must be read in the following order:

I	Julian Day
TEMPMX (I)	Maximum temperature, F or C
TEMPMN (I)	Minimum temperature, F or C
SOLRAD (I)	Total solar radiation, ly.
RAIN (I)	Rainfall or irrigation, in. or cm

I must be read under an I format and the others under R, E, or G format.

Table B-1. Input data for SORGF. Praeger's 1976 model runs.

```
---------- AL'S 1976 DATA DATE 1 RUN 1 PV705  BASED ON MAIN/TILLERS ----
 215  21    5  101976 76.2      4736039.00  17.  17.  ENG  2.5 1.02  .33 21527
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
    85.
(T71,I3,T1,F3.0,F2.0,F3.0,T17,F4.2)
07028595        0000                                                    091 040176
08654560        0000                                                    092 040276
06739588        0000                                                    093 040376
05537248        0000                                                    094 040476
07530593        0000                                                    095 040576
07941517        0000                                                    096 040676
07053095        0026                                                    097 040776
05749244        0103                                                    098 040876
07339554        0000                                                    099 040976
07952491        0000                                                    100 041076
07246200        0003                                                    101 041176
07137587        0000                                                    102 041276
07949460        0000                                                    103 041376
08664480        0000                                                    104 041476
07864377        0001                                                    105 041576
07553624        0004                                                    106 041676
07154116        0173                                                    107 041776
06551539        0018                                                    108 041876
07044560        0000                                                    109 041976
06150037        0058                                                    110 042076
07041644        0135                                                    111 042176
07653567        0000                                                    112 042276
08264474        0000                                                    113 042376
07651176        0040                                                    114 042476
05842477        0013                                                    115 042576
05538248        0000                                                    116 042676
05244094        0005                                                    117 042776
04844069        0021                                                    118 042876
06345518        0000                                                    119 042976
06351331        0001                                                    120 043076
07339648        0003                                                    121 050176
06747654        0000                                                    122 050276
06129721        0000                                                    123 050376
07942648        0000                                                    124 050476
07559281        0001                                                    125 050576
06343615        0122                                                    126 050676
06640690        0000                                                    127 050776
06836709        0000                                                    128 050876
07046388        0000                                                    129 050976
07751586        0000                                                    130 051076
08147693        0000                                                    131 051176
07453335        0001                                                    132 051276
06446384        0020                                                    133 051376
07345547        0000                                                    134 051476
06756127        0004                                                    135 051576
06252240        0074                                                    136 051676
06845741        0007                                                    137 051776
07339734        0000                                                    138 051876
08353709        0000                                                    139 051976
08462642        0000                                                    140 052076
08462512        0000                                                    141 052176
07963269        0054                                                    142 052276
07060237        0080                                                    143 052376
06453257        0003                                                    144 052476
```

Table B-1. (continued)

07152539	0000	145 052576
06153123	0004	146 052676
07650587	0013	147 052776
08152703	0000	148 052876
08259540	0000	149 052976
07763350	0000	150 053076
08053563	0000	151 053176
08555615	0000	152 060176
08360590	0000	153 060276
08259679	0000	154 060376
08252701	0000	155 060476
08260585	0000	156 060576
08361594	0001	157 060676
08458599	0000	158 060776
08665614	0000	159 060876
08666640	0000	160 060976
09269572	0000	161 061076
09272664	0001	162 061176
09574707	0000	163 061276
09563699	0000	164 061376
08872524	0001	165 061476
07757610	0006	166 061576
08749699	0000	167 061676
09066599	0000	168 061776
07357728	0170	169 061876
07748685	0000	170 061976
08451745	0000	171 062076
08562684	0000	172 062176
08764596	0000	173 062276
08065098	0105	174 062376
08162716	0166	175 062476
08754731	0000	176 062576
09069693	0000	177 062676
09368512	0000	178 062776
08966242	0021	179 062876
08366691	0122	180 062976
08055737	0000	181 063076
08259659	0000	182 070176
08066479	0000	183 070276
07566170	0000	184 070376
08461606	0000	185 070476
08456646	0000	186 070576
08658662	0000	187 070676
09269549	0000	188 070776
09469647	0000	189 070876
09573693	0000	190 070976
09270697	0000	191 071076
09172664	0000	192 071176
09171678	0000	193 071276
09371679	0000	194 071376
09373672	0000	195 071476
09169347	0000	196 071576
08361715	0008	197 071676
07862166	0017	198 071776
09164607	0064	199 071876
09172605	0000	200 071976
09474654	0000	201 072076
09074414	0000	202 072176
09570654	0000	203 072276
09774666	0000	204 072376

Table B-1. (continued)

09571650	0000	205 072476
09767624	0000	206 072576
09975548	0000	207 072676
09975611	0000	208 072776
09471588	0026	209 072876
09467612	0000	210 072976
10177591	0000	211 073076
09473543	0000	212 073176
8267478	0000	213 080176
8363553	0000	214 080276
8457632	0000	215 080376
9270614	0000	216 080476
9069391	0000	217 080576
8465623	0004	218 080676
8658613	0000	219 080776
9466609	0000	220 080876
10571635	0000	221 080976
9478278	0000	222 081076
9983347	0000	223 081176
9269580	0022	224 081276
9568583	0000	225 081376
8870484	0003	226 081476
8767536	0000	227 081576
9968578	0000	228 081676
9875585	0000	229 081776
9875582	0000	230 081876
9266617	0000	231 081976
9461584	0000	232 082076
9570562	0000	233 082176
9770523	0000	234 082276
9568543	0000	235 082376
9169390	0000	236 082476
9263529	0000	237 082576
10072559	0000	238 082676
9577527	0000	239 082776
8954598	0000	240 082876
9254580	0000	241 082976
9057543	0000	242 083076
8767315	0000	243 083176
8756469	0000	244 090176
9060544	0000	245 090276
9567540	0000	246 090376
9366524	0000	247 090476
10070524	0000	248 090576
9773513	0000	249 090676
9267544	0000	250 090776
8155183	0000	251 090876
7654552	0019	252 090976
8043547	0000	253 091076
8961506	0000	254 091176
8666445	0000	255 091276
7862178	0023	256 091376
8564452	0001	257 091476
7866125	0000	258 091576
8160389	0089	259 091676
8659432	0000	260 091776
8963366	0000	261 091876
8068299	0000	262 091976
7256483	0000	263 092076
7747484	0000	264 092176

Table B-1. (continued)

```
8852442         0000                                                    265 092276
7762450         0004                                                    266 092376
8149454         0000                                                    267 092476
7355076         0000                                                    268 092576
7258280         0092                                                    269 092676
6452411         0000                                                    270 092776
6243429         0000                                                    271 092876
7437466         0000                                                    272 092976
8943464         0000                                                    273 093076
9451448         0000                                                    274 100176
9250391         0000                                                    275 100276
8161236         0000                                                    276 100376
7454126         0035                                                    277 100476
6149312         0034                                                    278 100576
5836151         0000                                                    279 100676
5741381         0000                                                    280 100776
6430423         0000                                                    281 100876
6943425         0000                                                    282 100976
8243404         0000                                                    283 101076
9246402         0000                                                    284 101176
8156358         0000                                                    285 101276
7544394         0000                                                    286 101376
8341387         0000                                                    287 101476
7346391         0000                                                    288 101576
5231403         0000                                                    289 101676
5025353         0000                                                    290 101776
4839079         0000                                                    291 101876
4437024         0003                                                    292 101976
5925366         0000                                                    293 102076
6130372         0000                                                    294 102176
6831304         0000                                                    295 102276
6852152         0016                                                    296 102376
5939078         0000                                                    297 102476
5237266         0000                                                    298 102576
4831133         0000                                                    299 102676
4434104         0054                                                    300 102776
4732121         0001                                                    301 102876
4737049         0000                                                    302 102976
5138113         0042                                                    303 103076
6232317         0001                                                    304 103176
                                                                        305
---------- AL'S 1976 DATA DATE 1 RUN 2 PV705 ----------
     21    5  101976 76.2      7017939.00  17.  17.  ENG  2.5 1.02  .33 18513
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
---------- AL'S 1976 DATA DATE 1 RUN 3 PV705 ----------
     21    5  101976 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 12916
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
---------- AL'S 1976 DATA DATE 1 RUN 4 PV705 ----------
     21    5  101976 76.2      7448539.00  17.  17.  ENG  2.5 1.02  .33 18514
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
---------- AL'S 1976 DATA DATE 1 RUN 1 C42Y ----------
     21    5  101976 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 25833
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
```

Table B-1. (continued)

```
   103.
---------- AL'S 1976 DATA DATE 1 RUN 2 C42Y ----------
     21    5  101976 76.2      4520739.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
  240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
---------- AL'S 1976 DATA DATE 1 RUN 3 C42Y ----------
     21    5  101976 76.2      4736039.00  17.  17.  ENG  2.5 1.02  .33 23034
    1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
  240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
---------- AL'S 1976 DATA DATE 1 RUN 4 C42Y ----------
     21    5  101976 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33 14208
    1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
  240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
---------- AL'S 1976 DATA DATE 2 RUN 1 PV705 ----------
     20    5  141976 76.2      4736039.00  17.  17.  ENG  2.5 1.02  .33  5597
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 2 PV705 ----------
     20    5  141976 76.2      5166639.00  17.  17.  ENG  2.5 1.02  .33 21527
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 3 PV705 ----------
     20    5  141976 76.2      5597139.00  17.  17.  ENG  2.5 1.02  .33  4305
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 4 PV705 ----------
     20    5  141976 76.2      7104039.00  17.  17.  ENG  2.5 1.02  .33  8611
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 5 PV705 ----------
     20    5  141976 76.2      7663739.00  17.  17.  ENG  2.5 1.02  .33 10764
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 6 PV705 ----------
     20    5  141976 76.2      8309639.00  17.  17.  ENG  2.5 1.02  .33 24541
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
---------- AL'S 1976 DATA DATE 2 RUN 1 C42Y ----------
     18    5  141976 76.2      3013839.00  17.  17.  ENG  2.5 1.02  .33 12916
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
---------- AL'S 1976 DATA DATE 2 RUN 2 C42Y ----------
     18    5  141976 76.2      4090239.00  17.  17.  ENG  2.5 1.02  .33  4305
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
---------- AL'S 1976 DATA DATE 2 RUN 3 C42Y ----------
     18    5  141976 76.2      4951339.00  17.  17.  ENG  2.5 1.02  .33 15069
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
---------- AL'S 1976 DATA DATE 2 RUN 4 C42Y ----------
     18    5  141976 76.2      5597139.00  17.  17.  ENG  2.5 1.02  .33  6458
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
---------- AL'S 1976 DATA DATE 2 RUN 5 C42Y ----------
     18    5  141976 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33 25833
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
```

Table B-1. (continued)

```
---------- AL'S 1976 DATA DATE 3 RUN 1 PV705 ----------
     21   6   21976 76.2      4736039.00  17.  17.  ENG  2.5 1.02  .33  4305
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 3 RUN 2 PV705 ----------
     21   6   21976 76.2      5812439.00  17.  17.  ENG  2.5 1.02  .33 16217
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 3 RUN 3 PV705 ----------
     21   6   21976 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33  6458
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 3 RUN 4 PV705 ----------
     21   6   21976 76.2      6673539.00  17.  17.  ENG  2.5 1.02  .33 23680
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 3 RUN 1 C42Y ----------
     20   6   21976 76.2      3013839.00  17.  17.  ENG  2.5 1.02  .33 27124
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 3 RUN 2 C42Y ----------
     20   6   21976 76.2      4305539.00  17.  17.  ENG  2.5 1.02  .33 32291
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 3 RUN 3 C42Y ----------
     20   6   21976 76.2      4951339.00  17.  17.  ENG  2.5 1.02  .33 24972
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 3 RUN 4 C42Y ----------
     20   6   21976 76.2      5381839.00  17.  17.  ENG  2.5 1.02  .33  6458
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 3 RUN 5 C42Y ----------
     20   6   21976 76.2      6587439.00  17.  17.  ENG  2.5 1.02  .33 21527
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 3 RUN 6 C42Y ----------
     20   6   21976 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 22388
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 4 RUN 1 PV705 ----------
     21   6  111976 76.2      5381839.00  17.  17.  ENG  2.5 1.02  .33  6458
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 2 PV705 ----------
     21   6  111976 76.2      5467939.00  17.  17.  ENG  2.5 1.02  .33  5567
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 3 PV705 ----------
     21   6  111976 76.2      6458239.00  17.  17.  ENG  2.5 1.02  .33 10764
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 4 PV705 ----------
```

Table B-1. (continued)

```
    21   6  111976 76.2      6888739.00  17.  17.  ENG  2.5 1.02  .33 12916
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 5 PV705 ----------
    21   6  111976 76.2      9041539.00  17.  17.  ENG  2.5 1.02  .33 15930
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 6 PV705 ----------
    21   6  111976 76.2     10117939.00  17.  17.  ENG  2.5 1.02  .33  4305
   1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
 235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
 230.
---------- AL'S 1976 DATA DATE 4 RUN 1 C42Y ----------
    20   6  111976 76.2      4305539.00  17.  17.  ENG  2.5 1.02  .33  6456
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 4 RUN 2 C42Y ----------
    20   6  111976 76.2      5166639.00  17.  17.  ENG  2.5 1.02  .33  4305
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 4 RUN 3 C42Y ----------
    20   6  111976 76.2      6156839.00  17.  17.  ENG  2.5 1.02  .33 11625
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 4 RUN 4 C42Y ----------
    20   6  111976 76.2      6242939.00  17.  17.  ENG  2.5 1.02  .33 12916
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 4 RUN 5 C42Y ----------
    20   6  111976 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 15069
   1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
 233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
---------- AL'S 1976 DATA DATE 5 RUN 1 PV705 ----------
    22   7   11976 76.2      5295739.00  17.  17.  ENG  2.5 1.02  .33  7319
   1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
 217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
 358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 2 PV705 ----------
    22   7   11976 76.2      6156839.00  17.  17.  ENG  2.5 1.02  .33  3013
   1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
 217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
 358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 3 PV705 ----------
    22   7   11976 76.2      6673539.00  17.  17.  ENG  2.5 1.02  .33  2153
   1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
 217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
 358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 4 PV705 ----------
    22   7   11976 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33  9903
   1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
 217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
 358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 5 PV705 ----------
    22   7   11976 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 12916
   1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
 217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
 358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 6 PV705 ----------
```

Table B-1. (continued)

```
     22    7   11976 76.2      8226239.00  17.  17.  ENG  2.5 1.02  .33 14208
    1.     2.     5.    10.     19.    24.    31.    94.   112.   175.
  217.   276.   355.   451.    511.   516.   585.   617.   567.   471.
  358.   207.
---------- AL'S 1976 DATA DATE 5 RUN 1 C42Y ----------
     18    7   11976 76.2      4434639.00  17.  17.  ENG  2.5 1.02  .33 30138
    1.     3.     6.     8.     16.    33.    41.    76.   118.   171.
  227.   274.   325.   396.    445.   444.   368.   216.
---------- AL'S 1976 DATA DATE 5 RUN 2 C42Y ----------
     18    7   11976 76.2      5597139.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     3.     6.     8.     16.    33.    41.    76.   118.   171.
  227.   274.   325.   396.    445.   444.   368.   216.
---------- AL'S 1976 DATA DATE 5 RUN 3 C42Y ----------
     18    7   11976 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33 15069
    1.     3.     6.     8.     16.    33.    41.    76.   118.   171.
  227.   274.   325.   396.    445.   444.   368.   216.
---------- AL'S 1976 DATA DATE 5 RUN 4 C42Y ----------
     18    7   11976 76.2      6759639.00  17.  17.  ENG  2.5 1.02  .33 15930
    1.     3.     6.     8.     16.    33.    41.    76.   118.   171.
  227.   274.   325.   396.    445.   444.   368.   216.
---------- AL'S 1976 DATA DATE 5 RUN 5 C42Y ----------
     18    7   11976 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33  8611
    1.     3.     6.     8.     16.    33.    41.    76.   118.   171.
  227.   274.   325.   396.    445.   444.   368.   216.
```

Table B-2. Input data for SORGF. Jaiyesimi's 1977 model runs.

```
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 1  PV705   BASED ON MAINS/TILLERS
 168   21    5   31977 76.2      4519039.00  17.  17.  ENG  2.5 1.02 0.33 43040
    1.     3.     5.     8.     16.    25.    59.    90.   139.   162.
  238.   305.   447.   507.    502.   531.   494.   403.   291.   214.
   85.
(T71,I3,T1,F3.0,F2.0,F3.0,T17,F4.2)
7754440                                                    104        104
7558222                                                    105        105
7653278                                                    106        106
7557295          24                                        107        107
6758128                                                    108        108
7257404          14                                        109        109
7056240          16                                        110        110
6347 84          87                                        111        111
6152246          55                                        112        112
7347586                                                    113        113
6850661                                                    114        114
6737661                                                    115        115
7538649                                                    116        116
8255642                                                    117        117
8061563                                                    118        118
7048432                                                    119        119
6756171          36                                        120        120
7460355          02                                        121        121
7662400                                                    122        122
8461543                                                    123        123
8565486          01                                        124        124
8463474                                                    125        125
```

Table B-2. (continued)

8266530		126	126
7762272		127	127
8261417		128	128
7759638		129	129
7447679		130	130
7650542		131	131
8148698		132	132
8052484		133	133
8559667		134	134
8664672	03	135	135
8769510		136	136
8460454	22	137	137
8368487		138	138
7761 62		139	139
7658388	478	140	140
7360386	136	141	141
7555495	03	142	142
8058550	95	143	143
8564607		144	144
8467533		145	145
8568400		146	146
7965694	11	147	147
8461323	32	148	148
8163572	32	149	149
7761 27	119	150	150
7859685	52	151	151
8658535		152	152
8159725		153	153
8862634	01	154	154
9474695		155	155
9870722		156	156
9265619	09	157	157
8155735		158	158
9063702		159	159
8866619		160	160
9668673		161	161
9474642		162	162
8662562	207	163	163
8266386		164	164
8666671	03	165	165
9168638		166	166
8568275		167	167
8569303	23	168	168
8163408	628	169	169
8364633	34	170	170
8368577	04	171	171
8565307	22	172	172
8565488	132	173	173
8169293		174	174
8666366	82	175	175
8865612	10	176	176
9067657		177	177
9369717		178	178
8873485		179	179
8558682		180	180
8368612		181	181
8755727		182	182
9170577	07	183	183
9576687	01	184	184
9575716		185	185

Table B-2. (continued)

9578715		186	186
9879683		187	187
9473443		188	188
9268518	03	189	189
8663689	10	190	190
9168625		191	191
8665587	104	192	192
8973441		193	193
9675689		194	194
9778705		195	195
9575551		196	196
9776653	04	197	197
9777661		198	198
9679681		199	199
9678674		200	200
9776670		201	201
9175277		202	202
8974579		203	203
9273577		204	204
10478612		205	205
8273267	01	206	206
8069482		207	207
8559673		208	208
8966566		209	209
9566675		210	210
9967675		211	211
8961347		212	212
9051664		213	213
9362673	05	214	214
8766262	02	215	215
8865590	97	216	216
8870412	11	217	217
9267604	49	218	218
9779591		219	219
9878582		220	220
9578498		221	221
9372601		222	222
7859442	64	223	223
8357606	01	224	224
9165562		225	225
8167359		226	226
9368584	57	227	227
8469216	55	228	228
8161611	27	229	229
7862367		230	230
8164422		231	231
8564464		232	232
8567476	02	233	233
6861116	04	234	234
8162287	150	235	235
7865381		236	236
8864230		237	237
9576575	05	238	238
9174415		239	239
7764287	195	240	240
8057580	01	241	241
8869477		242	242
8971334		243	243
8367283	125	244	244
8970414	02	245	245

Table B-2. (continued)

```
8770285          02                                                  246        246
8070208          27                                                  247        247
8466407          02                                                  248        248
8560545                                                              249        249
8663464                                                              250        250
8767508                                                              251        251
8661463                                                              252        252
8048502                                                              253        253
8260273                                                              254        254
8867305         117                                                  255        255
6864158         256                                                  256        256
7450453                                                              257        257
6756130                                                              258        258
8560439          05                                                  259        259
8761393                                                              260        260
8268521          01                                                  261        261
7353529                                                              262        262
7252243                                                              263        263
8562426          06                                                  264        264
8156499                                                              265        265
8663312          08                                                  266        266
7951508          25                                                  267        267
8058489                                                              268        268
8850465                                                              269        269
7758478                                                              270        270
                                                                                271
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 2  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      5164039.00  17.  17.  ENG  2.5 1.02 0.33 10760
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 3  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      5810039.00  17.  17.  ENG  2.5 1.02 0.33 12910
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 4  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      8392039.00  17.  17.  ENG  2.5 1.02 0.33 32280
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 5  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      8607039.00  17.  17.  ENG  2.5 1.02 0.33  4300
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 6  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2     10114039.00  17.  17.  ENG  2.5 1.02 0.33  8610
     1.     3.     5.     8.    16.    25.    59.    90.   139.   162.
   238.   305.   447.   507.   502.   531.   494.   403.   291.   214.
     85.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 1  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      3873039.00  17.  17.  ENG  2.5 1.02 0.33 38730
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 2  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21    5   31977 76.2      4089039.00  17.  17.  ENG  2.5 1.02 0.33 75320
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
```

Table B-2. (continued)

```
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 3  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2     4304039.00  17.  17.  ENG  2.5 1.02 0.33 43040
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 4  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2     7962039.00  17.  17.  ENG  2.5 1.02 0.33 80130
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 5  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2     8177039.00  17.  17.  ENG  2.5 1.02 0.33  8610
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 6  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2     8392039.00  17.  17.  ENG  2.5 1.02 0.33 86730
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 7  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2    17215039.00  17.  17.  ENG  2.5 1.02 0.33  8610
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 1   RUN 8  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      21   5   31977 76.2    17430039.00  17.  17.  ENG  2.5 1.02 0.33  8610
     1.     3.     6.     8.    16.    35.    60.    95.   121.   176.
   240.   295.   371.   433.   512.   505.   475.   421.   339.   221.
   103.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 1  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     4304039.00  17.  17.  ENG  2.5 1.02 0.33 25820
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 2  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     4519039.00  17.  17.  ENG  2.5 1.02 0.33 10760
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 3  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     5380039.00  17.  17.  ENG  2.5 1.02 0.33 21520
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 4  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     7532039.00  17.  17.  ENG  2.5 1.02 0.33 12910
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 5  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     9468039.00  17.  17.  ENG  2.5 1.02 0.33  8610
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 6  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2     9683039.00  17.  17.  ENG  2.5 1.02 0.33 10760
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 7  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
      20   5  171977 76.2    15924039.00  17.  17.  ENG  2.5 1.02 0.33 25820
     1.     2.     6.    11.    16.    23.    43.    64.   107.   156.
   252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 8  PV705 XXXXXXXXXXXXXXXXXXXXXXXX
```

Table B-2. (continued)

```
     20   5  171977 76.2     17860039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     2.     6.    11.    16.    23.    43.    64.   107.   158.
  252.   320.   345.   416.   452.   444.   414.   378.   297.   171.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 1  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   5  171977 76.2      3228039.00  17.  17.  ENG  2.5 1.02 0.33 30130
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 2  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   5  171977 76.2      4304039.00  17.  17.  ENG  2.5 1.02 0.33 19370
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 3  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   5  171977 76.2      4519039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 4  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   5  171977 76.2      7962039.00  17.  17.  ENG  2.5 1.02 0.33 27970
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 2   RUN 5  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   5  171977 76.2      8823039.00  17.  17.  ENG  2.5 1.02 0.33 25820
    1.     3.     6.     9.    14.    23.    52.    86.   153.   202.
  273.   313.   366.   399.   415.   394.   262.   149.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 3   RUN 1  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     21   6   61977 76.2      4304039.00  17.  17.  ENG  2.5 1.02 0.33  8605
    1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
  235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
  230.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 3   RUN 2  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     21   6   61977 76.2     15493039.00  17.  17.  ENG  2.5 1.02 0.33 32280
    1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
  235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
  230.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 3   RUN 3  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     21   6   61977 76.2     15924039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     2.     5.    10.    23.    45.    62.    89.   145.   194.
  235.   273.   299.   327.   403.   421.   433.   445.   403.   339.
  230.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 3   RUN 1  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     20   6   61977 76.2     17215039.00  17.  17.  ENG  2.5 1.02 0.33  8610
    1.     3.     4.    13.    30.    55.    90.   112.   135.   201.
  233.   307.   324.   370.   381.   402.   384.   387.   311.   193.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 4   RUN 1  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     22   6  291977 76.2      4304039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
  217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
  358.   207.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 4   RUN 2  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     22   6  291977 76.2     15063039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
  217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
  358.   207.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 4   RUN 3  PV705 XXXXXXXXXXXXXXXXXXXXXXX
     22   6  291977 76.2     17215039.00  17.  17.  ENG  2.5 1.02 0.33 21520
    1.     2.     5.    10.    19.    24.    31.    94.   112.   175.
  217.   276.   355.   451.   511.   516.   585.   617.   567.   471.
  358.   207.
XXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 4   RUN 1  C42Y+ XXXXXXXXXXXXXXXXXXXXXXX
     18   6  291977 76.2     10329039.00  17.  17.  ENG  2.5 1.02 0.33 12910
    1.     3.     6.     8.    16.    33.    41.    76.   118.   171.
```

Table B-2. (continued)

```
   227.   274.   325.   396.   445.   444.   368.   216.
XXXXXXXXXXXXXXX SAM'S  1977 DATA  DATE 4   RUN 2  C42Y+ XXXXXXXXXXXXXXXXXXXXXXXX
      18   6  291977 76.2     17215039.00  17.  17.  ENG  2.5 1.02  0.33  4300
     1.     3.     6.     8.    16.    33.    41.    76.   118.   171.
   227.   274.   325.   396.   445.   444.   368.   216.
```

Table B-3. Input data for SORGF. Jaiyesimi's 1978 model runs.

```
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #1 @@@@@@   FS626 @@@@@@
 184  20   4  271978 76.2     3874939.00  17.  17.  ENG  2.5 1.02  .33 20092
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
(T71,I3,T1,F3.0,F2.0,F3.0,T50,F4.3)
06849464                                                0.00                 91
07858563         000                                    0.00                 92
08260414                                                0.00                 93
07046575         000                                    0.00                 94
07654195         0004                                   0.04                 95
07450589         0008                                   0.08                 96
08349449                                                0.00                 97
08565523                                                0.00                 98
07965310                                                0.00                 99
05545286         0043                                   0.43                100
06636632         000                                    0.00                101
06850532                                                0.00                102
06635544                                                0.00                103
07052383         0004                                   0.04                104
05346117                                                0.00                105
05044 78         0016                                   0.16                106
07046132         0004                                   0.04                107
05342190         0020                                   0.20                108
04940228         0006                                   0.06                109
05434543         000                                    0.00                110
05927560                                                0.00                111
06747228         0001                                   0.01                112
07339661                                                0.00                113
06551569         000                                    0.00                114
06544500                                                0.00                115
06936542                                                0.00                116
07149285                                                0.00                117
07151457         0011                                   0.11                118
07656530         0012                                   0.12                119
05955118         0017                                   0.17                120
05749359         0001                                   0.01                121
06039589                                                0.00                122
05545145                                                0.00                123
05445112         0003                                   0.03                124
06037471         0001                                   0.01                125
05943 16         0008                                   0.08                126
06046153         0140                                   1.40                127
06745607         0008                                   0.08                128
07247654                                                0.00                129
08048606                                                0.00                130
```

Table B-3. (continued)

07761368	0008	0.08	131
06856312	0008	0.08	132
07149716	0047	0.47	133
07744707		0.00	134
07549710		0.00	135
07147695		0.00	136
07451618		0.00	137
07760342		0.00	138
08863516		0.00	139
07459652	0002	0.02	140
07552634		0.00	141
07659258	0013	0.13	142
08960585	0123	1.23	143
09060657	0022	0.22	144
09061566		0.00	145
08461469	0100	1.00	146
08367431		0.00	147
08264654		0.00	148
07259362		0.00	149
08851698		0.00	150
08664374	0028	0.28	151
06856323	0031	0.31	152
07055531	0003	0.03	153
07559562	0001	0.01	154
07654496		0.00	155
08156609		0.00	156
07759305		0.00	157
08361726	0006	0.06	158
07648710		0.00	159
08655728		0.00	160
08866736		0.00	161
09471651		0.00	162
08561754		0.00	163
08555715		0.00	164
09064705		0.00	165
09572669		0.00	166
10276722		0.00	167
09778727		0.00	168
08565689		0.00	169
09059695		0.00	170
08465596	0324	3.24	171
08057745		0.00	172
08965645	0002	0.02	173
08870445		0.00	174
09474405	000	0.00	175
10078710		0.00	176
09673554	0005	0.05	177
09268539		0.00	178
09569695	0107	1.07	179
09574721		0.00	180
09776676		0.00	181
09680663	0001	0.01	182
09470737		0.00	183
10171712		0.00	184
10078729		0.00	185
10181730		0.00	186
09568533	0030	0.30	187
08570687	0004	0.04	188
09964672		0.00	189
09472199		0.00	190

Table B-3. (continued)

07356411	0120	1.20	191
08159196		0.00	192
10071509	0010	0.10	193
09375246		0.00	194
09666689	0077	0.77	195
09165732		0.00	196
09466589		0.00	197
09877663	000	0.00	198
09673605	0023	0.23	199
09576597	0008	0.08	200
09172184	0014	0.14	201
09776564	0016	0.16	202
08969386	0011	0.11	203
07860680		0.00	204
08858712		0.00	205
09974713		0.00	206
09278706		0.00	207
09161708		0.00	208
09967699		0.00	209
09070689		0.00	210
08366505		0.00	211
09362654		0.00	212
08265356	0059	0.59	213
08769481	0012	0.12	214
07661408		0.00	215
07754658	000	0.00	216
08254676	000	0.00	217
08863636		0.00	218
09265632		0.00	219
09570651		0.00	220
09269385		0.00	221
08767544	0004	0.04	222
08966537	0002	0.02	223
10166631		0.00	224
10474630		0.00	225
10079563		0.00	226
09471644	0027	0.27	227
09757643		0.00	228
10271624	0004	0.04	229
09978607		0.00	230
08260630		0.00	231
09157516		0.00	232
09974594		0.00	233
09977518		0.00	234
10176596		0.00	235
10280584		0.00	236
10175503		0.00	237
09979382		0.00	238
09471584	0015	0.15	239
08669430		0.00	240
08360581		0.00	241
08455577		0.00	242
08656592		0.00	243
09266545		0.00	244
10069547		0.00	245
09666571		0.00	246
09971552		0.00	247
09967571		0.00	248
10169513		0.00	249
10072506		0.00	250

Table B-3. (continued)

```
09468483                                        0.00                251
09166442                                        0.00                252
09166430                                        0.00                253
08974498                                        0.00                254
09176310                                        0.00                255
09169343        0001                            0.01                256
08453521        000                             0.00                257
09666423        0013                            0.13                258
10079520                                        0.00                259
08460184                                        0.00                260
09364520        0163                            1.63                261
08758205                                        0.00                262
06853 71        0234                            2.34                263
06646353        0040                            0.40                264
06543393                                        0.00                265
08945513                                        0.00                266
08557394                                        0.00                267
07760313                                        0.00                268
08149490                                        0.00                269
07758484                                        0.00                270
08046465                                        0.00                271
08157338                                        0.00                272
07150493        0005                            0.05                273
                                                                    274
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #2 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2      5166639.00  17.  17.  ENG  2.5 1.02  .33 43055
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #3 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33 38750
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #4 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2      6458239.00  17.  17.  ENG  2.5 1.02  .33 17222
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #5 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2      9472039.00  17.  17.  ENG  2.5 1.02  .33 43055
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #6 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2     10333139.00  17.  17.  ENG  2.5 1.02  .33 17222
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #7 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2     11194239.00  17.  17.  ENG  2.5 1.02  .33 25833
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #8 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2     13347039.00  17.  17.  ENG  2.5 1.02  .33 17222
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #9 @@@@@@   RS626 @@@@@@
      20   4  271978 76.2     18083039.00  17.  17.  ENG  2.5 1.02  .33 12916
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@  RUN #10 @@@@@   RS626 @@@@@@@@
      20   4  271978 76.2     18513539.00  17.  17.  ENG  2.5 1.02  .33 17222
     1.     2.     4.     8.    16.    28.    44.    74.   101.   136.
   198.   252.   329.   418.   495.   494.   489.   450.   388.   216.
```

Table B-3. (continued)

```
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #1 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 17222
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #2 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      4305539.00  17.  17.  ENG  2.5 1.02  .33 41620
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #3 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      5597139.00  17.  17.  ENG  2.5 1.02  .33 36597
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #4 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      6458239.00  17.  17.  ENG  2.5 1.02  .33 43055
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #5 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 23680
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #6 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2      8610939.00  17.  17.  ENG  2.5 1.02  .33 17222
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #7 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2     10763739.00  17.  17.  ENG  2.5 1.02  .33  8611
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #8 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2     12916439.00  17.  17.  ENG  2.5 1.02  .33 12916
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 1 @@@@@   RUN #9 @@@@@@   C42Y+ @@@@@@@
     21   4  271978 76.2     14208039.00  17.  17.  ENG  2.5 1.02  .33 21527
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@ DATE 1 @@@@@   RUN #10 @@@@@   C42Y+ @@@@@@@@
     21   4  271978 76.2     15805239.00  17.  17.  ENG  2.5 1.02  .33  8611
      1.     2.     5.    10.    18.    30.    59.    99.   143.   197.
    221.   290.   362.   465.   540.   549.   571.   494.   443.   245.
    189.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #1 @@@@@@   FS626 @@@@@@
     20   5  151978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 43055
      1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
    204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #2 @@@@@@   FS626 @@@@@@
     20   5  151978 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 60277
      1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
    204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #3 @@@@@@   FS626 @@@@@@
     20   5  151978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 25833
```

Table B-3. (continued)

```
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #4 @@@@@@   RS626 @@@@@@
      20    5  151978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 68888
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #5 @@@@@@   RS626 @@@@@@
      20    5  151978 76.2     12916439.00  17.  17.  ENG  2.5 1.02  .33 21527
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #6 @@@@@@   RS626 @@@@@@
      20    5  151978 76.2     13777539.00  17.  17.  ENG  2.5 1.02  .33 12916
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #7 @@@@@@   RS626 @@@@@@
      20    5  151978 76.2     14208039.00  17.  17.  ENG  2.5 1.02  .33  8611
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #8 @@@@@@   RS626 @@@@@@
      20    5  151978 76.2     16360839.00  17.  17.  ENG  2.5 1.02  .33  8611
     1.     2.     6.    11.    17.    34.    55.    76.   114.   166.
   204.   315.   396.   446.   468.   508.   489.   416.   302.   183.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #1 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 38749
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #2 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 34444
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #3 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      4305539.00  17.  17.  ENG  2.5 1.02  .33 17222
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #4 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      6027739.00  17.  17.  ENG  2.5 1.02  .33 45208
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #5 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 64582
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #6 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 60277
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #7 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2     11624839.00  17.  17.  ENG  2.5 1.02  .33 12916
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 2 @@@@@   RUN #8 @@@@@@   C42Y+ @@@@@@
      21    5  151978 76.2     12485939.00  17.  17.  ENG  2.5 1.02  .33 30138
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
```

Table B-3. (continued)

```
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@&@@   SAM'S DATA FOR 1978, &&&&@   DATE 2 @@@@@   RUN #9 @@@@@@   C42Y+ &@@&&&
      21   5  151978 76.2     13347039.00  17.  17.  ENG  2.5 1.02  .33 25833
     1.     2.     6.    14.    21.    36.    60.    91.   121.   153.
   214.   307.   380.   455.   501.   518.   547.   532.   408.   302.
   200.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #1 @@@@@@   RS626 &@@&&&
      19   5  301978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 55971
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #2 @@@@@@   RS626 &@@&&&
      19   5  301978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 60277
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #3 @@@@@@   RS626 &@@@&&
      19   5  301978 76.2      4305539.00  17.  17.  ENG  2.5 1.02  .33 30138
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, @&&@@   DATE 3 @@@@@   RUN #4 @@@@@@   RS626 &@@&&&
      19   5  301978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 55971
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #5 @@@@@@   RS626 &@@&&&
      19   5  301978 76.2      8610939.00  17.  17.  ENG  2.5 1.02  .33 60277
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #6 @@@@@@   RS626 &@@@&&
      19   5  301978 76.2     13777539.00  17.  17.  ENG  2.5 1.02  .33 12916
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #7 @@@@@@   RS626 &@@&&&
      19   5  301978 76.2     15069139.00  17.  17.  ENG  2.5 1.02  .33 23680
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #8 @@@@@@   RS626 &@@@&&
      19   5  301978 76.2     26693939.00  17.  17.  ENG  2.5 1.02  .33  4305
     1.     2.     6.    10.    18.    35.    62.   112.   169.   224.
   293.   348.   392.   420.   417.   410.   352.   280.   155.
@@&@@   SAM'S DATA FOR 1978, &@@@@   DATE 3 @@@@@   RUN #1 @@@@@@   C42Y+ &@@@&&
      22   5  301978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 40902
     1.     3.     5.     8.    12.    28.    58.   106.   162.   232.
   293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
   283.   148.
@@&@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #2 @@@@@@   C42Y+ &@@@&&
      22   5  301978 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 66888
     1.     3.     5.     8.    12.    28.    58.   106.   162.   232.
   293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
   283.   148.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #3 @@@@@@   C42Y+ &@@@&&
      22   5  301978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 38749
     1.     3.     5.     8.    12.    28.    58.   106.   162.   232.
   293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
   283.   148.
@@&@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #4 @@@@@@   C42Y+ &@@@&&
      22   5  301978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 77499
     1.     3.     5.     8.    12.    28.    58.   106.   162.   232.
   293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
   283.   148.
@@&@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #5 @@@@@@   C42Y+ &@@@&&
```

Table B-3. (continued)

```
      22    5  301978 76.2     12485939.00  17.  17.  ENG  2.5 1.02  .33 30138
    1.     3.     5.     8.     12.     28.     58.   106.   162.   232.
  293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
  283.   148.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #6 @@@@@@@   C42Y+ @@@@@@
      22    5  301978 76.2     13347039.00  17.  17.  ENG  2.5 1.02  .33 30138
    1.     3.     5.     8.     12.     28.     58.   106.   162.   232.
  293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
  283.   148.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 3 @@@@@   RUN #7 @@@@@@@   C42Y+ @@@@@@
      22    5  301978 76.2     15069139.00  17.  17.  ENG  2.5 1.02  .33 19375
    1.     3.     5.     8.     12.     28.     58.   106.   162.   232.
  293.   328.   380.   338.   379.   391.   439.   467.   467.   409.
  283.   148.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4.@@@@@   RUN #1 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 30138
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #2 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 22962
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #3 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #4 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 12916
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #5 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2     14638639.00  17.  17.  ENG  2.5 1.02  .33  8611
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #6 @@@@@@@   RS62E @@@@@@
      21    6   91978 76.2     21096839.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     2.     5.    11.     21.     41.     73.   109.   142.   176.
  186.   216.   246.   307.   346.   403.   375.   367.   290.   232.
  128.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #1 @@@@@@@   C42Y+ @@@@@@
      22    6   91978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33 36597
    1.     2.     4.    11.     24.     48.     75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #2 @@@@@@@   C42Y+ @@@@@@
      22    6   91978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 21527
    1.     2.     4.    11.     24.     48.     75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #3 @@@@@@@   C42Y+ @@@@@@
      22    6   91978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 21527
    1.     2.     4.    11.     24.     48.     75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #4 @@@@@@@   C42Y+ @@@@@@
```

Table B-3. (continued)

```
      22   6   91978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 25833
    1.     2.     4.    11.    24.    48.    75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #5 @@@@@@   C42Y+ @@@@@@
      22   6   91978 76.2     12916439.00  17.  17.  ENG  2.5 1.02  .33 25833
    1.     2.     4.    11.    24.    48.    75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #6 @@@@@@   C42Y+ @@@@@@
      22   6   91978 76.2     14638639.00  17.  17.  ENG  2.5 1.02  .33 25833
    1.     2.     4.    11.    24.    48.    75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 4 @@@@@   RUN #7 @@@@@@   C42Y+ @@@@@@
      22   6   91978 76.2     19374639.00  17.  17.  ENG  2.5 1.02  .33  4305
    1.     2.     4.    11.    24.    48.    75.   119.   181.   187.
  212.   226.   213.   225.   247.   288.   325.   304.   269.   234.
  217.   126.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #1 @@@@@@   RS626 @@@@@@
      17   6  231978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 35520
    1.     2.     4.    10.    21.    47.    70.    95.   143.   182.
  242.   289.   376.   440.   436.   377.   217.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #2 @@@@@@   RS626 @@@@@@
      17   6  231978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     2.     4.    10.    21.    47.    70.    95.   143.   182.
  242.   289.   376.   440.   436.   377.   217.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #3 @@@@@@   RS626 @@@@@@
      17   6  231978 76.2      8180439.00  17.  17.  ENG  2.5 1.02  .33 34444
    1.     2.     4.    10.    21.    47.    70.    95.   143.   182.
  242.   289.   376.   440.   436.   377.   217.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #4 @@@@@@   RS626 @@@@@@
      17   6  231978 76.2     14638639.00  17.  17.  ENG  2.5 1.02  .33 21528
    1.     2.     4.    10.    21.    47.    70.    95.   143.   182.
  242.   289.   376.   440.   436.   377.   217.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #1 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33 35879
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #2 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2      6888839.00  17.  17.  ENG  2.5 1.02  .33 43055
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #3 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33 21527
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #4 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2      8180439.00  17.  17.  ENG  2.5 1.02  .33 21527
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #5 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2     13777539.00  17.  17.  ENG  2.5 1.02  .33 18657
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #6 @@@@@@   C42Y+ @@@@@@
      18   6  231978 76.2     15499739.00  17.  17.  ENG  2.5 1.02  .33 17222
    1.     3.     6.    13.    30.    50.    73.   101.   125.   192.
  242.   283.   308.   397.   446.   516.   467.   296.
@@@@@   SAM'S DATA FOR 1978, @@@@@   DATE 5 @@@@@   RUN #7 @@@@@@   C42Y+ @@@@@@
```

Table B-3. (continued)

```
      18    6  231978 76.2     16360839.00  17.  17.  ENG  2.5 1.02  .33  E611
       1.     3.     6.    13.     30.    50.    73.   101.   125.   192.
     242.   283.   308.   397.    446.   516.   467.   296.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #1 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33  6458
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #2 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33 17222
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #3 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2      8180439.00  17.  17.  ENG  2.5 1.02  .33  E611
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #4 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2     13347039.00  17.  17.  ENG  2.5 1.02  .33 21527
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #5 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2     14208039.00  17.  17.  ENG  2.5 1.02  .33 17222
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #6 @@@@@@   RS62E @@@@@@
      19    7   61978 76.2     14638639.00  17.  17.  ENG  2.5 1.02  .33 21527
       1.     3.     6.    10.     18.    38.    59.    85.   123.   16E.
     223.   250.   296.   352.    395.   415.   363.   299.   174.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #1 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2      3444439.00  17.  17.  ENG  2.5 1.02  .33  4305
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #2 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2      3874939.00  17.  17.  ENG  2.5 1.02  .33  E611
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #3 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2      7319339.00  17.  17.  ENG  2.5 1.02  .33  4305
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #4 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2      7749839.00  17.  17.  ENG  2.5 1.02  .33  E611
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #5 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2     12485939.00  17.  17.  ENG  2.5 1.02  .33  4305
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #6 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2     12916439.00  17.  17.  ENG  2.5 1.02  .33 12916
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #7 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2     14208039.00  17.  17.  ENG  2.5 1.02  .33 17222
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #8 @@@@@@   C42Y+ @@@@@@
      20    7   61978 76.2     15069139.00  17.  17.  ENG  2.5 1.02  .33 12916
       1.     2.     6.    11.     20.    28.    52.    73.    91.   130.
     166.   212.   258.   300.    355.   366.   401.   347.   265.   161.
@@@@@    SAM'S DATA FOR 1978, @@@@@   DATE 6 @@@@@  RUN #9 @@@@@@   C42Y+ @@@@@@
```

Table B-3. (continued)

```
    20   7   61978 76.2     21527339.00  17.  17.  ENG  2.5 1.02  .33  6611
   1.     2.     6.    11.    20.    28.    52.    73.    91.   130.
 166.   212.   258.   300.   355.   366.   401.   347.   265.   161.
```

Table B-4. Input data for SORGF. Bunck's 1978 model runs.

```
HYBRID 1  DATE 1    16 LEAVES BUNCK
 184  16    4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
    1.     2.     3.     7.    14.    29.    49.    75.   100.   150.
  201.   281.   361.   378.   357.   307.
(T71,I3,T1,F3.0,F2.0,F3.0,T17,F4.2)
06849464        0000                                                    91
07858563        0000                                                    92
08260414        0000                                                    93
07046575        0000                                                    94
07654195        0004                                                    95
07450589        0008                                                    96
08349449        0000                                                    97
08565523        0000                                                    98
07965310        0000                                                    99
05545286        0043                                                   100
06636632        0000                                                   101
06850532        0000                                                   102
06635544        0000                                                   103
07052383        0004                                                   104
05346117        0000                                                   105
05044 78        0016                                                   106
07046132        0004                                                   107
05342190        0020                                                   108
04940228        0006                                                   109
05434543        0000                                                   110
05927560        0000                                                   111
06747228        0001                                                   112
07339661        0000                                                   113
06551569        0000                                                   114
06544500        0000                                                   115
06936542        0000                                                   116
07149285        0000                                                   117
07151457        0011                                                   118
07656530        0012                                                   119
05955118        0017                                                   120
05749359        0001                                                   121
06039589        0000                                                   122
05545145        0000                                                   123
05445112        0003                                                   124
06037471        0001                                                   125
05943 16        0009                                                   126
06046153        0140                                                   127
06745607        0008                                                   128
07247654        0009                                                   129
08048606        0000                                                   130
07761368        0008                                                   131
06856312        0008                                                   132
```

Table B-4. (continued)

07149716	0047	133
07744707	0000	134
07549710	0000	135
07147695	0000	136
07451618	0000	137
07760342	0000	138
08863516	0000	139
07459652	0002	140
07552634	0000	141
07659258	0013	142
08960585	0123	143
09060657	0022	144
09061566	0000	145
08461469	0100	146
08367431	0000	147
08264654	0000	148
07259362	0000	149
08851698	0000	150
08664374	0028	151
06856323	0031	152
07055531	0003	153
07559562	0001	154
07654496	0000	155
08156609	0000	156
07759305	0000	157
08361726	0006	158
07648710	0000	159
08655728	0000	160
08866736	0000	161
09471651	0000	162
08561754	0000	163
08555715	0000	164
09064705	0000	165
09572669	0000	166
10276722	0000	167
09778727	0000	168
08565689	0000	169
09059695	0000	170
08465596	0324	171
08057745	0000	172
08965645	0002	173
08870445	0000	174
09474405	0000	175
10078710	0000	176
09673554	0005	177
09268539	0000	178
09569695	0107	179
09574721	0000	180
09776676	0000	181
09680663	0001	182
09470737	0000	183
10171712	0000	184
10078729	0000	185
10181730	0000	186
09568533	0030	187
08570687	0004	188
09864672	0000	189
09472199	0000	190
07356411	0120	191
08159196	0000	192

Table B-4. (continued)

10071509	0010	193
09375246	0000	194
09666689	0077	195
09165732	0000	196
09466589	0000	197
09877663	0000	198
09673605	0023	199
09576597	0008	200
09172184	0014	201
09776564	0016	202
08969386	0011	203
07860680	0000	204
08858712	0000	205
09974713	0000	206
09278706	0000	207
09161708	0000	208
09967699	0000	209
09070689	0000	210
08366505	0000	211
09362654	0000	212
08265356	0059	213
08769481	0012	214
07661408	0000	215
07754658	0000	216
08254676	0000	217
08863636	0000	218
09265632	0000	219
09570651	0000	220
09269385	0000	221
08767544	0004	222
08966537	0002	223
10166631	0000	224
10474630	0000	225
10079563	0000	226
09471644	0027	227
09757643	0000	228
10271624	0004	229
09978607	0000	230
08260630	0000	231
09157516	0000	232
09974594	0000	233
09977518	0000	234
10176596	0000	235
10280584	0000	236
10175503	0000	237
09979382	0000	238
09471584	0015	239
08669430	0000	240
08360581	0000	241
08455577	0000	242
08656592	0000	243
09266545	0000	244
10069547	0000	245
09666571	0000	246
09971552	0000	247
09967571	0000	248
10169513	0000	249
10072506	0000	250
09468483	0000	251
09166442	0000	252

Table B-4. (continued)

```
09166430        0000                                                    253
08974498        0000                                                    254
09176310        0000                                                    255
09169343        0001                                                    256
08453521        0000                                                    257
09666423        0013                                                    258
10079520        0000                                                    259
08460184        0000                                                    260
09364520        0163                                                    261
08758205        0000                                                    262
06853 71        0234                                                    263
06646353        0040                                                    264
06943393        0000                                                    265
08945513        0000                                                    266
08557394        0000                                                    267
07760313        0000                                                    268
08149490        0000                                                    269
07758484        0000                                                    270
08046465        0000                                                    271
08157338        0000                                                    272
07150493        0005                                                    273
                                                                        274
HYBRID 1  DATE 1   17 LEAVES BUNCH
      17   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    3.    7.    14.    29.    49.    75.   100.   150.
     201.  281.  361.  378.  357.  307.  251.
HYBRID 1  DATE 1   18 LEAVES BUNCH
      18   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    3.    7.    14.    29.    49.    75.   100.   150.
     201.  281.  361.  378.  357.  307.  251.   99.
HYBRID 2  DATE 1   17 LEAVES BUNCH
      17   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    7.    17.    33.    56.    76.   105.   130.
     173.  231.  294.  362.  401.  369.  220.
HYBRID 2  DATE 1   18 LEAVES BUNCH
      18   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    7.    17.    33.    56.    76.   105.   130.
     173.  231.  294.  362.  401.  369.  220.  224.
HYBRID 2  DATE 1   19 LEAVES BUNCH
      19   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    7.    17.    33.    56.    76.   105.   130.
     173.  231.  294.  362.  401.  369.  220.  224.   90.
HYBRID 3  DATE 1   20 LEAVES BUNCH
      20   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    8.    15.    31.    54.    94.   127.   175.
     252.  333.  365.  458.  522.  484.  476.  411.  360.  255.
HYBRID 3  DATE 1   21 LEAVES BUNCH
      21   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    8.    15.    31.    54.    94.   127.   175.
     252.  333.  365.  458.  522.  484.  476.  411.  360.  255.
     353.
HYBRID 3  DATE 1   22 LEAVES BUNCH
      22   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    8.    15.    31.    54.    94.   127.   175.
     252.  333.  365.  458.  522.  484.  476.  411.  360.  255.
     353.  250.
HYBRID 3  DATE 1   23 LEAVES BUNCH
      23   4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
       1.    2.    4.    8.    15.    31.    54.    94.   127.   175.
     252.  333.  365.  458.  522.  484.  476.  411.  360.  255.
```

Table B-4. (continued)

```
   353.   250.   146.
HYBRID 4   DATE 1   20 LEAVES BUNCH
      20    4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     4.     8.     16.    43.    75.   107.   133.   185.
   236.   310.   414.   470.   465.   438.   472.   441.   382.   360.
HYBRID 4   DATE 1   21 LEAVES BUNCH
      21    4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     4.     8.     16.    43.    75.   107.   133.   185.
   236.   310.   414.   470.   465.   438.   472.   441.   382.   360.
   305.
HYBRID 4   DATE 1   22 LEAVES BUNCH
      22    4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     4.     8.     16.    43.    75.   107.   133.   185.
   236.   310.   414.   470.   465.   438.   472.   441.   382.   360.
   305.   206.
HYBRID 4   DATE 1   23 LEAVES BUNCH
      23    4  261978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     4.     8.     16.    43.    75.   107.   133.   185.
   236.   310.   414.   470.   465.   438.   472.   441.   382.   360.
   305.   206.   127.
HYBRID 1   DATE 2   16 LEAVES BUNCH
      16    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.
HYBRID 1   DATE 2   17 LEAVES BUNCH
      17    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.   448.
HYBRID 1   DATE 2   18 LEAVES BUNCH
      18    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.   448.   315.
HYBRID 1   DATE 2   19 LEAVES BUNCH
      19    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.   448.   315.   339.
HYBRID 1   DATE 2   20 LEAVES BUNCH
      20    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.   448.   315.   339.   419.
HYBRID 1   DATE 2   21 LEAVES BUNCH
      21    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     8.     14.    29.    36.    50.    77.   124.
   176.   264.   351.   359.   335.   361.   448.   315.   339.   419.
   299.
HYBRID 2   DATE 2   17 LEAVES BUNCH
      17    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     3.     8.     17.    20.    30.    50.    75.   124.
   196.   261.   308.   355.   372.   366.   193.
HYBRID 2   DATE 2   18 LEAVES BUNCH
      18    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     3.     8.     17.    20.    30.    50.    75.   124.
   196.   261.   308.   355.   372.   366.   193.   153.
HYBRID 3   DATE 2   20 LEAVES BUNCH
      20    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     18.    20.    30.    50.    74.    99.
   229.   287.   376.   426.   460.   466.   467.   376.   282.   155.
HYBRID 4   DATE 2   22 LEAVES BUNCH
      22    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     3.     8.     13.    24.    30.    50.    78.   106.
```

Table B-4. (continued)

```
   402.   230.   308.   353.   400.   399.   438.   410.   394.   340.
   305.   252.
HYBRID 4  DATE 2   23 LEAVES BUNCK
      23    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     3.     8.    13.    24.    30.    50.    78.   106.
   402.   230.   308.   353.   400.   399.   438.   410.   394.   340.
   305.   252.   215.
HYBRID 4  DATE 2   24 LEAVES BUNCK
      24    5  111978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     1.     3.     8.    13.    24.    30.    50.    78.   106.
   402.   230.   308.   353.   400.   399.   438.   410.   394.   340.
   305.   252.   215.   116.
HYBRID 1  DATE 3   16 LEAVES BUNCK
      16    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    18.    39.    72.   128.   179.
   240.   320.   350.   357.   330.   248.
HYBRID 1  DATE 3   17 LEAVES BUNCK
      17    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    18.    39.    72.   128.   179.
   240.   320.   350.   357.   330.   248.   398.
HYBRID 1  DATE 3   18 LEAVES BUNCK
      18    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    18.    39.    72.   128.   179.
   240.   320.   350.   357.   330.   248.   398.   353.
HYBRID 1  DATE 3   19 LEAVES BUNCK
      19    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    18.    39.    72.   128.   179.
   240.   320.   350.   357.   330.   248.   398.   353.   243.
HYBRID 1  DATE 3   20 LEAVES BUNCK
      20    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    18.    39.    72.   128.   179.
   240.   320.   350.   357.   330.   248.   398.   353.   243.    28.
HYBRID 2  DATE 3   17 LEAVES BUNCK
      17    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    12.    16.    31.    61.   169.   188.
   263.   340.   308.   343.   354.   328.   179.
HYBRID 2  DATE 3   18 LEAVES BUNCK
      18    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    12.    16.    31.    61.   169.   188.
   263.   340.   308.   343.   354.   328.   179.   198.
HYBRID 3  DATE 3   19 LEAVES BUNCK
      19    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    14.    25.    39.    87.   122.   197.
   270.   340.   345.   417.   425.   439.   358.   258.   203.
HYBRID 3  DATE 3   20 LEAVES BUNCK
      20    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    14.    25.    39.    87.   122.   197.
   270.   340.   345.   417.   425.   439.   358.   258.   203.   140.
HYBRID 3  DATE 3   21 LEAVES BUNCK
      21    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    14.    25.    39.    87.   122.   197.
   270.   340.   345.   417.   425.   439.   358.   258.   203.   140.
   100.
HYBRID 4  DATE 3   21 LEAVES BUNCK
      21    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     7.     7.    15.    30.    54.    99.   158.
   230.   278.   319.   318.   346.   390.   451.   413.   341.   269.
   177.
HYBRID 4  DATE 3   22 LEAVES BUNCK
      22    5  291978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
```

Table B-4. (continued)

```
     1.      3.      5.      7.      7.     15.     30.     54.     99.    158.
   230.    278.    319.    318.    246.    390.    451.    413.    341.    269.
   177.    115.
HYBRID 1 DATE 4 17 LEAVES BUNCK
      17    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.
HYBRID 1 DATE 4 18 LEAVES BUNCK
      18    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.    295.
HYBRID 1 DATE 4 19 LEAVES BUNCK
      19    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.    295.    310.
HYBRID 1 DATE 4 20 LEAVES BUNCK
      20    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.    295.    310.    289.
HYBRID 1 DATE 4 21 LEAVES BUNCK
      21    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.    295.    310.    289.
   181.
HYBRID 1 DATE 4 22 LEAVES BUNCK
      22    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.      8.     14.     30.     56.     97.    138.    161.
   162.    217.    246.    279.    330.    327.    283.    295.    310.    289.
   181.    188.
HYBRID 2 DATE 4 18 LEAVES BUNCK
      18    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      4.      8.     16.     29.     59.    116.    150.    155.
   168.    189.    276.    325.    371.    404.    281.    185.
HYBRID 2 DATE 4 19 LEAVES BUNCK
      19    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      4.      8.     16.     29.     59.    116.    150.    155.
   168.    189.    276.    325.    371.    404.    281.    185.    146.
HYBRID 3 DATE 4 19 LEAVES BUNCK
      19    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.     10.     18.     36.     66.    104.    135.    154.
   194.    216.    267.    318.    359.    388.    311.    231.    153.
HYBRID 3 DATE 4 20 LEAVES BUNCK
      20    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      5.     10.     18.     36.     66.    104.    135.    154.
   194.    216.    267.    318.    359.    388.    311.    231.    153.    129.
HYBRID 4 DATE 4 20 LEAVES BUNCK
      20    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      6.     10.     15.     28.     55.    104.    131.    162.
   176.    213.    240.    265.    318.    416.    358.    324.    286.    219.
HYBRID 4 DATE 4 21 LEAVES BUNCK
      21    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      6.     10.     15.     28.     55.    104.    131.    162.
   176.    213.    240.    265.    318.    416.    358.    324.    286.    219.
   191.
HYBRID 4 DATE 4 22 LEAVES BUNCK
      22    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.      3.      6.     10.     15.     28.     55.    104.    131.    162.
   176.    213.    240.    265.    318.    416.    358.    324.    286.    219.
   191.    136.
HYBRID 4 DATE 4 23 LEAVES BUNCK
```

Table B-4. (continued)

```
      23    6   91978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     6.    10.    15.    28.    55.   104.   131.   162.
   176.   213.   240.   265.   318.   416.   358.   324.   286.   219.
   191.   136.   204.
HYBRID 1 DATE 5 16 LEAVES BUNCK
      16    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    19.    30.    66.   102.   155.
   213.   285.   355.   407.   382.   311.
HYBRID 1 DATE 5 17 LEAVES BUNCK;
      17    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    19.    30.    66.   102.   155.
   213.   285.   355.   407.   382.   311.   236.
HYBRID 1 DATE 5 18 LEAVES BUNCK
      18    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    19.    30.    66.   102.   155.
   213.   285.   355.   407.   382.   311.   236.   245.
HYBRID 1 DATE 5 19 LEAVES BUNCK
      19    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    19.    30.    66.   102.   155.
   213.   285.   355.   407.   382.   311.   236.   245.   115.
HYBRID 2 DATE 5 16 LEAVES BUNCK
      16    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    24.    59.    91.   136.   192.
   242.   294.   322.   317.   290.   206.
HYBRID 2 DATE 5 17 LEAVES BUNCK
      17    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    24.    59.    91.   136.   192.
   242.   294.   322.   317.   290.   206.   108.
HYBRID 2 DATE 5 18 LEAVES BUNCK
      18    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    24.    59.    91.   136.   192.
   242.   294.   322.   317.   290.   206.   108.    84.
HYBRID 3 DATE 5 16 LEAVES BUNCK
      16    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    37.    68.   104.   140.   198.
   267.   344.   385.   434.   409.   347.
HYBRID 3 DATE 5 17 LEAVES BUNCK
      17    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    37.    68.   104.   140.   198.
   267.   344.   385.   434.   409.   347.   236.
HYBRID 3 DATE 5 18 LEAVES BUNCK
      18    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    37.    68.   104.   140.   198.
   267.   344.   385.   434.   409.   347.   236.   176.
HYBRID 3 DATE 5 19 LEAVES BUNCK
      19    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    37.    68.   104.   140.   198.
   267.   344.   385.   434.   409.   347.   236.   176.    56.
HYBRID 4 DATE 5 18 LEAVES BUNCK
      18    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    21.    43.    74.   115.   160.
   231.   284.   319.   340.   359.   379.   377.   303.
HYBRID 4 DATE 5 19 LEAVES BUNCK
      19    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    21.    43.    74.   115.   160.
   231.   284.   319.   340.   359.   379.   377.   303.   274.
HYBRID 4 DATE 5 20 LEAVES BUNCK
      20    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    21.    43.    74.   115.   160.
   231.   284.   319.   340.   359.   379.   377.   303.   274.   191.
```

Table B-4. (continued)

```
HYBRID 4 DATE 5 21 LEAVES BUNCK
      21    6  231978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    21.    43.    74.   115.   160.
   231.   284.   319.   340.   359.   379.   377.   303.   274.   191.
   233.
HYBRID 1 DATE 6 16 LEAVES BUNCK
      16    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    11.    22.    41.    69.   108.   140.   175.
   265.   326.   375.   389.   321.   209.
HYBRID 1 DATE 6 17 LEAVES BUNCK
      17    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    11.    22.    41.    69.   108.   140.   175.
   265.   326.   375.   389.   321.   209.    77.
HYBRID 2 DATE 6 16 LEAVES BUNCK
      16    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    13.    24.    97.    76.   106.   134.   173.
   222.   261.   344.   325.   299.   332.
HYBRID 2 DATE 6 17 LEAVES BUNCK
      17    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    13.    24.    97.    76.   106.   134.   173.
   222.   261.   344.   325.   299.   332.   126.
HYBRID 2 DATE 6 18 LEAVES BUNCK
      18    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    13.    24.    97.    76.   106.   134.   173.
   222.   261.   344.   325.   299.   332.   126.    72.
HYBRID 3 DATE 6 15 LEAVES BUNCK
      15    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    61.    90.   125.   160.
   257.   294.   336.   351.   336.
HYBRID 3 DATE 6 16 LEAVES BUNCK
      16    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    61.    90.   125.   160.
   257.   294.   336.   351.   336.   222.
HYBRID 3 DATE 6 17 LEAVES BUNCK
      17    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    61.    90.   125.   160.
   257.   294.   336.   351.   336.   222.    85.
HYBRID 3 DATE 6 18 LEAVES BUNCK
      18    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    61.    90.   125.   160.
   257.   294.   336.   351.   336.   222.    85.    41.
HYBRID 4 DATE 6 15 LEAVES BUNCK
      15    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    66.    96.   134.   174.
   252.   313.   378.   397.   366.
HYBRID 4 DATE 6 16 LEAVES BUNCK
      16    7   61978 76.2     120500  39.  17.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    12.    21.    38.    66.    96.   134.   174.
   252.   313.   378.   397.   366.   414.
```

Table B-5. Input data for SORGF. Schaffer's 1979 Manhattan model runs.

```
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ##########MANHATTAN##########   RATE 1###
```

Table B-5. (continued)

```
189  16   4  271979 76.2      5974139.00  17.  17.  ENG  2.5 1.02  .37 58664
    1.     2.     3.     5.     8.    13.    28.    86.   121.   149.
  209.   267.   341.   215.   269.   157.
(T78,I3,T1,2F3.0,T14,F3.0,T9,F4.3)
 71 49        285                                                          117
 71 49        285                                                          118
 76 56        530                                                          119
 59 55        118                                                          120
 75 43   .18 499                                                           121
 65 50   .27  82                                                           122
 51 41   .27 297                                                           123
 65 41   .   684                                                           124
 73 44   .   649                                                           125
 85 57   .   637                                                           126
 81 62   .   575                                                           127
 85 66   .   473                                                           128
 81 68   .   285                                                           129
 72 45   .31 138                                                           130
 63 36   .67 692                                                           131
 72 38   .   574                                                           132
 74 46   .01 664                                                           133
 73 47   .23 541                                                           134
 75 52   .   626                                                           135
 86 57   .   552                                                           136
 83 66   .   645                                                           137
 75 62   .09 327                                                           138
 72 56   .36 210                                                           139
 73 58   .34 503                                                           140
 72 50   .   668                                                           141
 79 46   .   682                                                           142
 75 52   .   552                                                           143
 70 41   .   646                                                           144
 75 42   .   675                                                           145
 81 52   .   627                                                           146
 82 52   .01 714                                                           147
 87 56   .   680                                                           148
 86 61   .   618                                                           149
 82 61   .   404                                                           150
 72 55   .   570                                                           151
 73 46   .   456                                                           152
 81 47   .   671                                                           153
 84 53   .   702                                                           154
 93 63   .   561                                                           155
 90 62   .   598                                                           156
 84 63   .   395                                                           157
 85 67   .   462                                                           158
 78 57   .41 209                                                           159
 66 57   .10 124                                                           160
 79 48   .08 737                                                           161
 83 50   .   732                                                           162
 88 62   .   706                                                           163
 94 65   .   712                                                           164
 94 66   .   723                                                           165
 93 72   .   645                                                           166
 94 72   .02 622                                                           167
 87 69   .04 486                                                           168
 90 72   .04 601                                                           169
 84 67   .   317                                                           170
 90 56   .07 736                                                           171
 98 58   .   702                                                           172
```

Table B-5. (continued)

90	63	.82	622	173
80	66	.29	450	174
74	62	.55	325	175
79	61	.	448	176
86	63	.02	574	177
91	72	.	513	178
85	66	.65	622	179
86	65	.	720	180
83	63	.	439	181
80	67	.	227	182
90	69	.	467	183
97	76	.	650	184
92	74	.	614	185
74	61	1.81	147	186
66	60	.12	120	187
77	63	.05	275	188
84	63	.	374	189
86	68	.	593	190
91	70	.	583	191
93	72	.	672	192
94	74	.	648	193
98	75	.	679	194
94	75	.	660	195
89	66	1.22	395	196
81	69	.34	402	197
78	65	.80	371	198
83	64	.02	525	199
83	61	.	618	200
87	64	.	594	201
88	68	.	547	202
90	71	.	503	203
83	70	.	109	204
90	73	.84	548	205
86	69	.28	581	206
89	67	.	529	207
90	70	.	488	208
94	70	.	534	209
93	74	.	340	210
90	74	.05	266	211
84	70	.02	285	212
85	60	.	553	213
89	69	.	419	214
94	68	.	642	215
95	74	.	638	216
97	75	.	639	217
97	77	.	630	218
98	77	.	636	219
96	75	.	614	220
95	76	.	611	221
87	67	.	117	222
78	58	.62	646	223
83	59	.	634	224
93	65	.	601	225
79	57	.	60	226
64	55	.94	190	227
79	60	.	247	228
94	74	.	594	229
95	75	.	562	230
94	72	.	605	231
90	70	.02	527	232

Table B-5. (continued)

87	67	.08	498	233
90	67	.	577	234
83	62	.	575	235
87	57	.	438	236
84	64	.	458	237
81	63	1.25	465	238
79	61	.	286	239
93	65	.	543	240
90	66	.01	510	241
95	72	.	543	242
91	76	.	537	243
82	70	.	252	244
91	63	.	567	245
91	66	.	543	246
92	69	.	532	247
95	70	.	508	248
86	67	.	257	249
79	56	.	548	250
83	57	1.11	490	251
88	62	.	528	252
90	65	.	547	253
88	57	.	529	254
86	61	.	422	255
71	54	.15	546	256
71	43	.	430	257
77	40	.	517	258
81	47	.	519	259
83	49	.	515	260
84	52	.	504	261
83	48	.	496	262
82	56	.	348	263
74	52	.	504	264
78	40	.	474	265
87	56	.	460	266
82	64	.	284	267
84	56	.	477	268
88	48	.	427	269
90	69	.	413	270
87	56	.	446	271
91	52	.	437	272
90	60	.	437	273
81	67	.	455	274
80	41	.	444	275
71	56	.	412	276
65	42	.	458	277
76	34	.	279	278
75	52	.	423	279
86	44	.	408	280
90	51	.	403	281
64	46	.	405	282
73	34	.	327	283
87	52	.	384	284
71	50	.	170	285
55	30	.	405	286
72	36	.	286	287
78	55	.	319	288
80	59	.	256	289
75	58	.01	318	290
74	53	.	71	291
82	55	1.52	251	292

Table B-5. (continued)

```
 86 70    .   355                                                                293
 85 52    .   290                                                                294
 52 36  1.22  201                                                                295
 59 32   .12  355                                                                296
 66 37    .   345                                                                297
 69 37    .   335                                                                298
 77 43    .   341                                                                299
 70 50    .   329                                                                300
 70 35    .   345                                                                301
 72 40    .   304                                                                302
 65 55   .84    26                                                               303
 62 44  2.24    82                                                               304
                                                                                 305
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ##########MANHATTAN##########   RATE 2###
      16   4  271979 76.2     12809339.00  17.  17.  ENG  2.5 1.02  .37 27448
     1.     2.     3.     5.     8.    13.    28.    86.   121.   149.
   209.   267.   341.   215.   269.   157.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ##########MANHATTAN##########   RATE 3###
      16   4  271979 76.2     16837239.00  17.  17.  ENG  2.5 1.02  .37 28525
     1.     2.     3.     5.     8.    13.    28.    86.   121.   149.
   209.   267.   341.   215.   269.   157.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 1###
      17   4  271979 76.2      4879739.00  17.  17.  ENG  2.5 1.02  .37 55256
     1.     5.    10.    15.    25.    35.    65.    71.    87.   209.
   206.   257.   314.   308.   347.   274.   168.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 2###
      17   4  271979 76.2      8557539.00  17.  17.  ENG  2.5 1.02  .37 36060
     1.     5.    10.    15.    25.    35.    65.    71.    87.   209.
   206.   257.   314.   308.   347.   274.   168.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 3###
      17   4  271979 76.2     17760839.00  17.  17.  ENG  2.5 1.02  .37
     1.     5.    10.    15.    25.    35.    65.    71.    87.   209.
   206.   257.   314.   308.   347.   274.   168.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 1###
      20   4  271979 76.2      3928939.00  17.  17.  ENG  2.5 1.02  .37 59740
     1.     2.     3.     4.     6.    12.    25.    38.    78.    96.
   152.   206.   252.   410.   484.   535.   577.   483.   335.   196.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 2###
      20   4  271979 76.2      9795339.00  17.  17.  ENG  2.5 1.02  .37 24220
     1.     2.     3.     4.     6.    12.    25.    38.    78.    96.
   152.   206.   252.   410.   484.   535.   577.   483.   335.   196.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 3###
      20   4  271979 76.2     17330339.00  17.  17.  ENG  2.5 1.02  .37 10225
     1.     2.     3.     4.     6.    12.    25.    38.    78.    96.
   152.   206.   252.   410.   484.   535.   577.   483.   335.   196.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 1###
      23   4  271979 76.2      6286339.00  17.  17.  ENG  2.5 1.02  .37 61140
     1.     5.    10.    15.    21.    33.    55.    56.    90.   138.
   460.   251.   183.   282.   282.   359.   446.   460.   437.   387.
   329.   259.   127.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 2###
      23   4  271979 76.2     10387439.00  17.  17.  ENG  2.5 1.02  .37 32831
     1.     5.    10.    15.    21.    33.    55.    56.    90.   138.
   460.   251.   183.   282.   282.   359.   446.   460.   437.   387.
   329.   259.   127.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 3###
      23   4  271979 76.2     24811339.00  17.  17.  ENG  2.5 1.02  .37
     1.     5.    10.    15.    21.    33.    55.    56.    90.   138.
   460.   251.   183.   282.   282.   359.   446.   460.   437.   387.
   329.   259.   127.
```

Table B-5. (continued)

```
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 1###
      15   5  171979 76.2      7642539.00  17.  17.  ENG  2.5 1.02  .37 51131
     1.     3.     6.     8.    10.    20.    40.    60.    84.   106.
   163.   267.   438.   464.   310.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 2###
      15   5  171979 76.2     15285039.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    20.    40.    60.    84.   106.
   163.   267.   438.   464.   310.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 3###
      15   5  171979 76.2     31054539.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    20.    40.    60.    84.   106.
   163.   267.   438.   464.   310.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ##############################   RATE 1###
      16   5  171979 76.2      6458439.00  17.  17.  ENG  2.5 1.02  .37 34446
     1.     3.     6.     8.    10.    20.    40.    60.    76.   135.
   176.   242.   382.   419.   328.   161.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ##############################   RATE 2###
      16   5  171979 76.2     11463839.00  17.  17.  ENG  2.5 1.02  .37  5382
     1.     3.     6.     8.    10.    20.    40.    60.    76.   135.
   176.   242.   382.   419.   328.   161.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ##############################   RATE 3###
      16   5  171979 76.2     22604639.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    20.    40.    60.    76.   135.
   176.   242.   382.   419.   328.   161.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ##############################   RATE 1###
      19   5  171979 76.2      6297039.00  17.  17.  ENG  2.5 1.02  .37 25296
     1.     3.     6.     8.    10.    15.    25.    35.    47.    97.
   151.   260.   329.   361.   496.   488.   419.   294.   130.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ##############################   RATE 2###
      19   5  171979 76.2     13831939.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    15.    25.    35.    47.    97.
   151.   260.   329.   361.   496.   488.   419.   294.   130.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ##############################   RATE 3###
      19   5  171979 76.2     24273139.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    15.    25.    35.    47.    97.
   151.   260.   329.   361.   496.   488.   419.   294.   130.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ##############################   RATE 1###
      21   5  171979 76.2      6889039.00  17.  17.  ENG  2.5 1.02  .37 34984
     1.     3.     6.     8.    10.    15.    25.    35.    45.    61.
   150.   168.   346.   431.   443.   490.   496.   484.   424.   356.
   235.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ##############################   RATE 2###
      21   5  171979 76.2     11894339.00  17.  17.  ENG  2.5 1.02  .37  9688
     1.     3.     6.     8.    10.    15.    25.    35.    45.    61.
   150.   168.   346.   431.   443.   490.   496.   484.   424.   356.
   235.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ##############################   RATE 3###
      21   5  171979 76.2     28363439.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     8.    10.    15.    25.    35.    45.    61.
   150.   168.   346.   431.   443.   490.   496.   484.   424.   356.
   235.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ##############################   RATE 1###
      16   6   11979 76.2      5758739.00  17.  17.  ENG  2.5 1.02  .37 38214
     1.     3.     6.     9.    11.    13.    13.    18.    43.    45.
    48.    94.   154.   251.   296.   275.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ##############################   RATE 2###
      16   6   11979 76.2      9041839.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     9.    11.    13.    13.    18.    43.    45.
    48.    94.   154.   251.   296.   275.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ##############################   RATE 3###
```

Table B-5. (continued)

```
      16   6   11979 76.2     18029939.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     6.     9.    11.    13.    13.    18.    43.    45.
    48.    94.   154.   251.   296.   275.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ##############################   RATE 1###
      18   6   11979 76.2      5543539.00  17.  17.  ENG  2.5 1.02  .37 69567
     1.     5.    10.    15.    16.    27.    28.    40.    60.    73.
    99.   228.   290.   353.   408.   400.   331.   157.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ##############################   RATE 2###
      18   6   11979 76.2     10710339.00  17.  17.  ENG  2.5 1.02  .37 20452
     1.     5.    10.    15.    16.    27.    28.    40.    60.    73.
    99.   228.   290.   353.   408.   400.   331.   157.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ##############################   RATE 3###
      18   6   11979 76.2     19536939.00  17.  17.  ENG  2.5 1.02  .37  5920
     1.     5.    10.    15.    16.    27.    28.    40.    60.    73.
    99.   228.   290.   353.   408.   400.   331.   157.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ##############################   RATE 1###
      19   6   11979 76.2      6186339.00  17.  17.  ENG  2.5 1.02  .37 25505
     1.     5.    10.    15.    20.    38.    67.    96.    90.    87.
   172.   242.   331.   376.   425.   432.   392.   295.   152.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ##############################   RATE 2###
      19   6   11979 76.2      9526239.00  17.  17.  ENG  2.5 1.02  .37 15070
     1.     5.    10.    15.    20.    38.    67.    96.    90.    87.
   172.   242.   331.   376.   425.   432.   392.   295.   152.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ##############################   RATE 3###
      19   6   11979 76.2     19321639.00  17.  17.  ENG  2.5 1.02  .37 13993
     1.     5.    10.    15.    20.    38.    67.    96.    90.    87.
   172.   242.   331.   376.   425.   432.   392.   295.   152.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 1###
      21   6   11979 76.2      5651239.00  17.  17.  ENG  2.5 1.02  .37 59561
     1.     5.     9.    12.    15.    24.    52.    84.   134.   160.
   116.   238.   254.   303.   338.   381.   405.   406.   391.   296.
   176.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 2###
      21   6   11979 76.2     10656539.00  17.  17.  ENG  2.5 1.02  .37 31754
     1.     5.     9.    12.    15.    24.    52.    84.   134.   160.
   116.   238.   254.   303.   338.   381.   405.   406.   391.   296.
   176.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 3###
      21   6   11979 76.2     18191339.00  17.  17.  ENG  2.5 1.02  .37
     1.     5.     9.    12.    15.    24.    52.    84.   134.   160.
   116.   238.   254.   303.   338.   381.   405.   406.   391.   296.
   176.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 1 ##############################   RATE 1###
      16   6  151979 76.2      5597439.00  17.  17.  ENG  2.5 1.02  .37 35880
     1.     3.     5.     8.    10.    20.    40.    60.    97.   140.
   188.   204.   218.   371.   338.   169.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 1 ##############################   RATE 2###
      16   6  151979 76.2      8234639.00  17.  17.  ENG  2.5 1.02  .37 27627
     1.     3.     5.     8.    10.    20.    40.    60.    97.   140.
   188.   204.   218.   371.   338.   169.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 1 ##############################   RATE 3###
      16   6  151979 76.2     16792039.00  17.  17.  ENG  2.5 1.02  .37
     1.     3.     5.     8.    10.    20.    40.    60.    97.   140.
   188.   204.   218.   371.   338.   169.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 2 ##############################   RATE 1###
      18   6  151979 76.2      4736239.00  17.  17.  ENG  2.5 1.02  .37 44491
     1.     3.     5.     8.    10.    20.    40.    60.   120.   214.
   270.   279.   317.   408.   394.   331.   282.   130.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 2 ##############################   RATE 2###
      18   6  151979 76.2      8934339.00  17.  17.  ENG  2.5 1.02  .37 27986
```

Table B-5. (continued)

```
     1.      3.      5.      8.     10.     20.     40.     60.    120.    214.
   270.    279.    317.    408.    394.    331.    282.    130.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 2 ##############################    RATE 3###
      18   6  151979 76.2     17814639.00  17.  17.  ENG  2.5 1.02  .37
     1.      3.      5.      8.     10.     20.     40.     60.    120.    214.
   270.    279.    317.    408.    394.    331.    282.    130.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 3 ##############################    RATE 1###
      19   6  151979 76.2      5489739.00  17.  17.  ENG  2.5 1.02  .37 59203
     1.      3.      5.      8.     10.     20.     40.     60.    120.    209.
   253.    343.    433.    417.    427.    440.    395.    369.    202.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 3 ##############################    RATE 2###
      19   6  151979 76.2      8718939.00  17.  17.  ENG  2.5 1.02  .37 19915
     1.      3.      5.      8.     10.     20.     40.     60.    120.    209.
   253.    343.    433.    417.    427.    440.    395.    369.    202.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 3 ##############################    RATE 3###
      19   6  151979 76.2     17168739.00  17.  17.  ENG  2.5 1.02  .37
     1.      3.      5.      8.     10.     20.     40.     60.    120.    209.
   253.    343.    417.    427.    440.    395.    369.    202.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 4 ##############################    RATE 1###
      22   6  151979 76.2      5166839.00  17.  17.  ENG  2.5 1.02  .37 32113
     1.      3.      5.      8.     10.     20.     40.     60.     90.    123.
   177.    260.    339.    459.    512.    495.    553.    530.    457.    350.
   315.    144.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 4 ##############################    RATE 2###
      22   6  151979 76.2      9149539.00  17.  17.  ENG  2.5 1.02  .37 11841
     1.      3.      5.      8.     10.     20.     40.     60.     90.    123.
   177.    260.    339.    459.    512.    495.    553.    530.    457.    350.
   315.    144.
SCHAFFER'S 1979 DATA DATE 4 HYBRID 4 ##############################    RATE 3###
      22   6  151979 76.2     16576739.00  17.  17.  ENG  2.5 1.02  .37
     1.      3.      5.      8.     10.     20.     40.     60.     90.    123.
   177.    260.    339.    459.    512.    495.    553.    530.    457.    350.
   315.    144.
```

Table B-6. Input data for SORGF. Schaffer's 1979 Hutchinson model runs.

```
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ##########HUTCHINSON#########    RATE 1###
 185  16   5   81979 76.2      8557537.56  17.  17.  ENG  2.5 1.87  .37 33368
     1.      5.     10.     12.     26.     42.     64.    116.    165.    258.
   320.    387.    412.    337.    345.    176.
(T78,I3,T1,2F3.0,T20,F3.0,T9,F4.3)
 70 41    .03        436                                                      121
 68 54    .53        154                                                      122
 55 41    .62        161                                                      123
 62 41    .04        495                                                      124
 73 38               681                                                      125
 80 51               645                                                      126
 79 61               601                                                      127
 82 62               593                                                      128
 79 68               282                                                      129
 75 40   1.05        376                                                      130
 69 33               376                                                      131
 72 42               692                                                      132
```

Table B-6. (continued)

75	42	.04	510	133
75	46	.02	615	134
75	52		619	135
80	55		511	136
80	54		622	137
79	60	.08	530	138
81	60		582	139
73	57	1.32	398	140
71	54		284	141
75	49		396	142
72	55		663	143
71	43		551	144
73	45		623	145
77	56		509	146
87	53		546	147
83	60		596	148
83	63		617	149
82	58		650	150
73	48		341	151
72	55		470	152
78	46		371	153
93	55		686	154
91	60		597	155
91	59		665	156
85	60	.61	568	157
88	62		554	158
87	56	.62	540	159
66	54	.45	126	160
78	47	.27	123	161
82	49		716	162
87	56		704	163
95	63		700	164
97	61		714	165
99	66		719	166
97	68		667	167
93	67		663	168
94	65		663	169
92	67		679	170
93	56		608	171
101	58		724	172
98	65		700	173
91	64	.79	562	174
81	62		535	175
83	61		537	176
90	65		362	177
95	68		572	178
94	70		616	179
95	66		570	180
93	64	.20	664	181
96	66	.04	658	182
101	70		646	183
102	72		616	184
104	72		666	185
101	65	.19	663	186
73	60	.48	198	187
83	63	.04	177	188
99	65		285	189
98	68		664	190
99	67		493	191
101	67		680	192

Table B-6. (continued)

102	71		676	193
104	72		650	194
102	75		662	195
99	73		641	196
91	69	.07	473	197
84	60	1.92	416	198
83	65		240	199
83	69		486	200
87	62		448	201
91	67		647	202
91	68		588	203
89	69	.62	380	204
91	71	.08	470	205
87	65	2.46	466	206
88	65		600	207
90	69		656	208
95	72		624	209
99	74		610	210
98	76		609	211
84	62	1.65	168	212
84	62		365	213
91	66		624	214
93	68	.24	572	215
95	68		648	216
98	70		646	217
96	73		629	218
98	74		640	219
98	73		639	220
97	71		626	221
95	67		613	222
78	55	.34	163	223
85	54		589	224
95	61		616	225
94	61		602	226
71	54		499	227
90	59	.08	142	228
96	71	.01	457	229
95	69		594	230
95	73		608	231
94	63		510	232
91	64	.16	567	233
95	62		595	234
90	58		589	235
87	62		494	236
87	62		500	237
88	64		552	238
87	63		529	239
99	63		253	240
99	71		554	241
97	67	.02	551	242
92	72	.72	557	243
97	65		527	244
94	67	.07	531	245
94	65		560	246
92	64		489	247
96	67		535	248
94	67		527	249
87	63		516	250
98	52		532	251
92	60		487	252

Table B-6. (continued)

```
92 60              524                                                  253
90 52              535                                                  254
90 57              535                                                  255
89 50              594                                                  256
79 47              528                                                  257
80 43              359                                                  258
84 48              506                                                  259
94 48              521                                                  260
88 50              452                                                  261
87 49              498                                                  262
84 50              506                                                  263
81 55              463                                                  264
83 46              463                                                  265
90 55              472                                                  266
92 61              473                                                  267
89 61   .02        456                                                  268
91 57              440                                                  269
93 65              434                                                  270
91 55              420                                                  271
95 49              433                                                  272
96 52              450                                                  273
93 55              462                                                  274
86 39              437                                                  275
85 58              450                                                  276
72 41              439                                                  277
90 39              443                                                  278
83 45              406                                                  279
92 47              427                                                  280
95 48              401                                                  281
90 51              391                                                  282
77 34              358                                                  283
93 56              339                                                  284
89 57              401                                                  285
71 41              385                                                  286
72 41              399                                                  287
78 55              366                                                  288
85 57              293                                                  289
81 53   .04        377                                                  290
85 52   .01        306                                                  291
82 53  2.30        242                                                  292
66 65              319                                                  293
85 55              375                                                  294
58 36  1.25        361                                                  295
66 34              377                                                  296
71 39              365                                                  297
71 48              355                                                  298
78 46              358                                                  299
75 49              353                                                  300
70 38              323                                                  301
71 43              357                                                  302
65 53  4.55        225                                                  303
57 38  3.37         35                                                  304
                                                                        305
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ############HUTCHINSON#########   RATE 2###
      16   5   81979 76.2    15661837.56  17.  17.  ENG  2.5 1.87  .37 31216
     1.     5.    10.    12.    26.    42.    64.   116.   165.   256.
   320.   387.   412.   337.   345.   176.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 1 ############HUTCHINSON#########   RATE 3###
      16   5   81979 76.2    25510937.56  17.  17.  ENG  2.5 1.87  .37 38751
     1.     5.    10.    12.    26.    42.    64.   116.   165.   256.
```

Table B-6. (continued)

```
   320.   387.   412.   337.   345.   176.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 1###
      19   5   81979 76.2     6350837.56  17.  17.  ENG  2.5 1.87  .37 16146
     1.     5.    10.    15.    18.    34.    60.   115.   164.   237.
   311.   346.   421.   478.   437.   363.   259.   176.    74.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 2###
      19   5   81979 76.2    11463837.56  17.  17.  ENG  2.5 1.87  .37  6458
     1.     5.    10.    15.    18.    34.    60.   115.   164.   237.
   311.   346.   421.   478.   437.   363.   259.   176.    74.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 2 ##############################   RATE 3###
      19   5   81979 76.2    20720937.56  17.  17.  ENG  2.5 1.87  .37 15608
     1.     5.    10.    15.    18.    34.    60.   115.   164.   237.
   311.   346.   421.   478.   437.   363.   259.   176.    74.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 1###
      20   5   81979 76.2     4897637.56  17.  17.  ENG  2.5 1.87  .37 28526
     1.     5.    10.    12.    15.    37.    62.    72.   130.   202.
   273.   326.   395.   413.   432.   392.   307.   246.   176.    86.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 2###
      20   5   81979 76.2    11948237.56  17.  17.  ENG  2.5 1.87  .37 26910
     1.     5.    10.    12.    15.    37.    62.    72.   130.   202.
   273.   326.   395.   413.   432.   392.   307.   246.   176.    86.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 3 ##############################   RATE 3###
      20   5   81979 76.2    20505637.56  17.  17.  ENG  2.5 1.87  .37 13456
     1.     5.    10.    12.    15.    37.    62.    72.   130.   202.
   273.   326.   395.   413.   432.   392.   307.   246.   176.    86.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 1###
      23   5   81979 76.2     6781437.56  17.  17.  ENG  2.5 1.87  .37 22066
     1.     5.    10.    12.    15.    24.    44.    69.   115.   161.
   234.   277.   354.   435.   483.   494.   506.   461.   434.   345.
   267.   175.    90.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 2###
      23   5   81979 76.2    11517637.56  17.  17.  ENG  2.5 1.87  .37  3229
     1.     5.    10.    12.    15.    24.    44.    69.   115.   161.
   234.   277.   354.   435.   483.   494.   506.   461.   434.   345.
   267.   175.    90.
SCHAFFER'S 1979 DATA DATE 1 HYBRID 4 ##############################   RATE 3###
      23   5   81979 76.2    25080337.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    12.    15.    24.    44.    69.   115.   161.
   234.   277.   354.   435.   483.   494.   506.   461.   434.   345.
   267.   175.    90.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 1###
      17   6  141979 76.2     5543537.56  17.  17.  ENG  2.5 1.87  .37 65842
     1.     5.    10.    12.    16.    33.    50.    92.   139.   197.
   205.   290.   319.   377.   479.   386.   260.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 2###
      17   6  141979 76.2     9472437.56  17.  17.  ENG  2.5 1.87  .37 23681
     1.     5.    10.    12.    16.    33.    50.    92.   139.   197.
   205.   290.   319.   377.   479.   386.   260.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 1 ##############################   RATE 3###
      17   6  141979 76.2    17599337.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    12.    16.    33.    50.    92.   139.   197.
   205.   290.   319.   377.   479.   386.   260.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ##############################   RATE 1###
      18   6  141979 76.2     5382037.56  17.  17.  ENG  2.5 1.87  .37 66559
     1.     5.    10.    15.    22.    41.    76.   132.   194.   233.
   273.   275.   311.   425.   387.   279.   214.   104.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ##############################   RATE 2###
      18   6  141979 76.2    12163437.56  17.  17.  ENG  2.5 1.87  .37  6958
     1.     5.    10.    15.    22.    41.    76.   132.   194.   233.
   273.   275.   311.   425.   387.   279.   214.   104.
```

Table B-6. (continued)

```
SCHAFFER'S 1979 DATA DATE 2 HYBRID 2 ################################   RATE 3###
      18   6  141979 76.2     21528337.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    22.    41.    76.   132.   194.   233.
   273.   275.   311.   425.   387.   279.   214.   104.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ################################   RATE 1###
      18   6  141979 76.2      5328237.56  17.  17.  ENG  2.5 1.87  .37 51130
     1.     5.    10.    15.    31.    54.    94.   161.   168.   215.
   217.   280.   306.   391.   451.   441.   377.   307.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ################################   RATE 2###
      18   6  141979 76.2      9795337.56  17.  17.  ENG  2.5 1.87  .37 10227
     1.     5.    10.    15.    31.    54.    94.   161.   168.   215.
   217.   280.   306.   391.   451.   441.   377.   307.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 3 ################################   RATE 3###
      18   6  141979 76.2     20344237.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    31.    54.    94.   161.   168.   215.
   217.   280.   306.   391.   451.   441.   377.   307.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ################################   RATE 1###
      21   6  141979 76.2      5489737.56  17.  17.  ENG  2.5 1.87  .37 89701
     1.     5.    10.    15.    17.    29.    53.    98.   137.   200.
   225.   253.   320.   318.   431.   409.   458.   410.   344.   228.
   124.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ################################   RATE 2###
      21   6  141979 76.2     10602737.56  17.  17.  ENG  2.5 1.87  .37  9687
     1.     5.    10.    15.    17.    29.    53.    98.   137.   200.
   225.   253.   320.   318.   431.   409.   458.   410.   344.   228.
   124.
SCHAFFER'S 1979 DATA DATE 2 HYBRID 4 ################################   RATE 3###
      21   6  141979 76.2     18352837.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    17.    29.    53.    98.   137.   200.
   225.   253.   320.   318.   431.   409.   458.   410.   344.   228.
   124.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ################################   RATE 1###
      17   7  111979 76.2      4305737.56  17.  17.  ENG  2.5 1.87  .37 22758
     1.     5.    10.    15.    30.    42.    86.   130.   188.   254.
   340.   403.   373.   320.   193.   260.   129.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ################################   RATE 2###
      17   7  111979 76.2      7481037.56  17.  17.  ENG  2.5 1.87  .37 16147
     1.     5.    10.    15.    30.    42.    86.   130.   188.   254.
   340.   403.   373.   320.   193.   260.   129.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 1 ################################   RATE 3###
      17   7  111979 76.2     13939537.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    30.    42.    86.   130.   188.   254.
   340.   403.   373.   320.   193.   260.   129.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ################################   RATE 1###
      19   7  111979 76.2      4897737.56  17.  17.  ENG  2.5 1.87  .37 30139
     1.     5.    10.    15.    19.    27.    60.   100.   181.   244.
   321.   365.   390.   378.   345.   315.   247.   175.    75.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ################################   RATE 2###
      19   7  111979 76.2     10818037.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    19.    27.    60.   100.   181.   244.
   321.   365.   390.   378.   345.   315.   247.   175.    75.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 2 ################################   RATE 3###
      19   7  111979 76.2     20936237.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    19.    27.    60.   100.   181.   244.
   321.   365.   390.   378.   345.   315.   247.   175.    75.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ################################   RATE 1###
      19   7  111979 76.2      5005337.56  17.  17.  ENG  2.5 1.87  .37 15070
     1.     5.    10.    15.    20.    36.    57.    78.   116.   209.
   250.   358.   397.   415.   375.   335.   240.   150.    74.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ################################   RATE 2###
```

Table B-6. (continued)

```
      19   7  111979 76.2      9580137.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    20.    36.    57.    78.   116.   209.
   250.   358.   397.   415.   375.   335.   240.   150.    74.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 3 ##############################   RATE 3###
      19   7  111979 76.2     17922337.56  17.  17.  ENG  2.5 1.87  .37
     1.     5.    10.    15.    20.    36.    57.    78.   116.   209.
   250.   358.   397.   415.   375.   335.   240.   150.    74.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 1###
      21   7  111979 76.2      4036537.56  17.  17.  ENG  2.5 1.87  .37 39290
     1.     4.     7.     9.    11.    18.    40.    69.   133.   202.
   267.   312.   346.   402.   422.   442.   396.   367.   262.   191.
   130.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 2###
      21   7  111979 76.2      9472437.56  17.  17.  ENG  2.5 1.87  .37  7356
     1.     4.     7.     9.    11.    18.    40.    69.   133.   202.
   267.   312.   346.   402.   422.   442.   396.   367.   262.   191.
   130.
SCHAFFER'S 1979 DATA DATE 3 HYBRID 4 ##############################   RATE 3###
      21   7  111979 76.2     16845837.56  17.  17.  ENG  2.5 1.87  .37
     1.     4.     7.     9.    11.    18.    40.    69.   133.   202.
   267.   312.   346.   402.   422.   442.   396.   367.   262.   191.
   130.
```

Table B-7. Input data for Manhattan 1980 SORGF runs.

```
1980 MANHATTAN ACCO 30 DATE 1
 178  16   5   71980 76.2      7391439.11  17.  17.  ENG  2.5 1.02  .33 26986
     1.     3.     5.    10.    15.    20.    25.    32.    40.    51.
    79.    99.   152.   227.   243.   183.
(T71,I3,T18,F4.0,T25,F3.0,T11,F5.2,T63,F4.3)
 5 780     603.6   74.   51.                                    0.04    127      1
 5 880     696.2   61.   35.                                    0.00    128      1
 5 980     514.8   72.   35.                                    0.00    129      1
 51080     564.2   83.   54.                                    0.16    130      1
 51180     239.8   75.   51.                                    0.00    131      1
 51280     439.2   76.   53.                                    0.00    132      1
 51380     565.0   73.   46.                                    0.00    133      1
 51480     636.6   74.   38.                                    0.00    134      1
 51580     379.8   72.   53.                                    0.00    135      1
 51680     052.8   67.   51.                                    0.74    136      1
 51780     156.8   62.   56.                                    0.13    137      1
 51880     315.6   64.   53.                                    0.00    138      1
 51980     515.0   72.   47.                                    0.00    139      1
 52080     444.2   77.   48.                                    0.00    140      1
 52180     582.8   78.   47.                                    0.20    141      1
 52280     567.0   78.   51.                                    0.00    142      1
 52380     611.0   80.   51.                                    0.00    143      1
 52480     481.6   85.   58.                                    0.00    144      1
 52580     537.6   93.   67.                                    0.31    145      1
 52680     530.4   90.   65.                                    0.13    146      1
 52780     422.0   85.   67.                                    0.00    147      1
 52880     452.8   86.   63.                                    0.00    148      1
 52980     547.8   87.   67.                                    0.00    149      1
```

Table B-7. (continued)

530 80	721.0	81.	58.	0.07	150	1
531 80	181.8	79.	59.	0.00	151	1
6 1 80	488.4	84.	64.	1.12	152	1
6 2 80	613.0	86.	71.	0.01	153	1
6 3 80	603.6	92.	63.	0.00	154	1
6 4 80	484.8	88.	71.	0.00	155	1
6 5 80	687.0	94.	73.	0.53	156	1
6 6 80	512.8	94.	75.	0.00	157	1
6 7 80	561.0	88.	74.	0.00	158	1
6 8 80	621.4	74.	56.	0.00	159	1
6 9 80	685.0	81.	55.	0.00	160	1
610 80	708.4	86.	55.	0.00	161	1
611 80	700.6	90.	59.	0.00	162	1
612 80	441.1	89.	70.	0.00	163	1
613 80	656.8	97.	73.	0.03	164	1
614 80	691.2	101.	73.	0.00	165	1
615 80	692.0	94.	71.	0.00	166	1
616 80	461.6	80.	64.	0.00	167	1
617 80	703.2	82.	56.	0.00	168	1
618 80	678.2	90.	64.	0.00	169	1
619 80	553.8	86.	69.	0.00	170	1
620 80	253.4	74.	57.	0.02	171	1
621 80	604.2	82.	56.	0.41	172	1
622 80	619.4	89.	63.	0.67	173	1
623 80	702.2	91.	65.	0.02	174	1
624 80	679.6	94.	67.	0.00	175	1
625 80	631.8	97.	72.	0.00	176	1
626 80	671.8	97.	77.	0.00	177	1
627 80	672.4	109.	78.	0.00	178	1
628 80	646.8	99.	74.	0.00	179	1
629 80	703.8	92.	60.	0.00	180	1
630 80	667.6	109.	66.	0.00	181	1
07 01 80	663.4	104.	81.	0.00	182	1
07 02 80	543.0	093.	66.	0.00	183	1
07 03 80	557.6	089.	67.	0.70	184	1
07 04 80	644.0	103.	74.	0.00	185	1
07 05 80	598.6	101.	79.	0.02	186	1
07 06 80	693.6	104.	80.	0.00	187	1
07 07 80	696.2	104.	81.	0.00	188	1
07 08 80	677.2	104.	82.	0.00	189	1
07 09 80	602.4	108.	83.	0.00	190	1
07 10 80	666.8	110.	80.	0.00	191	1
07 11 80	672.8	109.	79.	0.00	192	1
07 12 80	650.8	104.	76.	0.00	193	1
07 13 80	677.0	108.	78.	0.00	194	1
07 14 80	676.6	110.	83.	00.00	195	1
07 15 80	675.8	108.	80.	00.00	196	1
07 16 80	686.0	101.	80.	0.00	197	1
07 17 80	602.8	108.	74.	0.00	198	1
07 18 80	426.2	102.	82.	0.00	199	1
07 19 80	650.8	107.	76.	0.00	200	1
07 20 80	435.2	105.	76.	0.00	201	1
07 21 80	510.4	090.	70.	0.39	202	1
07 22 80	697.8	087.	62.	0.00	203	1
07 23 80	660.6	091.	57.	0.00	204	1
07 24 80	653.6	100.	65.	0.00	205	1
07 25 80	188.0	093.	71.	0.05	206	1
07 26 80	595.6	090.	64.	.03	207	1
07 27 80	623.6	091.	59.	0.00	208	1
07 28 80	635.4	105.	66.	0.00	209	1

Table B-7. (continued)

072980	641.2	108.	70.	0.00	210	1
073080	609.2	108.	82.	0.00	211	1
073180	391.4	099.	75.	0.01	212	1
8 180	620.4	105.	75.	0.02	213	1
8 280	489.0	99.	79.	0.00	214	1
8 380	626.4	105.	68.	0.00	215	1
8 480	361.4	96.	69.	0.00	216	1
8 580	255.6	94.	68.	0.33	217	1
8 680	595.0	96.	70.	0.17	218	1
8 780	624.2	100.	81.	0.00	219	1
8 880	625.2	101.	79.	0.00	220	1
8 980	596.6	101.	79.	0.00	221	1
810 80	545.4	103.	79.	0.00	222	1
811 80	589.4	89.	67.	0.19	223	1
812 80	534.2	99.	68.	0.00	224	1
813 80	570.0	100.	72.	0.00	225	1
814 80	173.8	95.	72.	0.00	226	1
815 80	152.8	81.	70.	1.50	227	1
816 80	451.8	93.	72.	0.24	228	1
817 80	482.2	90.	69.	0.21	229	1
818 80	590.4	96.	72.	0.00	230	1
819 80	571.0	97.	77.	0.00	231	1
820 80	403.4	91.	81.	0.00	232	1
821 80	586.8	90.	58.	0.00	233	1
822 80	390.2	90.	62.	0.01	234	1
	569.6	99.	65.	0.00	235	1
824 80	559.8	101.	71.	0.00	236	1
825 80	561.8	103.	74.	0.00	237	1
826 80	562.6	102.	69.	0.00	238	1
827 80	386.0	92.	66.	0.00	239	1
828 80	352.8	94.	65.	0.00	240	1
829 80	542.4	97.	69.	0.00	241	1
830 80	389.2	97.	74.	0.01	242	1
831 80	465.2	96.	68.	0.26	243	1
090180	544.2	085.	062.	1.10	244	1
090280	549.9	093.	062.	0.00	245	1
090380	538.2	097.	069.	0.00	246	1
090480	477.4	092.	071.	0.00	247	1
090580	509.0	098.	071.	0.00	248	1
090680	483.2	099.	072.	0.00	249	1
090780	366.6	095.	074.	0.00	250	1
090880	465.2	096.	075.	0.00	251	1
090980	481.0	085.	065.	0.04	252	1
091080	418.4	079.	054.	0.04	253	1
091180	236.8	091.	063.	0.00	254	1
091280	489.0	098.	076.	0.00	255	1
091380	493.6	087.	067.	0.00	256	1
091480	375.8	076.	059.	0.00	257	1
091580	224.4	080.	060.	0.17	258	1
091680	057.6	073.	049.	0.17	259	1
091780	502.2	072.	039.	0.78	260	1
091880	495.8	089.	052.	0.00	261	1
091980	468.8	095.	068.	0.00	262	1
092080	465.6	094.	077.	0.00	263	1
092180	463.6	097.	061.	0.00	264	1
092280	433.8	090.	062.	0.00	265	1
092380	484.4	075.	043.	0.00	266	1
092480	146.6	065.	045.	0.00	267	1
092580	402.8	070.	049.	0.12	268	1
092680	355.8	075.	040.	0.00	269	1

Table B-7. (continued)

```
092780    326.0  077.  053.                                    0.00    270    1
092880    084.8  067.  055.                                    0.07    271    1
092980    088.8  063.  059.                                    0.01    272    1
093080    435.6  086.  056.                                    0.02    273    1
100180    420.0  079.  057.                                    0.00    274    1
100280    388.0  070.  044.                                    0.00    275    1
100380    337.6  076.  034.                                    0.00    276    1
100480    429.2  071.  048.                                    0.00    277    1
100580    403.0  081.  044.                                    0.00    278    1
100680    408.6  084.  057.                                    0.00    279    1
100780    405.2  088.  045.                                    0.00    280    1
100880    414.6  091.  047.                                    0.00    281    1
100980    399.2  088.  045.                                    0.00    282    1
101080    409.8  074.  053.                                    0.00    283    1
101180    418.0  067.  039.                                    0.00    284    1
101280    392.4  075.  033.                                    0.00    285    1
101380    350.8  086.  057.                                    0.00    286    1
101480    266.0  078.  059.                                    0.09    287    1
101580    134.4  068.  059.                                    1.14    288    1
101680    336.0  074.  058.                                    0.88    289    1
101780    381.0  062.  042.                                    0.00    290    1
101880    349.2  058.  038.                                    0.00    291    1
101980    365.8  066.  033.                                    0.00    292    1
102080    356.2  073.  041.                                    0.00    293    1
102180    348.8  077.  041.                                    0.00    294    1
102280    354.0  077.  043.                                    0.00    295    1
102380    318.0  062.  042.                                    0.00    296    1
102480    286.0  052.  039.                                    0.34    297    1
102580    344.2  052.  030.                                    0.00    298    1
102680    280.0  052.  027.                                    0.00    299    1
102780    020.2  047.  034.                                    0.42    300    1
102880    325.2  043.  032.                                    0.56    301    1
102980    303.4  051.  023.                                    0.00    302    1
103080    324.2  064.  031.                                    0.00    303    1
103180    287.0  075.  033.                                    0.00    304    1
1980 MANHATTAN ACCO 60 DATE 1
      16   5   71980 76.2     13993339.11  17.  17.  ENG  2.5 1.02  .33 30313
     1.     4.     8.    17.    31.    52.    84.   121.   174.   226.
   257.   319.   327.   288.   252.   145.
1980 MANHATTAN ACCO 120 DATE 1
      16   5   71980 76.2     30498339.11  17.  17.  ENG  2.5 1.02  .33
     1.     3.     9.    18.    22.    31.    51.    62.    78.   110.
   145.   191.   236.   286.   293.   181.
1980 MANHATTAN PIONEER 30 DATE 1
      17   5   71980 76.2     10190039.11  17.  17.  ENG  2.5 1.02  .33  2088
     1.     5.    13.    35.    55.    80.   109.   138.   165.   197.
   255.   293.   372.   399.   388.   324.   207.
1980 MANHATTAN PIONEER 60 DATE 1
      17   5   71980 76.2     13706339.11  17.  17.  ENG  2.5 1.02  .33 48688
     1.     6.    13.    26.    46.    74.   112.   156.   205.   251.
   308.   394.   457.   447.   408.   343.   194.
1980 MANHATTAN PIONEER 120 DATE 1
      17   5   71980 76.2     18083739.11  17.  17.  ENG  2.5 1.02  .33 69238
     1.     6.    11.    21.    37.    59.    87.   119.   154.   198.
   268.   288.   362.   352.   287.   231.   144.
1980 MANHATTAN DEKALB 30 DATE 1
      18   5   71980 76.2      7534939.11  17.  17.  ENG  2.5 1.02  .33 40469
     1.     3.     7.    17.    33.    45.    61.   104.   161.   250.
   300.   360.   416.   437.   499.   483.   419.   203.
1980 MANHATTAN DEKALB 60 DATE 1
```

Table B-7. (continued)

```
      18   5   71980 76.2     15787439.11  17.  17.  ENG  2.5 1.02  .33  2631
     1.     3.     8.    17.    33.    47.    59.    97.   146.   204.
   286.   353.   410.   445.   413.   395.   339.   158.
1980 MANHATTAN  DEKALB 120 DATE 1
      18   5   71980 76.2     25618639.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     9.    19.    37.    43.    54.    66.   107.   162.
   244.   289.   422.   438.   405.   351.   337.   154.
1980 MANHATTAN ACCO 60 DATE 2
      16   6   61980 76.2     19303639.11  17.  17.  ENG  2.5 1.02  .33
     1.     5.    10.    21.    38.    62.    95.   135.   192.   203.
   245.   282.   298.   288.   229.   122.
1980 MANHATTAN ACCO 120 DATE 2
      16   6   61980 76.2     25995339.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.    12.    30.    44.    60.    77.    93.   105.   119.
    89.    95.   131.   164.   149.    77.
1980 MANHATTAN PIONEER 30 DATE 2
      17   6   61980 76.2      8647239.11  17.  17.  ENG  2.5 1.02  .33 43089
     1.     6.    15.    28.    31.    37.    47.    72.   104.   140.
   188.   250.   294.   326.   322.   279.   173.
1980 MANHATTAN PIONEER 60 DATE 2
      17   6   61980 76.2     21743539.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     8.    15.    27.    46.    72.   102.   138.   185.
   244.   290.   338.   357.   348.   316.   205.
1980 MANHATTAN PIONEER 120 DATE 2
      17   6   61980 76.2     39432539.11  17.  17.  ENG  2.5 1.02  .33
     1.     3.     7.    11.    22.    40.    67.   103.   147.   196.
   259.   306.   329.   344.   299.   216.    97.
1980 MANHATTAN DEKALB 120 DATE 2
      18   6   61980 76.2     36920939.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     7.    13.    22.    34.    48.    51.    58.    64.
   157.   243.   297.   293.   288.   277.   202.   104.
1980 MANHATTAN ACCO 30 DATE 3
      16   6  271980 76.2     14036839.11  17.  17.  ENG  2.5 1.02  .33
     1.     5.    20.    56.    82.   101.   144.   190.   255.   357.
   413.   434.   369.   367.   297.   173.
1980 MANHATTAN ACCO 60 DATE 3
      16   6  271980 76.2     11525239.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     8.    14.    23.    36.    51.    68.   126.   157.
   215.   293.   348.   351.   297.   168.
1980 MANHATTAN ACCO 120 DATE 3
      16   6  271980 76.2     16311739.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.    14.    24.    38.    54.    72.   144.   179.   262.
   320.   361.   321.   274.   227.   140.
1980 MANHATTAN PIONEER 30 DATE 3
      17   6  271980 76.2     11410039.11  17.  17.  ENG  2.5 1.02  .33
     1.     6.    10.    25.    42.    64.    92.   123.   171.   254.
   310.   347.   343.   350.   293.   218.   113.
1980 MANHATTAN PIONEER 60 DATE 3
      17   6  271980 76.2     14700139.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     7.    13.    23.    36.    51.    68.   135.   223.
   270.   306.   352.   367.   336.   268.   169.
1980 MANHATTAN PIONEER 120 DATE 3
      17   6  271980 76.2     25529439.11  17.  17.  ENG  2.5 1.02  .33
     1.     4.     8.    11.    20.    33.    51.    73.    98.   165.
   284.   338.   352.   341.   257.   206.   113.
1980 MANHATTAN DEKALB 30 DATE 3
      18   6  271980 76.2      9328939.11  17.  17.  ENG  2.5 1.02  .33
     1.     6.    18.    34.    52.    86.   165.   208.   266.   395.
   455.   502.   514.   438.   399.   321.   261.   110.
1980 MANHATTAN DEKALB 60 DATE 3
```

Table B-7. (continued)

```
     18    6  271980 76.2     13280139.11  17.  17.  ENG  2.5 1.02  .33
    1.      4.     12.     21.     36.     68.   106.   161.   220.   321.
  434.   464.   512.   485.   410.   326.   286.   145.
1980 MANHATTAN DEKALB 120 DATE 3
     18    6  271980 76.2     18179439.11  17.  17.  ENG  2.5 1.02  .33
    1.      5.     13.     21.     32.     47.    52.    69.    82.   135.
  230.   306.   347.   368.   367.   367.   293.   160.
```

Table B-8. Input data for Hutchinson 1980 SORGF model runs.

```
1980 HUTCHINSON ACCO 40 DATE 2
 179   16    6   51980 76.2     13308437.56  12.  17.  ENG  2.5 1.87  .37
    1.      5.     10.     21.     38.     62.     95.   135.   192.   203.
  245.   282.   298.   288.   229.   122.
(I70,I3,T1,F3.0,T9,F2.0,T23,F3.0,T15,F4.3)
 78      49      0.00    123                                             120       1
 66      52      0.65    307                                             121       1
 71      48      0.00    431                                             122       1
 78      46      0.00    570                                             123       1
 79      51      0.00    380                                             124       1
 81      50      0.00    665                                             125       1
 80      49      0.00    608                                             126       1
 78      49      0.00    478                                             127       1
 66      39      0.00    619                                             128       1
 68      42      0.00    511                                             129       1
 86      52      0.00    586                                             130       1
 81      54      0.00    414                                             131       1
 78      52      0.00    675                                             132       1
 77      44      0.00    684                                             133       1
 71      41      0.00    475                                             134       1
 70      53      0.00    133                                             135       1
 67      49      1.40    133                                             136       1
 67      52      0.14    288                                             137       1
 67      49      0.00    437                                             138       1
 76      46      0.00    613                                             139       1
 74      51      0.00    409                                             140       1
 75      48      0.38    550                                             141       1
 75      52      0.00    537                                             142       1
 75      52      0.00    579                                             143       1
 81      60      0.00    523                                             144       1
 87      70      0.00    702                                             145       1
 87      71      0.00    635                                             146       1
 85      70      0.82    212                                             147       1
 81      61      0.00    526                                             148       1
 81      60      0.00    579                                             149       1
 83      53      0.00    705                                             150       1
 85      62      0.00    516                                             151       1
 82      67      0.00    359                                             152       1
 87      70      0.00    700                                             153       1
 89      64      0.00    673                                             154       1
 88      67      0.00    671                                             155       1
 91      68      0.00    665                                             156       1
 93      70      0.00    627                                             157       1
```

Table B-8. (continued)

92	70	0.00	637	158	1
90	55	0.00	440	159	1
81	56	0.00	643	160	1
85	53	0.00	626	161	1
88	59	0.00	607	162	1
91	63	0.00	630	163	1
97	68	0.04	694	164	1
103	67	0.00	696	165	1
101	76	0.00	698	166	1
90	62	0.00	343	167	1
76	61	0.23	270	168	1
87	68	0.08	379	169	1
91	63	0.03	500	170	1
85	60	0.35	192	171	1
85	60	0.05	314	172	1
90	62	0.35	499	173	1
97	66	0.00	690	174	1
103	75	0.00	826	175	1
104	74	0.00	673	176	1
107	71	0.00	682	177	1
110	70	0.00	694	178	1
109	77	0.00	637	179	1
100	60	0.00	504	180	1
100	74	0.00	686	181	1
109	74	0.00	681	182	1
105	70	0.03	637	183	1
95	68	0.70	649	184	1
106	74	0.00	674	185	1
103	74	0.00	664	186	1
103	75	0.00	699	187	1
103	78	0.00	683	188	1
104	78	0.00	636	189	1
108	79	0.00	669	190	1
108	76	0.00	722	191	1
109	80	0.00	683	192	1
110	74	0.00	682	193	1
107	78	0.00	677	194	1
108	76	0.00	667	195	1
107	76	0.00	673	196	1
107	75	0.00	608	197	1
109	75	0.00	680	198	1
108	75	0.00	674	199	1
105	80	0.00	671	200	1
105	80	0.00	564	201	1
101	66	1.20	452	202	1
89	64	0.00	641	203	1
90	62	0.00	440	204	1
97	65	0.00	643	205	1
96	75	0.00	402	206	1
92	66	0.00	587	207	1
95	65	0.00	563	208	1
104	68	0.00	662	209	1
107	67	0.00	649	210	1
106	77	0.00	629	211	1
105	75	0.00	486	212	1
108	73	0.00	585	213	1
107	79	0.00	466	214	1
105	80	0.00	622	215	1
99	79	0.00	581	216	1
99	68	0.00	526	217	1

Table B-8. (continued)

98	66	2.14	611	218	1
98	75	0.00	630	219	1
98	74	0.00	630	220	1
99	74	0.00	606	221	1
102	75	0.00	583	222	1
98	68	0.33	573	223	1
100	69	0.00	621	224	1
98	73	0.00	580	225	1
92	77	0.49	87	226	1
83	68	2.00	208	227	1
93	68	0.34	510	228	1
92	67	0.40	504	229	1
91	98	0.00	585	230	1
95	71	0.00	580	231	1
94	77	0.00	536	232	1
88	60	0.00	278	233	1
88	64	0.00	547	234	1
97	65	0.00	571	235	1
98	70	0.00	567	236	1
99	70	0.00	568	237	1
100	65	0.00	545	238	1
97	66	0.00	381	239	1
94	65	0.00	510	240	1
96	65	0.00	542	241	1
103	72	0.00	553	242	1
98	68	0.00	545	243	1
92	66	0.04	555	244	1
93	63	0.00	533	245	1
98	65	0.00	543	246	1
100	68	0.00	540	247	1
99	70	0.00	501	248	1
97	69	0.00	463	249	1
95	68	0.00	462	250	1
92	70	0.00	522	251	1
92	67	0.43	221	252	1
83	58	0.00	377	253	1
91	65	0.00	454	254	1
99	72	0.00	520	255	1
98	63	0.00	433	256	1
86	63	0.00	334	257	1
96	63	0.00	469	258	1
93	56	0.00	250	259	1
77	38	0.00	551	260	1
90	50	0.00	549	261	1
98	64	0.00	401	262	1
96	78	0.00	560	263	1
99	74	0.00	572	264	1
95	61	0.00	519	265	1
75	48	0.00	497	266	1
75	46	0.00	245	267	1
73	46	0.00	505	268	1
72	45	0.00	377	269	1
67	51	0.00	147	270	1
61	53	0.20	127	271	1
62	55	0.00	185	272	1
87	48	0.00	504	273	1
83	54	0.00	485	274	1
78	48	0.00	420	275	1
82	38	0.00	485	276	1
82	46	0.00	492	277	1

Table B-8. (continued)

```
 82      47     0.00     471                                                278        1
 85      53     0.00     481                                                279        1
 90      47     0.00     474                                                280        1
 90      50     0.00     488                                                281        1
 90      47     0.00     456                                                282        1
 88      55     0.00     447                                                283        1
 73      36     0.00     459                                                284        1
 78      41     0.00     433                                                285        1
 86      51     0.00     426                                                286        1
 85      58     0.00     417                                                287        1
 83      58     0.00     288                                                288        1
 71      54     0.78     435                                                289        1
 70      38     0.00     430                                                290        1
 65      39     0.00     415                                                291        1
 70      36     0.00     415                                                292        1
 77      42     0.00     416                                                293        1
 79      44     0.00     415                                                294        1
 76      46     0.00     411                                                295        1
 72      45     0.00     157                                                296        1
 56      36     0.00     404                                                297        1
                                                                            298
1980 HUTCHINSON ACCO 80 DATE 2
      16   6   51980 76.2     18299037.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.    12.    30.    44.    60.    77.    93.   105.   119.
    89.    95.   131.   164.   149.    77.
1980 HUTCHINSON PIONEER 20 DATE 2
      17   6   51980 76.2      7247837.56  12.  17.  ENG  2.5 1.87  .37
     1.     6.    15.    28.    31.    37.    47.    72.   104.   140.
  188.   250.   294.   326.   322.   279.   173.
1980 HUTCHINSON PIONEER 40 DATE 2
      17   6   51980 76.2      9903037.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     8.    15.    27.    46.    72.   102.   138.   185.
  244.   290.   338.   357.   348.   316.   205.
1980 HUTCHINSON DEKALB 20 DATE 2
      18   6   51980 76.2      6889037.56  12.  17.  ENG  2.5 1.87  .37
     1.     6.    12.    23.    39.    49.    60.    77.    85.   113.
  194.   243.   282.   315.   369.   377.   338.   153.
1980 HUTCHINSON DEKALB 40 DATE 2
      18   6   51980 76.2     11194737.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     7.    14.    25.    41.    52.    63.    78.    90.
  120.   225.   269.   293.   300.   281.   229.   108.
1980 HUTCHINSON DEKALB 80 DATE 2
      18   6   51980 76.2     10307537.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     7.    13.    22.    34.    48.    51.    58.    64.
  157.   243.   297.   293.   288.   277.   202.   104.
1980 HUTCHINSON ACCO 20 DATE 3
      16   6  301980 76.2      6350837.56  12.  17.  ENG  2.5 1.87  .37
     1.     5.    20.    56.    82.   101.   144.   190.   255.   357.
  413.   434.   369.   367.   297.   173.
1980 HUTCHINSON ACCO 40 DATE 3
      16   6  301980 76.2      9903037.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     8.    14.    23.    36.    51.    68.   126.   157.
  215.   293.   348.   351.   297.   168.
1980 HUTCHINSON ACCO 80 DATE 3
      16   6  301980 76.2     14495737.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.    14.    24.    38.    54.    72.   144.   179.   262.
  320.   361.   321.   274.   227.   140.
1980 HUTCHINSON PIONEER 20 DATE 3
      17   6  301980 76.2      5382137.56  12.  17.  ENG  2.5 1.87  .37
     1.     6.    10.    25.    42.    64.    92.   123.   171.   254.
```

Table B-8. (continued)

```
   310.   347.   343.   350.   293.   218.   113.
1980 HUTCHINSON PIONEER 40 DATE 3
      17   6  301980 76.2     10907637.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     7.    13.    23.    36.    51.    68.   135.   223.
   270.   306.   352.   367.   336.   268.   169.
1980 HUTCHINSON PIONEER 80 DATE 3
      17   6  301980 76.2     18299637.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.     8.    11.    20.    33.    51.    73.    98.   165.
   284.   338.   352.   341.   257.   206.   113.
1980 HUTCHINSON DEKALB 20 DATE 3
      18   6  301980 76.2      4736237.56  12.  17.  ENG  2.5 1.87  .37
     1.     6.    18.    34.    52.    86.   165.   208.   266.   395.
   455.   502.   514.   438.   399.   321.   261.   110.
1980 HUTCHINSON DEKALB 40 DATE 3
      18   6  301980 76.2      9400737.56  12.  17.  ENG  2.5 1.87  .37
     1.     4.    12.    21.    36.    68.   106.   161.   220.   321.
   434.   464.   512.   485.   410.   326.   286.   145.
1980 HUTCHINSON DEKALB 80 DATE 3
      18   6  301980 76.2     19231937.56  12.  17.  ENG  2.5 1.87  .37
     1.     5.    13.    21.    32.    47.    52.    69.    82.   135.
   230.   306.   347.   368.   367.   367.   293.   160.
```

Table B-9. Input data for Parsons 1981 SORGF model runs.

```
PARSONS DATE 1 ACCO 30
 209  16   4  241981 76.2      4808037.20  12.  17.  ENG  2.5 1.65  .37 15931
     1.     3.     5.    10.    15.    20.    25.    32.    40.    51.
    79.    95.   152.   227.   243.   183.
(T70,I3,T15,F3.0,T25,F3.0,T45,F3.0,T35,F4.3)
               078       050       0.00       489                    097       1
               083       051       0.00       392                    098       1
               073       046       0.00       363                    099       1
               082       064       0.00       368                    100       1
               076       062       0.46       320                    101       1
               068       064       0.00       384                    102       1
               086       055       0.00       299                    103       1
               061       046       0.81       441                    104       1
               062       040       0.00       385                    105       1
               073       055       0.00       425                    106       1
               084       060       0.00       501                    107       1
               080       060       0.00       255                    108       1
               077       060       0.51       196                    109       1
               060       052       0.78       076                    110       1
               066       052       0.00       145                    111       1
               073       051       0.00       186                    112       1
               073       050       0.00       553                    113       1
               079       045       0.00       558                    114       1
               082       050       0.00       558                    115       1
               082       054       0.00       554                    116       1
               083       060       0.00       533                    117       1
               076       055       0.00       313                    118       1
               085       047       0.05       550                    119       1
               079       055       0.16       526                    120       1
```

Table B-9. (continued)

075	048	0.00	550	121	1
078	040	0.00	569	122	1
077	056	0.00	368	123	1
073	062	0.01	170	124	1
073	052	0.35	518	125	1
070	051	0.00	494	126	1
069	045	0.00	447	127	1
068	051	0.39	307	128	1
067	052	0.41	200	129	1
062	044	0.72	483	130	1
069	037	0.00	603	131	1
073	047	0.00	360	132	1
068	051	0.19	123	133	1
069	046	1.11	475	134	1
071	043	0.00	494	135	1
068	056	0.05	261	136	1
068	054	0.15	071	137	1
074	051	0.76	345	138	1
064	046	0.04	358	139	1
073	041	0.00	590	140	1
076	047	0.00	579	141	1
080	060	0.00	440	142	1
080	062	0.07	454	143	1
084	059	0.02	278	144	1
078	051	0.00	586	145	1
086	054	0.00	592	146	1
082	055	0.00	348	147	1
082	061	0.00	256	148	1
079	064	0.26	236	149	1
071	059	0.13	169	150	1
070	055	0.04	318	151	1
085	050	0.00	577	152	1
080	066	0.28	382	153	1
084	066	0.00	341	154	1
084	065	0.00	410	155	1
085	068	0.00	337	156	1
089	065	0.56	324	157	1
089	064	0.00	590	158	1
095	070	0.00	557	159	1
094	077	0.00	552	160	1
081	067	0.06	137	161	1
092	065	0.06	421	162	1
086	071	0.01	353	163	1
086	074	0.01	310	164	1
085	077	0.00	194	165	1
079	062	1.39	153	166	1
078	056	0.56	607	167	1
082	051	0.00	634	168	1
091	062	0.00	550	169	1
089	067	0.20	346	170	1
091	073	0.02	501	171	1
091	073	0.00	499	172	1
078	063	0.38	131	173	1
092	065	0.00	508	174	1
076	073	0.00	579	175	1
095	072	0.00	450	176	1
090	066	0.00	331	177	1
087	067	0.89	452	178	1
089	066	0.00	580	179	1
093	070	0.00	509	180	1

Table B-9. (continued)

083	071	0.54	254	181	1
089	072	2.04	470	182	1
090	070	0.00	530	183	1
082	073	0.00	209	184	1
084	074	0.00	378	185	1
087	071	0.03	478	186	1
086	067	0.00	427	187	1
086	070	0.00	381	188	1
085	072	0.00	472	189	1
092	074	0.00	461	190	1
095	071	0.00	543	191	1
095	072	0.00	571	192	1
097	074	0.00	553	193	1
097	072	0.00	476	194	1
094	075	0.00	537	195	1
098	076	0.00	563	196	1
100	072	0.00	443	197	1
097	070	0.11	440	198	1
092	074	0.00	288	199	1
095	075	0.00	367	200	1
100	072	0.00	579	201	1
091	069	0.84	267	202	1
090	069	0.00	401	203	1
099	078	0.00	337	204	1
102	073	0.00	497	205	1
101	075	0.00	490	206	1
101	078	0.00	490	207	1
095	070	0.08	462	208	1
082	063	0.00	352	209	1
080	061	0.00	330	210	1
077	067	0.00	219	211	1
090	070	0.67	327	212	1
093	069	0.33	487	213	1
086	072	0.00	186	214	1
093	071	0.06	444	215	1
097	074	0.00	535	216	1
096	074	0.00	456	217	1
093	069	0.00	115	218	1
085	066	0.02	126	219	1
087	059	0.00	518	220	1
094	061	0.00	437	221	1
081	066	0.01	070	222	1
088	064	0.00	105	223	1
091	059	0.00	424	224	1
093	070	0.06	329	225	1
096	071	0.00	479	226	1
101	071	0.00	348	227	1
081	070	0.01	038	228	1
079	061	0.35	095	229	1
079	057	0.00	407	230	1
080	057	0.00	506	231	1
083	057	0.00	185	232	1
086	055	0.00	489	233	1
088	056	0.00	457	234	1
088	060	0.00	358	235	1
096	065	0.00	457	236	1
096	065	0.00	432	237	1
084	065	1.24	322	238	1
080	064	0.00	415	239	1
085	061	0.00	426	240	1

Table B-9. (continued)

085	067	0.00	445	241	1
093	071	0.00	470	242	1
092	073	0.00	426	243	1
088	067	1.03	222	244	1
076	057	0.00	159	245	1
080	058	0.00	359	246	1
085	060	0.00	484	247	1
085	064	0.00	306	248	1
089	069	0.00	394	249	1
084	069	0.22	216	250	1
074	054	0.00	107	251	1
080	054	0.00	468	252	1
084	058	0.00	471	253	1
086	061	0.00	471	254	1
087	069	0.00	369	255	1
089	065	0.00	409	256	1
088	061	0.00	320	257	1
090	062	0.00	379	258	1
080	055	0.00	468	259	1
069	043	0.00	471	260	1
065	031	0.00	471	261	1
072	043	0.00	369	262	1
081	050	0.00	409	263	1
085	060	0.00	320	264	1
088	059	0.00	379	265	1
090	060	0.00	378	266	1
089	063	0.00	067	267	1
084	067	0.07	136	268	1
088	068	0.00	205	269	1
091	051	0.00	253	270	1
082	058	0.00	378	271	1
088	062	0.00	372	272	1
089	072	0.00	378	273	1
091	058	0.00	372	274	1
075	044	0.00	335	275	1
072	046	0.00	253	276	1
072	051	0.04	155	277	1
091	069	0.00	253	278	1
089	052	0.50	155	279	1
067	049	0.00	305	280	1
060	037	0.00	196	281	1
066	039	0.00	253	282	1
063	052	0.00	092	283	1
069	043	0.00	231	284	1
070	054	1.04	159	285	1
067	060	0.38	052	286	1
070	065	0.62	036	287	1
077	059	0.67	199	288	1
061	057	0.82	069	289	1
071	058	1.23	091	290	1
077	046	0.00	347	291	1
056	034	0.00	345	292	1
068	036	0.00	347	293	1
073	045	0.00	272	294	1
064	040	0.19	209	295	1
053	030	0.02	272	296	1
045	030	0.00	236	297	1
057	033	0.00	254	298	1
049	037	0.17	072	299	1
055	034	0.00	268	300	1

Table B-9. (continued)

```
              068       041       0.00      291                         301       1
              066       048       0.00      172                         302       1
              072       050       0.00      274                         303       1
              070       058       0.92      175                         304       1
                                                                        305
PARSONS DATE 1 ACCO 30
      16   4  241981 76.2     4808037.20  12.  17.  ENG  2.5 1.65  .37 15931
     1.     3.     7.    15.    18.    29.    38.    50.    66.   111.
  161.   252.   304.   353.   354.   255.
PARSONS DATE 1 ACCO 60
      16   4  241981 76.2    10233537.20  12.  17.  ENG  2.5 1.65  .37  3827
     1.     4.     8.    17.    31.    52.    84.   121.   174.   226.
  257.   319.   327.   288.   252.   145.
PARSONS DATE 1 ACCO 60
      16   4  241981 76.2    10233537.20  12.  17.  ENG  2.5 1.65  .37  3827
     1.     3.     8.    15.    28.    48.    62.    74.   107.   144.
  194.   239.   292.   397.   372.   220.
PARSONS DATE 1 ACCO 120
      16   4  241981 76.2    20093037.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     9.    18.    22.    31.    51.    62.    78.   110.
  145.   191.   236.   286.   293.   181.
PARSONS DATE 1 ACCO 120
      16   4  241981 76.2    20093037.20  12.  17.  ENG  2.5 1.65  .37
     1.     2.     5.    10.    18.    31.    50.    74.   102.   131.
  169.   203.   266.   354.   268.   180.
PARSONS DATE 1 PIONEER 30
      17   4  241981 76.2     6027937.20  12.  17.  ENG  2.5 1.65  .37  6133
     1.     5.    13.    35.    55.    80.   109.   138.   165.   197.
  255.   293.   372.   399.   388.   324.   207.
PARSONS DATE 1 PIONEER 30
      17   4  241981 76.2     6027937.20  12.  17.  ENG  2.5 1.65  .37  6133
     1.     4.    12.    22.    30.    51.    90.   144.   231.   268.
  318.   412.   425.   421.   310.   257.   120.
PARSONS DATE 1 PIONEER 60
      17   4  241981 76.2    11768937.20  12.  17.  ENG  2.5 1.65  .37
     1.     6.    13.    26.    46.    74.   112.   156.   205.   251.
  308.   394.   457.   447.   408.   343.   194.
PARSONS DATE 1 PIONEER 60
      17   4  241981 76.2    11768937.20  12.  17.  ENG  2.5 1.65  .37
     1.     7.    16.    41.    60.    80.   100.   119.   132.   147.
  239.   338.   362.   341.   352.   219.   149.
PARSONS DATE 1 PIONEER 120
      17   4  241981 76.2    23106937.20  12.  17.  ENG  2.5 1.65  .37
     1.     6.    11.    21.    37.    59.    87.   119.   154.   198.
  268.   288.   362.   352.   287.   231.   144.
PARSONS DATE 1 PIONEER 120
      17   4  241981 76.2    23106937.20  12.  17.  ENG  2.5 1.65  .37
     1.     5.    16.    23.    30.    38.    58.    83.   146.   230.
  223.   331.   288.   275.   227.   182.    58.
PARSONS DATE 1 DEKALB 30
      18   4  241981 76.2     4377437.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     7.    17.    33.    45.    61.   104.   161.   250.
  300.   360.   416.   437.   499.   483.   419.   203.
PARSONS DATE 1 DEKALB 30
      18   4  241981 76.2     4377437.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    12.    38.    55.    75.    95.   114.   128.   144.
  226.   300.   385.   439.   452.   506.   426.   281.
PARSONS DATE 1 DEKALB 60
      18   4  241981 76.2    10548837.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     8.    17.    33.    47.    59.    97.   146.   204.
```

Table B-9. (continued)

```
   286.   353.   410.   445.   413.   395.   339.   158.
 PARSONS DATE 1 DEKALB 60
      18   4  241981 76.2    10548837.20  12.  17.  ENG  2.5 1.65  .37
     1.     5.    10.    21.    37.    61.    93.   131.   185.   194.
   310.   446.   465.   472.   477.   394.   354.   198.
 PARSONS DATE 1 DEKALB 120
      18   4  241981 76.2    26407937.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     9.    19.    37.    43.    54.    66.   107.   162.
   244.   289.   422.   438.   405.   351.   337.   154.
 PARSONS DATE 1 DEKALB 120
      18   4  241981 76.2    26407937.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    10.    21.    38.   100.   144.   195.   263.   326.
   374.   405.   518.   504.   432.   444.   315.   173.
 PARSONS DATE 2 ACCO 30
      16   6   51981 76.2     3946837.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     8.    16.    30.    50.    76.   109.   145.   182.
   189.   231.   256.   273.   246.   119.
 PARSONS DATE 2 ACCO 30
      16   6   51981 76.2     3946837.20  12.  17.  ENG  2.5 1.65  .37
     1.     2.     6.    11.    23.    41.    66.   100.   139.   194.
   244.   270.   283.   260.   233.   131.
 PARSONS DATE 2 ACCC 60
      16   6   51981 76.2     6709637.20  12.  17.  ENG  2.5 1.65  .37  9927
     1.     5.    10.    21.    38.    62.    95.   135.   192.   203.
   245.   282.   298.   288.   229.   122.
 PARSONS DATE 2 ACCO 60
      16   6   51981 76.2     6709637.20  12.  17.  ENG  2.5 1.65  .37  9927
     1.     5.    11.    20.    34.    44.    56.    83.   123.   160.
   176.   199.   203.   194.   148.    51.
 PARSONS DATE 2 ACCO 120
      16   6   51981 76.2    13024637.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    12.    30.    44.    60.    77.    93.   105.   119.
    89.    95.   131.   164.   149.    77.
 PARSONS DATE 2 ACCO 120
      16   6   51981 76.2    13024637.20  12.  17.  ENG  2.5 1.65  .37
     1.     6.    12.    21.    36.    55.    78.   104.   175.   203.
   197.   218.   218.   222.   201.   104.
PARSONS DATE 2 PIONEER 30
      17   6   51981 76.2     3659837.20  12.  17.  ENG  2.5 1.65  .37
     1.     6.    15.    28.    31.    37.    47.    72.   104.   140.
   188.   250.   294.   326.   322.   279.   173.
PARSONS DATE 2 PIONEER 30
      17   6   51981 76.2     3659837.20  12.  17.  ENG  2.5 1.65  .37
     1.     6.    12.    18.    22.    36.    57.    81.   108.   180.
   258.   287.   326.   351.   347.   291.   113.
PARSONS DATE 2 PIONEER 60
      17   6   51981 76.2     8180737.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     8.    15.    27.    46.    72.   102.   138.   185.
   244.   290.   338.   357.   348.   316.   205.
PARSONS DATE 2 PIONEER 60
      17   6   51981 76.2     8180737.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     8.    16.    28.    48.    74.   105.   140.   191.
   243.   277.   283.   258.   221.   177.    84.
PARSONS DATE 2 PIONEER 120
      17   6   51981 76.2    13634537.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     7.    11.    22.    40.    67.   103.   147.   196.
   259.   306.   329.   344.   299.   216.    97.
PARSONS DATE 2 PIONEER 120
      17   6   51981 76.2    13634537.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     6.    14.    19.    27.    36.    41.    49.   105.
```

Table B-9. (continued)

```
   173.   244.   284.   252.   210.   153.    66.
PARSONS DATE 2 DEKALB 30
      18    6   51981 76.2     3372837.20  12.  17.  ENG  2.5 1.65  .37  7654
     1.     6.    12.    23.    39.    49.    60.    77.    85.   113.
   194.   243.   282.   315.   369.   377.   338.   153.
PARSONS DATE 2 DEKALB 30
      18    6   51981 76.2     3372837.20  12.  17.  ENG  2.5 1.65  .37  7654
     1.     5.    10.    18.    26.    33.    55.    84.   120.   138.
   160.   220.   270.   318.   370.   392.   310.   215.
PARSONS DATE 2 DEKALB 60
      18    6   51981 76.2     7857837.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     7.    14.    25.    41.    52.    63.    78.    90.
   120.   225.   269.   293.   300.   281.   229.   138.
PARSONS DATE 2 DEKALB 60
      18    6   51981 76.2     7857837.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     6.    12.    24.    33.    43.    72.   110.   156.
   210.   288.   296.   311.   299.   287.   243.   118.
PARSONS DATE 2 DEKALB 120
      18    6   51981 76.2    13168137.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     7.    13.    22.    34.    48.    51.    58.    64.
   157.   243.   297.   293.   288.   277.   202.   104.
PARSONS DATE 2 DEKALB 120
      18    6   51981 76.2    13168137.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     7.    13.    24.    40.    52.    61.    88.   117.
   179.   252.   299.   308.   331.   329.   265.   128.
PARSONS DATE 3 ACCO 30
      16    7   61981 76.2     4520937.20  12.  17.  ENG  2.5 1.65  .37  2153
     1.     5.    20.    56.    82.   101.   144.   190.   255.   357.
   413.   434.   369.   367.   297.   173.
PARSONS DATE 3 ACCO 30
      16    7   61981 76.2     4520937.20  12.  17.  ENG  2.5 1.65  .37  2153
     1.     5.    16.    41.    53.    62.    89.   119.   164.   212.
   273.   369.   374.   372.   307.   160.
PARSONS DATE 3 ACCO 60
      16    7   61981 76.2     8539537.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     8.    14.    23.    36.    51.    68.   126.   157.
   215.   293.   348.   351.   297.   168.
PARSONS DATE 3 ACCO 60
      16    7   61981 76.2     8539537.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     8.    14.    22.    36.    68.   121.   149.   226.
   290.   333.   360.   356.   312.   174.
PARSONS DATE 3 ACCO 120
      16    7   61981 76.2    15249137.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    14.    24.    38.    54.    72.   144.   179.   262.
   320.   361.   321.   274.   227.   140.
PARSONS DATE 3 ACCO 120
      16    7   61981 76.2    15249137.20  12.  17.  ENG  2.5 1.65  .37
     1.     5.    12.    23.    39.    60.   111.   145.   200.   277.
   338.   393.   373.   317.   261.   139.
PARSONS DATE 3 PIONEER 30
      17    7   61981 76.2     5346237.20  12.  17.  ENG  2.5 1.65  .37  4425
     1.     6.    10.    25.    42.    64.    92.   123.   171.   254.
   310.   347.   343.   350.   293.   218.   113.
PARSONS DATE 3 PIONEER 30
      17    7   61981 76.2     5346237.20  12.  17.  ENG  2.5 1.65  .37  4425
     1.     6.     8.    18.    40.    59.   108.   145.   191.   270.
   320.   336.   332.   361.   333.   288.   162.
PARSONS DATE 3 PIONEER 60
      17    7   61981 76.2     9185437.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     7.    13.    23.    36.    51.    68.   135.   223.
```

Table B-9. (continued)

```
   270.   306.   352.   367.   336.   268.   169.
PARSONS DATE 3 PIONEER 60
      17   7   61981 76.2      9185437.20  12.  17.  ENG  2.5 1.65  .37
     1.     5.    10.    19.    31.    48.    92.   159.   252.   316.
   351.   361.   362.   356.   284.   211.    74.
PARSONS DATE 3 PIONEER 120
      17   7   61981 76.2     16433237.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.     8.    11.    20.    33.    51.    73.    98.   165.
   284.   338.   352.   341.   257.   206.   113.
PARSONS DATE 3 PIONEER 120
      17   7   61981 76.2     16433237.20  12.  17.  ENG  2.5 1.65  .37
     1.     3.     8.    14.    26.    67.    97.   129.   194.   276.
   329.   389.   346.   276.   235.   158.    90.
PARSONS DATE 3 DEKALB 30
      18   7   61981 76.2      5274437.20  12.  17.  ENG  2.5 1.65  .37  8013
     1.     6.    18.    34.    52.    86.   165.   208.   266.   395.
   455.   502.   514.   438.   399.   321.   261.   110.
PARSONS DATE 3 DEKALB 30
      18   7   61981 76.2      5274437.20  12.  17.  ENG  2.5 1.65  .37  8013
     1.     5.    16.    30.    50.    77.   110.   147.   228.   274.
   338.   380.   446.   489.   477.   426.   322.   151.
PARSONS DATE 3 DEKALB 60
      18   7   61981 76.2      8970137.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    12.    21.    36.    68.   106.   161.   220.   321.
   434.   464.   512.   485.   410.   326.   286.   145.
PARSONS DATE 3 DEKALB 60
      18   7   61981 76.2      8970137.20  12.  17.  ENG  2.5 1.65  .37
     1.     4.    11.    25.    42.    71.    92.   169.   266.   405.
   483.   518.   501.   462.   441.   377.   265.   101.
PARSONS DATE 3 DEKALB 120
      18   7   61981 76.2     14710937.20  12.  17.  ENG  2.5 1.65  .37 10285
     1.     5.    13.    21.    32.    47.    52.    69.    82.   135.
   230.   306.   347.   368.   367.   367.   293.   160.
PARSONS DATE 3 DEKALB 120
      18   7   61981 76.2     14710937.20  12.  17.  ENG  2.5 1.65  .37 10285
     1.     5.    10.    14.    35.    63.   149.   193.   263.   346.
   432.   520.   491.   439.   394.   311.   239.   114.
```

Table B-10. Input data for Powhattan 1981 SORGF model runs.

```
POWHATTAN PIONEER DATE 1 RATE 30
 200  17   5   11981 76.2      7128239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.    20.    40.    45.    49.   104.
   187.   263.   329.   443.   485.   468.   329.
(T70,I3,T9,F2.0,T17,F2.0,T25,F3.0,T34,F4.3)
          62       45      346      0.02                                106        1
          73       52      509      0.00                                107        1
          86       53      280      0.00                                108        1
          77       57       96      0.68                                109        1
          60       48      106      0.97                                110        1
          53       43      118      0.01                                111        1
          63       47      282      0.03                                112        1
          68       44      522      0.00                                113        1
```

Table B-10. (continued)

70	45	559	0.00	114	1
71	49	556	0.00	115	1
86	60	563	0.00	116	1
87	60	508	0.00	117	1
88	59	356	0.00	118	1
69	52	385	0.00	119	1
82	49	337	0.00	120	1
69	45	538	0.00	121	1
68	43	554	0.00	122	1
79	50	334	0.00	123	1
79	60	136	0.01	124	1
70	47	322	0.88	125	1
67	47	385	0.00	126	1
64	39	325	0.00	127	1
59	44	255	0.20	128	1
65	50	102	0.00	129	1
57	37	551	0.03	130	1
62	37	565	0.00	131	1
66	46	272	0.14	132	1
67	48	72	0.02	133	1
53	47	547	0.87	134	1
69	49	519	0.00	135	1
71	51	211	0.00	136	1
64	50	85	0.00	137	1
56	50	258	1.27	138	1
52	43	431	1.23	139	1
64	46	457	0.00	140	1
70	47	482	0.00	141	1
74	55	478	0.00	142	1
80	60	470	0.22	143	1
79	48	635	0.00	144	1
74	55	340	0.00	145	1
77	53	543	0.18	146	1
81	58	470	0.29	147	1
79	62	232	0.00	148	1
76	63	512	0.00	149	1
83	61	555	0.00	150	1
76	54	603	0.00	151	1
77	50	583	0.00	152	1
78	56	245	0.07	153	1
82	59	285	0.01	154	1
81	62	147	0.01	155	1
78	62	334	0.07	156	1
87	64	454	0.00	157	1
86	63	501	0.00	158	1
91	70	517	0.00	159	1
95	65	440	0.00	160	1
93	62	312	0.00	161	1
76	61	314	0.36	162	1
73	59	545	0.07	163	1
86	70	523	0.00	164	1
87	74	301	0.00	165	1
86	56	220	1.41	166	1
71	52	573	0.03	167	1
75	54	592	0.00	168	1
82	58	327	0.00	169	1
78	53	477	0.09	170	1
82	63	438	0.02	171	1
84	65	299	0.00	172	1
81	61	414	0.21	173	1

Table B-10. (continued)

82	62	575	0.00	174	1
80	70	569	0.00	175	1
94	63	388	0.61	176	1
85	62	364	0.00	177	1
82	64	495	0.79	178	1
82	67	625	0.00	179	1
89	72	409	0.00	180	1
88	67	413	0.04	181	1
83	66	420	0.00	182	1
83	66	433	0.00	183	1
85	69	274	0.00	184	1
81	68	338	0.02	185	1
83	66	529	0.00	186	1
88	66	624	0.00	187	1
88	68	522	0.00	188	1
87	71	602	0.00	189	1
90	69	574	0.00	190	1
90	72	607	0.00	191	1
94	73	643	0.00	192	1
97	75	650	0.00	193	1
98	73	646	0.00	194	1
97	74	627	0.00	195	1
98	72	474	0.15	196	1
93	71	522	0.02	197	1
90	69	327	0.00	198	1
87	69	213	0.35	199	1
81	71	337	0.00	200	1
87	69	648	0.38	201	1
90	66	321	0.00	202	1
80	63	512	0.11	203	1
84	65	510	0.03	204	1
84	67	123	0.03	205	1
79	66	308	2.76	206	1
80	66	211	1.60	207	1
76	63	263	1.40	208	1
79	59	237	0.05	209	1
67	58	323	0.00	210	1
75	61	429	0.00	211	1
80	66	337	0.00	212	1
80	68	522	0.00	213	1
88	67	440	0.78	214	1
87	67	547	0.01	215	1
84	69	542	0.00	216	1
90	69	341	1.27	217	1
87	68	232	0.41	218	1
78	63	597	0.19	219	1
79	59	577	0.00	220	1
84	64	464	0.00	221	1
82	61	568	0.20	222	1
79	58	592	0.00	223	1
81	61	564	0.00	224	1
83	64	133	0.07	225	1
76	67	534	0.00	226	1
90	72	388	0.00	227	1
81	63	517	0.00	228	1
77	56	401	0.00	229	1
71	52	562	0.00	230	1
73	53	535	0.00	231	1
75	53	598	0.00	232	1
78	54	499	0.00	233	1

Table B-10. (continued)

80	56	478	0.00	234	1
81	60	198	0.00	235	1
77	63	459	0.12	236	1
83	64	206	0.03	237	1
77	62	340	0.33	238	1
78	63	281	0.00	239	1
74	61	336	0.10	240	1
76	58	535	0.17	241	1
85	62	500	0.00	242	1
91	70	269	0.00	243	1
86	54	502	0.11	244	1
70	48	521	0.00	245	1
75	55	357	0.00	246	1
83	61	320	0.12	247	1
77	62	385	0.00	248	1
81	62	255	0.00	249	1
80	66	388	0.99	250	1
74	55	530	0.00	251	1
79	56	529	0.00	252	1
83	56	526	0.00	253	1
84	61	378	0.00	254	1
84	58	506	0.00	255	1
83	57	466	0.00	256	1
87	61	468	0.00	257	1
79	52	439	0.00	258	1
73	45	327	0.03	259	1
60	40	411	0.00	260	1
63	43	473	0.00	261	1
70	46	467	0.00	262	1
80	50	459	0.00	263	1
83	56	352	0.00	264	1
78	53	339	0.00	265	1
72	54	405	0.00	266	1
84	58	111	0.00	267	1
70	67	272	0.64	268	1
78	65	430	0.02	269	1
75	46	442	0.00	270	1
73	46	432	0.00	271	1
77	48	427	0.00	272	1
90	69	377	0.00	273	1
90	48	447	0.00	274	1
70	36	436	0.00	275	1
64	38	68	0.00	276	1
57	48	300	1.05	277	1
75	55	281	0.00	278	1
81	46	414	0.00	279	1
64	40	324	0.00	280	1
63	37	388	0.00	281	1
64	40	65	0.00	282	1
55	48	205	0.00	283	1
64	45	191	0.00	284	1
65	50	71	0.12	285	1
62	55	56	0.04	286	1
64	55	203	0.48	287	1
67	49	129	0.00	288	1
59	49	128	0.00	289	1
60	49	241	0.17	290	1
67	41	310	0.00	291	1
50	32	370	0.00	292	1
71	34	355	0.00	293	1

Table B-10. (continued)

```
        73       44       306       0.00                                    294        1
        54       30       331       0.00                                    295        1
        48       22       359       0.00                                    296        1
        42       23       106       0.00                                    297        1
        46       34       165       0.12                                    298        1
        51       39       341       0.00                                    299        1
        57       35       310       0.00                                    300        1
        70       41       254       0.00                                    301        1
        67       46       261       0.00                                    302        1
        71       50        93       0.00                                    303        1
        64       52        59       0.00                                    304        1
                                                                             305
POWHATTAN PIONEER DATE 1 RATE 30
      17   5   11981 76.2      7128239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.     8.    10.    20.    30.   117.   173.   277.
   322.   389.   445.   537.   480.   335.   222.
POWHATTAN PIONEER DATE 1 RATE 60
      17   5   11981 76.2     12113239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    10.    17.    39.    65.    94.    99.   183.
   255.   348.   388.   400.   450.   383.   246.
POWHATTAN PIONEER DATE 1 RATE 60
      17   5   11981 76.2     12113239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    10.    20.    42.    63.    90.   131.   168.
   270.   351.   335.   450.   445.   299.   176.
POWHATTAN PIONEER DATE 1 RATE 120
      17   5   11981 76.2     19662439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     5.    17.    20.    26.    32.    38.    41.
    70.   141.   176.   197.   230.   214.   126.
POWHATTAN PIONEER DATE 1 RATE 120
      17   5   11981 76.2     19662439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.     8.    17.    29.    45.    87.   112.   151.
   242.   308.   340.   365.   365.   342.   256.
POWHATTAN DEKALB DATE 1 RATE 30
      19   5   11981 76.2      6123639.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.    20.    26.    40.    49.    71.
    88.   161.   257.   351.   398.   492.   474.   372.   203.
POWHATTAN DEKALB DATE 1 RATE 30
      19   5   11981 76.2      6123639.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     9.    16.    33.    49.    68.   112.   145.
   231.   344.   386.   476.   560.   671.   649.   468.   251.
POWHATTAN DEKALB DATE 1 RATE 60
      19   5   11981 76.2     11099039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     4.     5.    12.    15.    32.    75.    83.
   185.   263.   315.   394.   450.   454.   352.   248.   113.
POWHATTAN DEKALB DATE 1 RATE 60
      19   5   11981 76.2     11099039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     5.    12.    16.    18.    29.    30.    31.
    58.   171.   265.   266.   350.   363.   285.   196.    76.
POWHATTAN DEKALB DATE 1 RATE 120
      19   5   11981 76.2     14256539.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     9.    20.    40.    47.    88.   116.
   171.   292.   343.   440.   537.   601.   522.   291.   262.
POWHATTAN DEKALB DATE 1 RATE 120
      19   5   11981 76.2     14256539.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.     9.    20.    40.    47.    62.
    83.   203.   251.   342.   433.   483.   424.   275.   143.
POWHATTAN ACCO DATE 2 RATE 30
      16   6  101981 76.2      7654539.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     6.     7.    16.    30.    54.    84.    86.   204.
   218.   233.   265.   311.   265.   166.
```

Table B-10. (continued)

```
POWHATTAN ACCO DATE 2 RATE 30
      16   6  101981 76.2      7654539.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     7.    18.    36.    62.    95.   107.   127.
   211.   235.   302.   284.   248.   124.
POWHATTAN ACCO DATE 2 RATE 60
      16   6  101981 76.2      8419939.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    10.    12.    29.    59.   112.   168.   202.
   205.   265.   248.   219.   215.   126.
POWHATTAN ACCO DATE 2 RATE 60
      16   6  101981 76.2      8419939.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    10.    12.    29.    59.   112.   168.   202.
   206.   210.   203.   183.   199.   116.
POWHATTAN ACCO DATE 2 RATE 120
      16   6  101981 76.2     16505039.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     4.     8.    10.    20.    30.    50.    72.   120.
   155.   203.   238.   200.   181.    79.
POWHATTAN ACCO DATE 2 RATE 120
      16   6  101981 76.2     16505039.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    62.    68.
   166.   194.   200.   219.   210.   101.
POWHATTAN PIONEER DATE 2 RATE 30
      17   6  101981 76.2      7128239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.    20.    40.    45.    49.   104.
   187.   263.   329.   443.   485.   468.   329.
POWHATTAN PIONEER DATE 2 RATE 30
      17   6  101981 76.2      7128239.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.     8.    10.    20.    30.   117.   173.   277.
   322.   389.   445.   537.   480.   335.   222.
POWHATTAN PIONEER DATE 2 RATE 60
      17   6  101981 76.2     11433839.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    10.    17.    39.    65.    94.    99.   183.
   255.   348.   388.   400.   450.   383.   246.
POWHATTAN PIONEER DATE 2 RATE 60
      17   6  101981 76.2     11433839.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    10.    20.    42.    63.    90.   131.   168.
   270.   351.   335.   450.   445.   299.   176.
POWHATTAN PIONEER DATE 2 RATE 120
      17   6  101981 76.2     16792039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     5.    17.    20.    26.    32.    38.    41.
    70.   141.   176.   197.   230.   214.   126.
POWHATTAN PIONEER DATE 2 RATE 120
      17   6  101981 76.2     16792039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.     8.    17.    29.    45.    87.   112.   151.
   242.   308.   340.   365.   342.   256.
POWHATTAN DEKALB DATE 2 RATE 30
      19   6  101981 76.2      7845839.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.    20.    26.    40.    49.    71.
    88.   161.   257.   351.   398.   492.   474.   372.   203.
POWHATTAN DEKALB DATE 2 RATE 30
      19   6  101981 76.2      7845839.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     9.    16.    33.    49.    68.   112.   145.
   231.   344.   386.   476.   560.   671.   649.   468.   251.
POWHATTAN DEKALB DATE 2 RATE 60
      19   6  101981 76.2     11386039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     4.     5.    12.    15.    32.    75.    83.
   185.   262.   315.   394.   450.   454.   352.   248.   113.
POWHATTAN DEKALB DATE 2 RATE 60
      19   6  101981 76.2     11386039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     5.    12.    16.    18.    29.    30.    31.
    58.   171.   265.   266.   350.   363.   285.   196.    76.
```

Table B-10. (continued)

```
POWHATTAN DEKALB DATE 2 RATE 120
      19   6  101981 76.2     18179439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     8.     9.    20.    40.    47.    62.
    83.   203.   251.   342.   433.   483.   424.   275.   143.
POWHATTAN DEKALB DATE 2 RATE 120
      19   6  101981 76.2     18179439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.     9.    20.    40.    47.    88.   116.
   171.   292.   343.   440.   537.   601.   522.   291.   262.
POWHATTAN ACCO DATE 3 RATE 30
      16   6  261981 76.2      6171439.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     6.     7.    16.    30.    54.    84.    86.   204.
   218.   233.   265.   311.   265.   166.
POWHATTAN ACCO DATE 3 RATE 30
      16   6  261981 76.2      6171439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     3.     7.    18.    36.    62.    95.   107.   127.
   211.   235.   302.   284.   248.   124.
POWHATTAN ACCO DATE 3 RATE 60
      16   6  261981 76.2      7463139.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    10.    12.    29.    59.   112.   168.   202.
   205.   265.   248.   219.   215.   126.
POWHATTAN ACCO DATE 3 RATE 60
      16   6  261981 76.2      7463139.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    10.    12.    29.    59.   112.   168.   202.
   206.   210.   203.   183.   199.   116.
POWHATTAN ACCO DATE 3 RATE 120
      16   6  261981 76.2      9687739.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     4.     8.    10.    20.    30.    50.    72.   120.
   155.   203.   238.   200.   181.    79.
POWHATTAN ACCO DATE 3 RATE 120
      16   6  261981 76.2      9687739.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    62.    68.
   166.   194.   200.   219.   210.   101.
POWHATTAN PIONEER DATE 3 RATE 30
      17   6  261981 76.2      6257539.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     7.    13.    26.    47.    99.   145.   154.
   180.   234.   279.   307.   268.   159.    79.
POWHATTAN PIONEER DATE 3 RATE 30
      17   6  261981 76.2      6257539.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    33.    69.   105.   145.
   156.   186.   275.   315.   293.   218.   102.
POWHATTAN PIONEER DATE 3 RATE 60
      17   6  261981 76.2      9281139.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.    10.    18.    40.    75.   119.   156.   149.
   162.   221.   274.   302.   305.   203.   105.
POWHATTAN PIONEER DATE 3 RATE 60
      17   6  261981 76.2      9281139.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.    10.    15.    28.    52.    83.   148.   151.   180.
   235.   252.   279.   293.   276.   194.    77.
POWHATTAN PIONEER DATE 3 RATE 120
      17   6  261981 76.2     13682439.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    33.    68.    96.   152.
   199.   246.   262.   249.   243.   169.    79.
POWHATTAN PIONEER DATE 3 RATE 120
      17   6  261981 76.2     13682439.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     4.     7.    23.    41.    61.   109.   116.   123.
   135.   180.   194.   165.   183.   108.    43.
POWHATTAN DEKALB DATE 3 RATE 30
      19   6  261981 76.2      7104339.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     4.    11.    22.    43.    67.   114.   130.
   145.   207.   252.   336.   388.   404.   356.   297.   134.
```

Table B-10. (continued)

```
POWHATTAN DEKALB DATE 3 RATE 30
      19    6  261981 76.2      7104339.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     6.     7.    16.    30.    54.    86.    84.   101.
  131.   140.   147.   306.   398.   392.   356.   265.   135.
POWHATTAN DEKALB DATE 3 RATE 60
      19    6  261981 76.2      9663839.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     4.     6.    10.    19.    37.    52.    71.    86.
  162.   203.   315.   288.   357.   361.   383.   342.   169.
POWHATTAN DEKALB DATE 3 RATE 60
      19    6  261981 76.2      9663839.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    75.    86.
   93.   112.   129.   138.   266.   305.   302.   200.   123.
POWHATTAN DEKALB DATE 3 RATE 120
      19    6  261981 76.2      9759539.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    10.    19.    31.    58.    97.   100.   105.
  126.   135.   169.   162.   215.   261.   293.   260.   134.
POWHATTAN DEKALB DATE 3 RATE 120
      19    6  261981 76.2      9759539.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     9.    16.    27.    61.    77.   114.   138.
  199.   260.   275.   332.   235.   293.   351.   347.   232.
POWHATTAN ACCO DATE 4 RATE 30
      16    7   71981 76.2      5693039.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    75.    83.
   98.   110.   117.   111.   103.   101.
POWHATTAN ACCO DATE 4 RATE 30
      16    7   71981 76.2      5693039.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    26.    32.    38.    74.
  135.    96.   109.    95.    73.    45.
POWHATTAN ACCO DATE 4 RATE 60
      16    7   71981 76.2      8156839.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    75.    90.
  120.   120.   168.   215.   252.   186.
POWHATTAN ACCO DATE 4 RATE 60
      16    7   71981 76.2      8156839.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.     8.    10.    20.    30.    50.    75.    83.
  119.   132.   180.   169.   265.   182.
POWHATTAN ACCO DATE 4 RATE 120
      16    7   71981 76.2     16074439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    11.    18.    21.    43.    54.    66.    67.
  161.   189.   218.   259.   283.   188.
POWHATTAN ACCO DATE 4 RATE 120
      16    7   71981 76.2     16074439.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    11.    18.    21.    43.    54.    66.    67.
  115.   148.   239.   293.   293.   193.
POWHATTAN PIONEER DATE 4 RATE 30
      17    7   71981 76.2      8180739.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    75.    83.
  110.   132.   169.   192.   236.   274.   212.
POWHATTAN PIONEER DATE 4 RATE 30
      17    7   71981 76.2      8180739.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     8.    10.    20.    30.    50.    75.    83.
  110.   123.   211.   214.   356.   347.   183.
POWHATTAN PIONEER DATE 4 RATE 60
      17    7   71981 76.2     10190039.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     2.     8.    24.    31.    58.   100.   158.   183.
  225.   263.   244.   212.   148.   123.    38.
POWHATTAN PIONEER DATE 4 RATE 60
      17    7   71981 76.2     10190039.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     5.    11.    18.    21.    43.    54.    66.    92.
  105.   126.   235.   270.   341.   324.   206.
```

Table B-10. (continued)

```
POWHATTAN PICNEER DATE 4 RATE 120
      17   7   71981 76.2     19805939.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     4.    10.    18.    33.    61.    99.   127.   132.
   140.   168.   201.   236.   267.   167.    82.
POWHATTAN PICNEER DATE 4 RATE 120
      17   7   71981 76.2     19805939.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    15.    27.    43.    89.   111.   120.   151.
   188.   248.   331.   372.   332.   259.   142.
POWHATTAN DEKALB DATE 4 RATE 30
      19   7   71981 76.2      6936939.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    11.    24.    38.    50.    99.   113.   120.
   126.   132.   141.   165.   184.   139.   359.   329.   149.
POWHATTAN DEKALB DATE 4 RATE 30
      19   7   71981 76.2      6936939.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     7.    12.    15.    30.    41.    61.    66.    80.
   101.   142.   160.   199.   261.   346.   433.   462.   326.
POWHATTAN DEKALB DATE 4 RATE 60
      19   7   71981 76.2      9568139.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.     6.    10.    17.    20.    31.    50.    69.
    72.    81.    99.   105.   155.   312.   402.   394.   225.
POWHATTAN DEKALB DATE 4 RATE 60
      19   7   71981 76.2      9568139.40  12.  17.  ENG  2.5 1.02  .33
     1.     3.     5.    15.    27.    43.    89.   111.   117.   132.
   140.   152.   209.   222.   335.   366.   315.   316.   138.
POWHATTAN DEKALB DATE 4 RATE 120
      19   7   71981 76.2     18131539.40  12.  17.  ENG  2.5 1.02  .33
     1.     2.     4.     7.    11.    19.    32.    50.    71.    80.
   110.   120.   126.   137.   191.   242.   291.   172.   117.
POWHATTAN DEKALB DATE 4 RATE 120
      19   7   71981 76.2     18131539.40  12.  17.  ENG  2.5 1.02  .33
      1     2.     3.     5.    10.    16.    30.    42.    65.    77.
    81.    90.   137.   144.   239.   260.   236.   194.   107.
```

Table B-11. Input data for St. John 1981 SORGF model runs.

```
ACCO 20 DATE 1 AT ST. JCHN RUN 1
 204   16   5  211981 76.2      1865837.56   5.  15.  ENG  2.5 0.50 0.17 14830
     1.     8.    21.    53.   117.   141.   259.   309.   408.   446.
   511.   505.   452.   366.   255.   123.
(T70,I3,T11,F3.0,T21,F3.0,T31,F3.0,T41,F4.3)
          076        031        642        0.00                              091
          082        054        551        0.00                              092        1
          081        042        452        0.00                              093        1
          059        034        422        0.00                              094        1
          062        034        618        0.00                              095        1
          073        035        597        0.00                              096        1
          083        049        642        0.00                              097        1
          067        042        624        0.00                              098        1
          077        042        634        0.00                              099        1
          085        062        556        0.00                              100        1
          088        056        601        0.08                              101        1
          080        058        543        0.00                              102        1
          090        038        528        0.00                              103        1
```

Table B-11. (continued)

C6C	038	617	0.00	104	1
063	037	473	0.05	105	1
08C	050	505	0.00	106	1
090	050	670	0.00	107	1
066	056	160	0.75	108	1
075	058	375	0.00	109	1
053	049	086	0.04	110	1
063	049	196	0.00	111	1
068	055	560	0.00	112	1
075	040	710	0.00	113	1
084	044	703	0.00	114	1
087	056	721	0.00	115	1
090	059	717	0.00	116	1
091	062	610	0.00	117	1
069	052	340	0.00	118	1
091	055	619	0.00	119	1
080	049	577	0.00	120	1
078	048	621	0.00	121	1
083	050	607	0.00	122	1
081	060	405	0.25	123	1
066	050	207	0.33	124	1
068	046	589	0.00	125	1
063	049	291	0.00	126	1
059	044	118	0.32	127	1
069	049	348	1.50	128	1
053	043	094	0.63	129	1
060	034	692	0.00	130	1
068	034	666	0.00	131	1
076	048	551	0.04	132	1
063	045	146	0.55	133	1
070	041	681	0.00	134	1
069	049	552	0.04	135	1
059	051	053	0.51	136	1
065	055	119	0.04	137	1
06C	042	153	0.79	138	1
065	041	664	0.00	139	1
067	037	609	0.00	140	1
074	052	392	0.00	141	1
088	061	631	0.00	142	1
08C	057	635	0.00	143	1
078	049	630	0.00	144	1
084	057	644	0.00	145	1
084	057	600	0.00	146	1
083	064	460	0.00	147	1
082	061	354	0.28	148	1
072	063	182	0.04	149	1
077	058	623	0.00	150	1
079	053	615	0.00	151	1
083	057	529	0.00	152	1
088	063	607	0.08	153	1
079	062	184	1.88	154	1
079	062	393	0.04	155	1
089	060	637	0.00	156	1
091	064	520	0.00	157	1
095	067	631	0.00	158	1
104	072	652	0.00	159	1
105	070	677	0.00	160	1
088	065	614	0.04	161	1
080	062	183	0.32	162	1
087	070	565	0.00	163	1

Table B-11. (continued)

089	071	606	0.00	164	1
093	069	558	0.00	165	1
074	054	508	0.79	166	1
082	048	713	0.00	167	1
088	059	701	0.00	168	1
084	063	428	0.00	169	1
092	061	564	0.00	170	1
096	072	664	0.00	171	1
101	071	671	0.00	172	1
081	064	185	0.00	173	1
096	067	625	0.00	174	1
100	076	642	0.00	175	1
094	068	640	0.00	176	1
090	070	525	0.00	177	1
098	073	678	0.00	178	1
097	073	682	0.00	179	1
094	068	319	0.12	180	1
084	067	337	0.00	181	1
091	068	487	0.08	182	1
090	071	417	0.00	183	1
082	068	252	1.69	184	1
084	066	648	0.04	185	1
088	064	598	0.00	186	1
090	063	589	0.00	187	1
087	067	459	0.00	188	1
094	071	607	0.00	189	1
093	067	649	0.00	190	1
097	072	654	0.00	191	1
100	075	674	0.00	192	1
102	075	672	0.00	193	1
097	074	644	0.00	194	1
103	075	658	0.00	195	1
100	072	545	0.00	196	1
093	070	493	0.00	197	1
094	070	429	0.12	198	1
088	070	502	0.31	199	1
093	069	613	0.87	200	1
099	072	638	0.08	201	1
097	071	531	0.00	202	1
104	068	581	0.00	203	1
096	074	486	0.00	204	1
095	074	348	0.00	205	1
096	070	527	0.00	206	1
090	070	432	0.08	207	1
084	065	377	1.46	208	1
076	063	301	0.00	209	1
080	066	427	0.00	210	1
087	068	495	0.00	211	1
092	071	627	0.00	212	1
094	071	606	0.00	213	1
087	069	504	0.39	214	1
094	069	613	0.00	215	1
097	073	595	0.00	216	1
102	074	616	0.00	217	1
088	069	440	0.16	218	1
082	061	622	0.00	219	1
090	057	606	0.00	220	1
082	061	313	0.00	221	1
078	063	377	0.08	222	1
084	060	533	0.00	223	1

Table B-11. (continued)

080	062	348	0.00	224	1
087	069	401	0.35	225	1
096	070	590	0.00	226	1
090	067	547	0.00	227	1
087	067	401	0.00	228	1
079	059	358	0.00	229	1
080	052	538	0.00	230	1
083	053	576	0.00	231	1
087	054	573	0.00	232	1
088	053	581	0.00	233	1
092	057	560	0.00	234	1
086	064	402	0.16	235	1
094	059	564	0.00	236	1
093	071	267	0.00	237	1
086	064	515	0.00	238	1
080	057	440	0.00	239	1
088	054	527	0.00	240	1
096	065	550	0.00	241	1
096	073	517	0.00	242	1
095	065	480	0.00	243	1
078	052	473	0.00	244	1
084	047	558	0.00	245	1
090	064	421	0.00	246	1
084	061	343	0.04	247	1
087	064	400	0.04	248	1
077	066	164	1.34	249	1
076	055	526	0.35	250	1
083	051	538	0.00	251	1
085	053	537	0.00	252	1
086	059	508	0.00	253	1
092	062	455	0.08	254	1
088	060	464	0.00	255	1
087	063	412	0.00	256	1
083	060	492	0.00	257	1
076	051	394	0.00	258	1
067	046	463	0.00	259	1
066	036	501	0.00	260	1
074	043	494	0.00	261	1
086	051	493	0.00	262	1
089	053	470	0.00	263	1
084	055	461	0.00	264	1
089	055	451	0.00	265	1
081	063	211	0.00	266	1
081	064	270	0.00	267	1
088	062	437	0.08	268	1
079	054	457	0.00	269	1
077	049	459	0.00	270	1
086	052	424	0.00	271	1
092	067	442	0.00	272	1
091	058	383	0.12	273	1
074	051	416	0.00	274	1
072	051	384	0.00	275	1
077	057	203	0.04	276	1
087	061	417	0.00	277	1
071	054	219	0.00	278	1
065	045	344	0.00	279	1
060	045	213	0.00	280	1
055	045	110	0.00	281	1
058	046	079	0.04	282	1
068	043	356	0.16	283	1

Table B-11. (continued)

```
          060       053       040       0.66                                284       1
          073       060       150       0.00                                285       1
          074       064       159       0.00                                286       1
          056       049       514       0.32                                287       1
          050       045       044       0.28                                288       1
          062       051       084       0.76                                289       1
          066       042       331       0.00                                290       1
          057       035       377       0.00                                291       1
          073       035       369       0.00                                292       1
          075       046       364       0.00                                293       1
                                                                              294
ACCO 20 DATE 1 AT ST. JOHN RUN 4
      16   5  211981 76.2     1865837.56   5.  15.  ENG  2.5 0.50 0.17 14830
     1.     9.    23.    38.    59.    84.   105.   124.   146.   169.
   229.   350.   420.   471.   432.   265.
ACCO 40 DATE 1 AT ST. JOHN RUN 1
      16   5  211981 76.2     3229237.56   5.  15.  ENG  2.5 0.50 0.17 24160
     1.    10.    27.    45.    69.    99.   130.   170.   213.   291.
   322.   329.   329.   324.   279.   129.
ACCO 40 DATE 1 AT ST. JOHN RUN 4
      16   5  211981 76.2     3229237.56   5.  15.  ENG  2.5 0.50 0.17 24160
     1.     8.    21.    41.    68.   105.   151.   192.   244.   307.
   327.   383.   410.   332.   231.   106.
ACCO 80 DATE 1 AT ST. JOHN RUN 1
      16   5  211981 76.2     6099737.56   5.  15.  ENG  2.5 0.50 0.17  5023
     1.     6.    11.    16.    21.    41.    68.   105.   150.   188.
   235.   341.   324.   265.   219.   103.
ACCO 80 DATE 1 AT ST. JOHN RUN 4
      16   5  211981 76.2     6099737.56   5.  15.  ENG  2.5 0.50 0.17  5023
     1.     3.     5.    11.    21.    36.    56.    80.   108.   145.
   159.   199.   194.   248.   191.    59.
PIONEER 20 DATE 1 AT ST. JOHN RUN 1
      18   5  211981 76.2     3301037.56   5.  15.  ENG  2.5 0.50 0.17  7176   1
     1.     7.    14.    44.    77.   125.   203.   268.   332.   376.
   446.   493.   533.   502.   416.   312.   219.    98.
PIONEER 20 DATE 1 AT ST. JOHN RUN 4
      18   5  211981 76.2     3301037.56   5.  15.  ENG  2.5 0.50 0.17  7176
     1.     8.    15.    34.    56.    80.   110.   155.   218.   297.
   317.   378.   416.   433.   362.   274.   187.    97.
PIONEER 40 DATE 1 AT ST. JOHN RUN 1
      18   5  211981 76.2     6996737.56   5.  15.  ENG  2.5 0.50 0.17  3707
     1.     5.     8.    14.    28.    46.    71.   110.   147.   182.
   226.   307.   312.   346.   372.   332.   214.    86.
PIONEER 40 DATE 1 AT ST. JOHN RUN 4
      18   5  211981 76.2     6996737.56   5.  15.  ENG  2.5 0.50 0.17  3707
     1.     7.    10.    17.    35.    59.    84.   112.   158.   223.
   297.   300.   341.   378.   322.   206.   105.    28.
PIONEER 80 DATE 1 AT ST. JOHN RUN 1
      18   5  211981 76.2    11290437.56   5.  15.  ENG  2.5 0.50 0.17
     1.     3.     6.    10.    20.    36.    60.    93.   133.   177.
   226.   288.   327.   389.   416.   427.   371.   223.
PIONEER 80 DATE 1 AT ST. JOHN RUN 4
      18   5  211981 76.2    11290437.56   5.  15.  ENG  2.5 0.50 0.17
     1.     5.     9.    16.    28.    44.    69.   101.   139.   178.
   214.   257.   252.   331.   343.   329.   233.    92.
DEKALB 20 DATE 1 AT ST. JOHN RUN 1
      20   5  211981 76.2     2188737.56   5.  15.  ENG  2.5 0.50 0.17 14213
     1.     3.     6.    14.    28.    44.    74.   124.   193.   279.
   402.   495.   614.   650.   627.   585.   491.   368.   239.    79.
DEKALB 20 DATE 1 AT ST. JOHN RUN 4
```

Table B-11. (continued)

```
      20    5  211981 76.2      2188737.56    5.  15.  ENG  2.5 0.50 0.17 14213
     1.      3.      5.     10.     14.     32.     50.     74.    101.    128.
   154.    185.    222.    324.    386.    454.    483.    485.    393.    206.
DEKALB 40 DATE 1 AT ST. JOHN RUN 1
      20    5  211981 76.2      5238537.56    5.  15.  ENG  2.5 0.50 0.17 12200
     1.      3.      5.     11.     21.     37.     59.     88.    122.    130.
   135.    140.    160.    207.    269.    272.    331.    363.    300.    126.
DEKALB 40 DATE 1 AT ST. JOHN RUN 4
      20    5  211981 76.2      5238537.56    5.  15.  ENG  2.5 0.50 0.17 12200
     1.      5.      8.     17.     33.     59.     75.     86.    120.    158.
   259.    297.    367.    442.    471.    439.    331.    223.    155.     38.
DEKALB 80 DATE 1 AT ST. JOHN RUN 1
      20    5  211981 76.2     10572837.56    5.  15.  ENG  2.5 0.50 0.17
     1.      4.      7.     25.     43.     68.    100.    135.    173.    207.
   251.    269.    288.    378.    474.    502.    444.    332.    203.     66.
DEKALB 80 DATE 1 AT ST. JOHN RUN 4
      20    5  211981 76.2     10572837.56    5.  15.  ENG  2.5 0.50 0.17
     1.      3.      5.      9.     17.     31.     51.     76.    107.    141.
   174.    202.    235.    273.    315.    416.    515.    475.    304.    123.
ST JOHN DATE 2 RUN ------  1
      16    6  161981 76.2      2404037.56    5.  15.  ENG  2.5 0.50 0.17 25236
     1.      8.     16.     26.     40.     62.     88.    125.    176.    205.
   263.    316.    402.    497.    559.    391.
ST JOHN DATE 2 RUN ------  2
      16    6  161981 76.2      2404037.56    5.  15.  ENG  2.5 0.50 0.17 25236
     1.      6.     25.     42.     64.     98.    140.    187.    231.    285.
   356.    426.    509.    585.    544.    391.
ST JOHN DATE 2 RUN ------  7
      16    6  161981 76.2      4664537.56    5.  15.  ENG  2.5 0.50 0.17 20332
     1.     10.     34.     52.     74.     98.    125.    160.    205.    263.
   309.    386.    467.    504.    459.    295.
ST JOHN DATE 2 RUN ------  8
      16    6  161981 76.2      4664537.56    5.  15.  ENG  2.5 0.50 0.17 20332
     1.      8.     21.     42.     69.     98.    126.    160.    194.    243.
   322.    400.    478.    515.    433.    249.
ST JOHN DATE 2 RUN ------  13
      16    6  161981 76.2      6745537.56    5.  15.  ENG  2.5 0.50 0.17
     1.      8.     32.     64.     92.    118.    141.    168.    179.    227.
   298.    354.    383.    383.    279.    163.
ST JOHN DATE 2 RUN ------  14
      16    6  161981 76.2      6745537.56    5.  15.  ENG  2.5 0.50 0.17
     1.      6.     18.     50.    110.    178.    242.    306.    376.    422.
   399.    342.    322.    297.    230.    115.
ST JOHN DATE 2 RUN ------  19
      18    6  161981 76.2      3157537.56    5.  15.  ENG  2.5 0.50 0.17 17222
     1.     10.     27.     48.     85.    127.    165.    214.    258.    302.
   372.    439.    479.    456.    378.    302.    206.     74.
ST JOHN DATE 2 RUN ------  20
      18    6  161981 76.2      3157537.56    5.  15.  ENG  2.5 0.50 0.17 17222
     1.      9.     38.     75.    121.    173.    225.    235.    318.    366.
   416.    512.    527.    490.    439.    345.    293.    135.
ST JOHN DATE 2 RUN ------  25
      18    6  161981 76.2      6506337.56    5.  15.  ENG  2.5 0.50 0.17
     1.      8.     20.     49.     82.    118.    155.    203.    230.    310.
   388.    445.    450.    408.    341.    284.    213.    100.
ST JOHN DATE 2 RUN ------  26
      18    6  161981 76.2      6506337.56    5.  15.  ENG  2.5 0.50 0.17
     1.      6.     10.     33.     60.    100.    144.    207.    235.    310.
   378.    456.    480.    456.    367.    288.    223.    123.
ST JOHN DATE 2 RUN ------  31
```

Table B-11. (continued)

```
      18   6  161981 76.2     11051237.56   5.  15.  ENG  2.5 0.50 0.17
     1.      5.      9.     17.     31.     52.     74.     99.    165.    197.
   229.    282.    367.    385.    366.    293.    215.    106.
ST JOHN DATE 2 RUN ------  32
      18   6  161981 76.2     11051237.56   5.  15.  ENG  2.5 0.50 0.17
     1.      7.     14.     28.     46.     71.    101.    150.    222.    248.
   331.    397.    414.    355.    284.    235.    155.     78.
ST JOHN DATE 2 RUN ------  37
      19   6  161981 76.2      2583437.56   5.  15.  ENG  2.5 0.50 0.17 27269
     1.      2.      3.      7.     16.     30.     52.    122.    163.    210.
   270.    329.    391.    462.    545.    529.    288.    292.    108.
ST JOHN DATE 2 RUN ------  38
      19   6  161981 76.2      2583437.56   5.  15.  ENG  2.5 0.50 0.17 27269
     1.      3.      5.     12.     24.     48.     90.    169.    216.    281.
   301.    383.    486.    558.    582.    566.    497.    341.     51.
ST JOHN DATE 2 RUN ------  43
      19   6  161981 76.2      5489737.56   5.  15.  ENG  2.5 0.50 0.17 22605
     1.      5.     10.     20.     44.     77.    102.    136.    184.    249.
   292.    315.    391.    469.    565.    603.    623.    507.    269.
ST JOHN DATE 2 RUN ------  44
      19   6  161981 76.2      5489737.56   5.  15.  ENG  2.5 0.50 0.17 22605
     1.      7.     13.     22.     34.     63.     84.    113.    152.    179.
   221.    273.    321.    377.    450.    555.    529.    427.    182.
ST JOHN DATE 2 RUN ------  49
      19   6  161981 76.2      9328937.56   5.  15.  ENG  2.5 0.50 0.17  5741
     1.      4.      9.     18.     57.     84.    116.    150.    194.    247.
   288.    316.    397.    471.    507.    529.    443.    351.    174.
ST JOHN DATE 2 RUN ------  50
      19   6  161981 76.2      9328937.56   5.  15.  ENG  2.5 0.50 0.17  5741
     1.      7.     14.     26.     73.    107.    147.    188.    227.    273.
   301.    350.    421.    503.    522.    504.    431.    305.    142.
ST JOHN DATE 3 RUN ------  1
      16   7   81981 76.2      2583437.56   5.  15.  ENG  2.5 0.50 0.17  5262
     1.      8.     21.     53.    117.    141.    259.    309.    408.    446.
   511.    505.    452.    366.    255.    123.
ST JOHN DATE 3 RUN ------  2
      16   7   81981 76.2      2583437.56   5.  15.  ENG  2.5 0.50 0.17  5262
     1.      9.     23.     38.     59.     84.    105.    124.    146.    169.
   229.    350.    420.    471.    432.    265.
ST JOHN DATE 3 RUN ------  7
      16   7   81981 76.2      3588137.56   5.  15.  ENG  2.5 0.50 0.17 11003
     1.     10.     27.     45.     69.     99.    130.    170.    213.    291.
   322.    329.    329.    324.    279.    129.
ST JOHN DATE 3 RUN ------  8
      16   7   81981 76.2      3588137.56   5.  15.  ENG  2.5 0.50 0.17 11003
     1.      8.     21.     41.     68.    105.    151.    192.    244.    307.
   327.    383.    410.    332.    231.    106.
ST JOHN DATE 3 RUN ------  13
      16   7   81981 76.2      6063837.56   5.  15.  ENG  2.5 0.50 0.17  2990
     1.      6.     11.     16.     21.     41.     68.    105.    150.    188.
   235.    241.    324.    265.    219.    103.
ST JOHN DATE 3 RUN ------  14
      16   7   81981 76.2      6063837.56   5.  15.  ENG  2.5 0.50 0.17  2990
     1.      3.      5.     11.     21.     36.     56.     80.    108.    145.
   159.    199.    194.    248.    191.     59.
ST JOHN DATE 3 RUN ------  19
      17   7   81981 76.2      4162137.56   5.  15.  ENG  2.5 0.50 0.17 10525
     1.      5.      9.     17.     29.     46.     92.    117.    141.    169.
   244.    277.    323.    326.    346.    260.    126.
ST JOHN DATE 3 RUN ------  20
```

Table B-11. (continued)

```
     17   7   81981 76.2      4162137.56   5.  15.  ENG  2.5 0.50 C.17 10525
    1.     5.     8.    11.    36.    55.    79.   105.   132.   135.
  163.    84.   132.   180.   287.   265.   135.
ST JCHN CATE 3 RUN ------  25
     17   7   81981 76.2      6817337.56   5.  15.  ENG  2.5 0.50 C.17  3109
    1.     6.    12.    22.    39.    90.   123.   156.   188.   213.
  241.   245.   313.   335.   312.   252.   108.
ST JCHN DATE 3 RUN ------  26
     17   7   81981 76.2      6817337.56   5.  15.  ENG  2.5 0.50 C.17  3109
    1.     5.     9.    19.    46.    62.    89.   127.   170.   214.
  268.   279.   289.   383.   336.   341.   191.
ST JCHN CATE 3 RUN ------  31
     17   7   81981 76.2      9041937.56   5.  15.  ENG  2.5 0.50 C.17
    1.     4.     7.    11.    16.    30.    57.    61.    69.    84.
  115.   210.   259.   248.   248.   214.    99.
ST JCHN CATE 3 RUN ------  32
     17   7   81981 76.2      9041937.56   5.  15.  ENG  2.5 0.50 C.17
    1.     5.     7.    10.    19.    34.    55.    83.   117.   187.
  229.   212.   203.   291.   297.   248.   142.
ST JCHN DATE 3 RUN ------  37
     19   7   81981 76.2      2152837.56   5.  15.  ENG  2.5 0.50 C.17 49276
    1.     5.    20.    30.    50.    63.    96.   135.   178.   219.
  255.   296.   330.   419.   439.   506.   450.   336.   143.
ST JCHN DATE 3 RUN ------  38
     19   7   81981 76.2      2152837.56   5.  15.  ENG  2.5 0.50 C.17 49276
    1.     4.    15.    29.    48.    62.    95.   137.   160.   183.
  229.   271.   302.   274.   383.   459.   466.   398.   221.
ST JCHN CATE 3 RUN ------  43
     19   7   81981 76.2      6027937.56   5.  15.  ENG  2.5 0.50 C.17 16744
    1.     5.    10.    27.    47.    76.    95.   114.   119.   125.
  136.   159.   221.   281.   293.   216.   193.   257.   166.
ST JCHN DATE 3 RUN ------  44
     19   7   81981 76.2      6027937.56   5.  15.  ENG  2.5 0.50 C.17 16744
    1.     5.     8.    17.    33.    61.    82.   102.   158.   192.
  226.   323.   348.   351.   434.   482.   404.   307.   105.
ST JCHN CATE 3 RUN ------  49
     19   7   81981 76.2      7140237.56   5.  15.  ENG  2.5 0.50 C.17  8970
    1.     5.     9.    12.    44.    59.    74.   114.   165.   179.
  193.   165.   221.   338.   248.   342.   337.   351.   161.
ST JCHN DATE 3 RUN ------  50
     19   7   81981 76.2      7140237.56   5.  15.  ENG  2.5 0.50 C.17  8970
    1.     4.     9.    18.    34.    58.    74.    90.   132.   155.
  178.   227.   288.   375.   383.   416.   383.   283.   141.
```

Table B-12. Input data for Minneola 1981 SORGF model runs.

```
 MINNEOLA DATE 1 RUN------  1
 175  16   5  221981 76.2      2116937.27  12.  17.  ENG  2.5 1.26  .35 44372
    1.     3.     9.    13.    21.    32.    39.    58.   108.   140.
  167.   265.   295.   351.   366.   231.
(T75,I3,T18,F3.0,T24,F3.0,T11,F5.2,T55,F4.3)
051181     671.0  072.   39.                                0.00     0.00         131
051281     452.0  075.   46.                                0.00     0.02         132
```

Table B-12. (continued)

051381	233.1	055.	43.	0.64	0.42	133
051481	715.2	068.	39.	0.00	0.00	134
051581	513.5	073.	48.	0.00	0.01	135
051681	059.8	059.	53.	0.25	0.69	136
051781	477.9	077.	57.	0.14	0.00	137
051881	158.2	058.	44.	0.03	0.04	138
051981	701.9	065.	40.	0.00	0.00	139
052081	586.0	071.	44.	0.00	0.00	140
052181	515.3	079.	53.	0.00	0.00	141
052281	721.7	089.	60.	0.00	0.00	142
052381	676.6	080.	54.	0.00	0.00	143
052481	484.0	079.	51.	0.00	0.00	144
052581	671.2	084.	57.	0.00	0.41	145
052681	409.6	084.	60.	0.00	0.00	146
052781	522.8	085.	60.	0.00	0.64	147
052881	583.2	081.	63.	0.00	0.69	148
052981	158.8	073.	63.	0.03	0.52	149
053081	695.1	075.	57.	0.39	0.00	150
053181	633.0	079.	57.	0.00	0.00	151
060181	573.2	086.	060.	0.00	0.03	152
060281	703.7	081.	061.	0.00	0.00	153
060381	373.2	081.	061.	0.04	0.00	154
060481	588.8	082.	058.	0.00	0.00	155
060581	515.0	086.	064.	0.00	0.00	156
060681	486.8	089.	065.	0.00	0.00	157
060781	678.0	099.	066.	0.00	0.00	158
060881	683.9	104.	072.	0.00	0.00	159
060981	728.1	099.	070.	0.00	0.00	160
061081	631.0	086.	065.	0.00	0.00	161
061181	331.9	091.	064.	0.00	0.02	162
061281	709.2	094.	065.	0.00	0.00	163
061381	685.6	095.	070.	0.00	0.00	164
061481	536.0	095.	063.	0.00	0.54	165
061581	488.8	075.	055.	0.48	0.49	166
061681	754.5	083.	050.	0.00	0.00	167
061781	754.0	092.	060.	0.00	0.00	168
061881	425.0	080.	059.	0.00	0.00	169
061981	648.4	094.	058.	0.00	0.00	170
062081	716.5	095.	068.	0.00	0.00	171
062181	719.4	099.	074.	0.00	0.00	172
062281	503.0	083.	067.	0.00	0.00	173
062381	641.9	099.	067.	0.00	0.00	174
062481	648.1	103.	077.	0.00	0.08	175
062581	669.5	095.	063.	0.01	0.00	176
062681	715.6	100.	071.	0.00	0.00	177
062781	726.0	101.	076.	0.00	0.00	178
062881	717.3	100.	075.	0.00	0.00	179
062981	333.9	092.	071.	0.00	0.23	180
063081	339.5	086.	068.	0.18	0.00	181
070181	471.3	092.	070.	0.00	0.69	182
070281	667.5	094.	072.	0.91	0.36	183
070381	343.9	085.	070.	0.46	0.94	184
070481	660.4	088.	066.	0.02	0.00	185
070581	710.2	087.	063.	0.00	0.00	186
070681	691.0	090.	068.	0.00	0.00	187
070781	591.0	091.	069.	0.00	0.00	188
070881	632.7	096.	071.	0.00	0.00	189
070981	689.3	092.	069.	0.00	0.00	190
071081	689.5	097.	072.	0.00	0.00	191
071181	712.1	101.	074.	0.00	0.00	192

Table B-12. (continued)

071281	708.0	102.	075.	0.00	0.00	193
071381	654.7	102.	073.	0.00	0.00	194
071481	681.4	103.	076.	0.00	0.00	195
071581	408.8	100.	073.	0.00	0.30	196
071681	427.2	091.	072.	0.01	0.00	197
071781	464.1	097.	070.	0.00	0.84	198
071881	482.5	089.	070.	0.00	0.17	199
071981	680.1	096.	070.	0.65	0.09	200
072081	687.7	098.	072.	0.28	0.00	201
072181	664.2	105.	075.	0.00	0.00	202
072281	617.9	092.	068.	0.00	0.00	203
072381	531.6	097.	074.	0.00	0.00	204
072481	395.9	102.	080.	0.46	0.00	205
072581	521.4	093.	070.	0.00	0.01	206
072681	510.7	090.	066.	0.00	0.86	207
072781	421.0	085.	066.	1.83	1.04	208
072881	144.9	076.	066.	0.00	0.00	209
072981	498.2	089.	067.	0.00	0.00	210
073081	604.8	092.	068.	0.00	0.00	211
073181	654.1	096.	072.	0.00	0.00	212
080181	630.1	098.	074.	0.00	0.07	213
080281	516.8	090.	072.	0.66	0.73	214
080381	636.6	095.	072.	0.00	0.00	215
080481	639.9	098.	073.	0.00	0.00	216
080581	637.3	100.	074.	0.00	0.00	217
080681	569.4	087.	071.	0.00	0.00	218
080781	613.9	087.	062.	0.00	0.00	219
080881	624.9	090.	058.	0.00	0.00	220
080981	256.8	084.	062.	0.00	0.20	221
081081	239.7	078.	066.	0.15	0.20	222
081181	578.5	084.	065.	0.14	0.00	223
081281	162.9	075.	066.	0.00	0.08	224
081381	456.7	090.	070.	0.35	0.33	225
081481	588.8	095.	070.	0.00	0.00	226
081581	507.1	091.	071.	0.00	0.04	227
081681	471.5	085.	065.	0.17	0.00	228
081781	435.8	081.	063.	0.00	0.00	229
081881	552.5	082.	058.	0.00	0.00	230
081981	614.4	086.	059.	0.00	0.00	231
082081	597.1	088.	060.	0.00	0.00	232
082181	589.9	091.	061.	0.00	0.00	233
082281	564.9	095.	065.	0.00	0.24	234
082381	536.6	086.	067.	0.41	0.30	235
082481	586.9	094.	066.	0.00	0.00	236
082581	497.1	095.	072.	0.00	0.00	237
082681	529.4	088.	064.	0.00	0.00	238
082781	502.4	085.	060.	0.00	0.00	239
082881	580.4	091.	059.	0.00	0.00	240
082981	575.2	100.	067.	0.02	0.04	241
083081	549.5	099.	073.	0.00	0.00	242
083181	524.0	095.	065.	0.00	0.03	243
090181	512.1	081.	060.	0.00	0.00	244
090281	567.3	090.	055.	0.00	0.00	245
090381	297.2	087.	064.	0.00	0.01	246
090481	352.0	084.	061.	0.02	0.00	247
090581	307.5	089.	066.	0.00	0.14	248
090681	361.9	087.	067.	0.73	1.97	249
090781	550.2	079.	061.	0.00	0.00	250
090881	544.2	082.	055.	0.00	0.00	251
090981	549.3	087.	060.	0.00	0.00	252

Table B-12. (continued)

```
091081    515.8  091.  060.                              0.00    0.00      253
091181    515.7  092.  068.                              0.00    0.00      254
091281    311.6  083.  065.                              0.12    0.34      255
091381    473.9  085.  063.                              1.65    0.00      256
091481    501.5  085.  059.                              0.00    0.00      257
091581    410.3  078.  052.                              0.00    0.00      258
091681    348.8  068.  047.                              0.17    0.09      259
091781    510.0  066.  040.                              0.00    0.00      260
091881    513.2  075.  044.                              0.00    0.00      261
091981    514.9  086.  053.                              0.00    0.00      262
092081    500.8  093.  057.                              0.00    0.00      263
092181    466.8  085.  054.                              0.00    0.00      264
092281    310.6  095.  054.                              0.00    0.00      265
092381    154.3  080.  065.                              0.00    0.00      266
092481    373.3  087.  066.                              0.00    0.00      267
092581    469.9  090.  065.                              0.36    0.52      268
092681    501.4  080.  057.                              0.00    0.00      269
092781    474.1  081.  052.                              0.00    0.00      270
092881    429.5  092.  060.                              0.00    0.00      271
092981    453.3  093.  065.                              0.00    0.00      272
093081    379.1  090.  060.                              0.00    0.00      273
100181    439.4  075.  051.                              0.00    0.00      274
100281    328.9  075.  051.                              0.00    0.00      275
100381    343.4  088.  057.                              0.00    0.00      276
100481    450.6  087.  049.                              0.00    0.00      277
100581    205.7  073.  053.                              0.00    0.00      278
100681    322.3  066.  046.                              0.00    0.00      279
100781    254.5  063.  049.                              0.00    0.00      280
100881    084.3  055.  049.                              0.00    0.00      281
100981    095.8  060.  049.                              0.00    0.00      282
101081    267.6  065.  044.                              0.02    0.00      283
101181    057.4  063.  057.                              0.00    0.00      284
101281    351.5  083.  060.                              0.00    0.00      285
101381    199.8  079.  056.                              0.00    0.00      286
101481    182.0  063.  049.                              0.00    0.00      287
101581    046.3  050.  046.                              0.11    0.24      288
101681    121.8  062.  049.                              0.23    0.08      289
101781    331.5  066.  047.                              0.28    0.03      290
101881    393.0  062.  040.                              0.00    0.00      291
101981    383.9  075.  040.                              0.00    0.00      292
102081    383.6  082.  040.                              0.00    0.00      293
102181    099.3  047.  040.                              0.00    0.00      294
102281    345.3  053.  033.                              0.00    0.00      295
102381    297.6  049.  027.                              0.00    0.00      296
102481    296.0  061.  038.                              0.00    0.02      297
102581    186.7  053.  037.                              1.03    1.03      298
102681    356.6  065.  035.                              0.03    0.00      299
102781    279.6  067.  040.                              0.00    0.00      300
102881    282.1  069.  047.                              0.00    0.00      301
102981    275.0  078.  050.                              0.00    0.00      302
103081    327.1  074.  054.                              0.00    0.00      303
103181    042.6  054.  046.                              0.00    0.00      304
                                                                           305
MINNEOLA DATE 1 RUN------  2
      16    5  221981 76.2      2116937.27  12.  17.  ENG  2.5 1.26  .35 44372
     1.     3.     7.    18.     32.    44.    71.    97.   137.   165.
   221.   258.   296.   307.    279.   145.
 MINNECLA DATE 1 RUN------  7
      16    5  221981 76.2      4377437.27  12.  17.  ENG  2.5 1.26  .35 38512
     1.     3.     9.    12.     14.    18.    27.    48.    86.   119.
```

Table B-12. (continued)

```
  159.   196.   223.   286.   311.   198.
MINNECLA DATE 1 RUN------  8
     16   5  221981 76.2      4377437.27  12.  17.  ENG  2.5 1.26  .35 38512
    1.     3.     8.    17.    21.    35.    54.   100.   139.   185.
  230.   256.   275.   302.   270.   153.
MINNEOLA DATE 1 RUN------ 13
     16   5  221981 76.2      6243237.27  12.  17.  ENG  2.5 1.26  .35 49515
    1.     3.     9.    24.    37.    52.    85.   147.   203.   241.
  310.   329.   347.   349.   281.   180.
MINNECLA DATE 1 RUN------ 14
     16   5  221981 76.2      6243237.27  12.  17.  ENG  2.5 1.26  .35 49515
    1.     3.     8.    24.    32.    47.    61.    88.   148.   196.
  229.   268.   300.   329.   340.   214.
MINNECLA DATE 1 RUN------ 19
     18   5  221981 76.2      3408637.27  12.  17.  ENG  2.5 1.26  .35 40067
    1.     4.    15.    31.    44.    75.   133.   181.   228.   254.
  319.   411.   543.   569.   459.   327.   187.   101.
MINNECLA DATE 1 RUN------ 20
     18   5  221981 76.2      3408637.27  12.  17.  ENG  2.5 1.26  .35 40067
    1.     4.    14.    38.    59.    74.   120.   190.   229.   275.
  339.   398.   490.   520.   515.   393.   261.   130.
MINNECLA DATE 1 RUN------ 25
     18   5  221981 76.2      6781437.27  12.  17.  ENG  2.5 1.26  .35 34565
    1.     4.    24.    47.    80.   123.   165.   200.   215.   269.
  360.   467.   511.   441.   343.   223.   131.    57.
MINNECLA DATE 1 RUN------ 26
     18   5  221981 76.2      6781437.27  12.  17.  ENG  2.5 1.26  .35 34565
    1.     4.    21.    42.    58.    81.   122.   183.   233.   251.
  290.   384.   466.   531.   484.   357.   215.    90.
MINNECLA DATE 1 RUN------ 31
     18   5  221981 76.2     12235237.27  12.  17.  ENG  2.5 1.26  .35 27389
    1.     4.    18.    27.    45.    78.   129.   181.   233.   267.
  335.   433.   427.   399.   234.   161.   135.    89.
MINNECLA DATE 1 RUN------ 32
     18   5  221981 76.2     12235237.27  12.  17.  ENG  2.5 1.26  .35 27389
    1.     4.    16.    24.    33.    57.    85.   139.   189.   234.
  254.   334.   398.   460.   342.   205.   119.    60.
MINNECLA DATE 1 RUN------ 37
     20   5  221981 76.2      2511637.27  12.  17.  ENG  2.5 1.26  .35 67216
    1.     4.    22.    31.    59.    72.   116.   164.   217.   260.
  314.   469.   569.   486.   502.   357.   306.   282.   230.   117.
MINNECLA DATE 1 RUN------ 38
     20   5  221981 76.2      2511637.27  12.  17.  ENG  2.5 1.26  .35 67216
    1.     4.    23.    34.    56.    95.   143.   185.   238.   302.
  372.   499.   537.   577.   479.   357.   294.   289.   231.    90.
MINNECLA DATE 1 RUN------ 43
     20   5  221981 76.2      5812637.27  12.  17.  ENG  2.5 1.26  .35 48080
    1.     4.    11.    21.    32.    52.    94.   144.   203.   243.
  307.   354.   495.   574.   604.   513.   327.   235.   193.   117.
MINNECLA DATE 1 RUN------ 44
     20   5  221981 76.2      5812637.27  12.  17.  ENG  2.5 1.26  .35 48080
    1.     3.     9.    11.    18.    28.    38.    62.   104.   153.
  199.   261.   316.   496.   467.   302.   219.   216.   166.    81.
MINNECLA DATE 1 RUN------ 49
     20   5  221981 76.2     10584737.27  12.  17.  ENG  2.5 1.26  .35 26671
    1.     4.    11.    20.    35.    45.    80.   132.   181.   254.
  324.   364.   461.   563.   533.   437.   265.   184.   116.    67.
MINNECLA DATE 1 RUN------ 50
     20   5  221981 76.2     10584737.27  12.  17.  ENG  2.5 1.26  .35 26671
    1.     4.    10.    16.    26.    32.    38.    55.    93.   153.
```

Table B-12. (continued)

```
   189.   238.   301.   394.   439.   399.   259.   144.   118.    75.
MINNCELA DATE 2 RUN------  1
      16   6  181981 76.2     1614637.27  12.  17.  ENG  2.5 1.26  .35 48439
     1.     6.    13.    18.    25.    32.    38.    45.    95.   133.
   184.   252.   351.   442.   402.   228.
MINNCELA DATE 2 RUN------  2
      16   6  181981 76.2     1614637.27  12.  17.  ENG  2.5 1.26  .35 48439
     1.     5.     7.    10.    19.    33.    52.    76.   111.   154.
   208.   257.   288.   332.   293.   176.
MINNCELA DATE 2 RUN------  7
      16   6  181981 76.2     3552237.27  12.  17.  ENG  2.5 1.26  .35 38152
     1.     4.     9.    20.    27.    38.    64.   101.   159.   192.
   221.   261.   310.   315.   307.   172.
MINNCELA DATE 2 RUN------  8
      16   6  181981 76.2     3552237.27  12.  17.  ENG  2.5 1.26  .35 38152
     1.     5.    10.    18.    30.    46.    65.    85.   106.   131.
   156.   194.   239.   231.   199.    97.
MINNCELA DATE 2 RUN------ 13
      16   6  181981 76.2     6386737.27  12.  17.  ENG  2.5 1.26  .35 28944
     1.     5.    13.    15.    17.    19.    20.    21.    38.    62.
   105.   169.   236.   299.   311.   187.
MINNCELA DATE 2 RUN------ 14
      16   6  181981 76.2     6386737.27  12.  17.  ENG  2.5 1.26  .35 28944
     1.     6.    16.    46.    67.    93.   119.   144.   165.   188.
   192.   237.   284.   321.   293.   180.
MINNCELA DATE 2 RUN------ 19
      18   6  181981 76.2     2224637.27  12.  17.  ENG  2.5 1.26  .35 36072
     1.     6.    14.    27.    32.    48.    78.   126.   169.   218.
   318.   376.   427.   434.   390.   315.   231.    97.
MINNCELA DATE 2 RUN------ 20
      18   6  181981 76.2     2224637.27  12.  17.  ENG  2.5 1.26  .35 36072
     1.     6.    10.    16.    32.    57.    76.    95.   156.   196.
   246.   315.   375.   390.   403.   397.   315.   128.
MINNCELA DATE 2 RUN------ 25
      18   6  181981 76.2     4808037.27  12.  17.  ENG  2.5 1.26  .35 12199
     1.     5.    18.    32.    76.   104.   135.   163.   186.   212.
   265.   354.   426.   496.   520.   564.   472.   279.
MINNCELA DATE 2 RUN------ 26
      18   6  181981 76.2     4808037.27  12.  17.  ENG  2.5 1.26  .35 12199
     1.     6.    16.    27.    65.    90.   141.   162.   185.   213.
   274.   349.   404.   427.   405.   383.   265.   122.
MINNCELA DATE 2 RUN------ 31
      18   6  181981 76.2     8144837.27  12.  17.  ENG  2.5 1.26  .35  6100
     1.     6.    23.    37.    55.    75.   117.   133.   151.   186.
   272.   345.   378.   405.   400.   388.   306.   149.
MINNCELA DATE 2 RUN------ 32
      18   6  181981 76.2     8144837.27  12.  17.  ENG  2.5 1.26  .35  6100
     1.     6.    13.    25.    43.    67.   132.   168.   213.   289.
   374.   452.   452.   481.   475.   461.   361.   201.
MINNCELA DATE 2 RUN------ 37
      20   6  181981 76.2     1973437.27  12.  17.  ENG  2.5 1.26  .35 44372
     1.     5.     7.    17.    36.    69.    96.   122.   214.   244.
   298.   365.   439.   446.   509.   526.   522.   538.   403.   231.
MINNCELA DATE 2 RUN------ 38
      20   6  181981 76.2     1973437.27  12.  17.  ENG  2.5 1.26  .35 44372
     1.     5.    17.    26.    38.    52.    62.    74.    78.    86.
   152.   207.   279.   373.   496.   540.   510.   436.   329.   156.
MINNCELA DATE 2 RUN------ 43
      20   6  181981 76.2     3875137.27  12.  17.  ENG  2.5 1.26  .35 44970
     1.     5.    11.    21.    36.    57.    84.   114.   145.   174.
```

Table B-12. (continued)

```
   208.   251.   304.   410.   430.   478.   438.   520.   462.   261.
MINNCELA DATE 2 RUN------  44
      20    6  181981 76.2     3675137.27  12.  17.  ENG  2.5 1.26  .35 44970
     1.     5.     7.    14.    26.    44.    70.   101.   137.   185.
   197.   257.   313.   408.   460.   473.   488.   498.   408.   206.
MINNCELA DATE 2 RUN------  49
      20    6  181981 76.2     8109037.27  12.  17.  ENG  2.5 1.26  .35 15548
     1.     5.     9.    14.    26.    35.    44.    68.    99.   143.
   192.   262.   335.   394.   439.   474.   492.   427.   327.   165.
MINNCELA DATE 2 RUN------  50
      20    6  181981 76.2     8109037.27  12.  17.  ENG  2.5 1.26  .35 15548
     1.     6.    10.    13.    27.    33.    39.    50.    82.   128.
   184.   247.   331.   396.   416.   416.   421.   408.   285.   120.
 MINNOELA DATE 3 RUN-------   1    **********************************************
      16    7   91981 76.2     1937537.27  12.  17.  ENG  2.5 1.26  .35119654
     1.     4.    10.    21.    38.    63.    98.   140.   187.   234.
   238.   212.   229.   296.   314.   152.
 MINNOELA DATE 3 RUN-------   2    **********************************************
      16    7   91981 76.2     1937537.27  12.  17.  ENG  2.5 1.26  .35119654
     1.     5.    10.    17.    28.    42.    58.    76.    91.   105.
   120.   165.   191.   291.   269.   124.
 MINNOELA DATE 3 RUN-------   7    **********************************************
      16    7   91981 76.2     3516337.27  12.  17.  ENG  2.5 1.26  .35 85395
     1.     4.     6.    12.    23.    38.    60.    85.   114.   179.
   143.   229.   190.   260.   219.   140.
 MINNOELA DATE 3 RUN-------   8    **********************************************
      16    7   91981 76.2     3516337.27  12.  17.  ENG  2.5 1.26  .35 85395
     1.     5.     9.    11.    23.    44.    60.    76.   122.   180.
   265.   233.   259.   311.   298.   202.
 MINNOELA DATE 3 RUN-------  13    **********************************************
      16    7   91981 76.2     3444537.27  12.  17.  ENG  2.5 1.26  .35 65063
     1.     5.     8.    12.    23.    40.    62.    90.   123.   157.
   188.   225.   211.   333.   269.   176.
 MINNOELA DATE 3 RUN-------  14    **********************************************
      16    7   91981 76.2     3444537.27  12.  17.  ENG  2.5 1.26  .35 65063
     1.     4.     8.    16.    28.    47.    71.    99.   130.   161.
   198.   165.   150.   196.   236.   141.
 MINNOELA DATE 3 RUN-------  19    **********************************************
      18    7   91981 76.2     2870437.27  12.  17.  ENG  2.5 1.26  .35 88026
     1.     5.     9.    17.    29.    46.    67.    92.   117.   141.
   169.   244.   277.   323.   326.   346.   260.   126.
 MINNOELA DATE 3 RUN-------  20    **********************************************
      18    7   91981 76.2     2870437.27  12.  17.  ENG  2.5 1.26  .35 88026
     1.     5.    11.    21.    36.    55.    67.    79.   105.   132.
   135.   163.    84.   134.   180.   287.   265.   135.
 MINNOELA DATE 3 RUN-------  25    **********************************************
      18    7   91981 76.2     3085737.27  12.  17.  ENG  2.5 1.26  .35 51142
     1.     6.    12.    22.    39.    61.    90.   123.   156.   188.
   213.   241.   245.   313.   335.   312.   252.   108.
 MINNOELA DATE 3 RUN-------  26    **********************************************
      18    7   91981 76.2     3085737.27  12.  17.  ENG  2.5 1.26  .35 51142
     1.     5.     9.    19.    34.    46.    57.    89.   127.   170.
   214.   268.   278.   289.   383.   336.   341.   191.
 MINNOELA DATE 3 RUN-------  31    **********************************************
      18    7   91981 76.2     7929637.27  12.  17.  ENG  2.5 1.26  .35 52744
     1.     4.     7.    11.    16.    30.    53.    57.    61.    69.
    84.   115.   210.   259.   248.   248.   214.    99.
 MINNOELA DATE 3 RUN-------  32    **********************************************
      18    7   91981 76.2     7929637.27  12.  17.  ENG  2.5 1.26  .35 52744
     1.     5.     7.    10.    19.    34.    55.    83.   117.   152.
```

Table B-12. (continued)

```
  187.   229.   212.   203.   291.   297.   248.   142.
MINNOELA DATE 3 RUN-------  37  ********************************************
     20   7   91981 76.2      1758137.27  12.  17.  ENG  2.5 1.26  .35 60399
      1.    5.   11.   21.    30.   39.   63.   96.   135.   178.
  219.   255.   296.   330.   419.   439.   506.   450.   336.   143.
MINNOELA DATE 3 RUN-------  38  ********************************************
     20   7   91981 76.2      1758137.27  12.  17.  ENG  2.5 1.26  .35 60399
      1.    4.   10.   20.    29.   37.   62.   95.   137.   160.
  183.   229.   271.   302.   274.   383.   459.   466.   398.   221.
MINNOELA DATE 3 RUN-------  43  ********************************************
     20   7   91981 76.2      3444537.27  12.  17.  ENG  2.5 1.26  .35 86505
      1.    5.   10.   14.    27.   47.   76.   95.   114.   119.
  125.   136.   159.   221.   281.   293.   216.   193.   257.   166.
MINNOELA DATE 3 RUN-------  44  ********************************************
     20   7   91981 76.2      3444537.27  12.  17.  ENG  2.5 1.26  .35 86505
      1.    5.    8.   13.    17.   33.   61.   82.   102.   158.
  192.   226.   323.   348.   351.   434.   482.   404.   307.   105.
MINNOELA DATE 3 RUN-------  49  ********************************************
     20   7   91981 76.2      6817337.27  12.  17.  ENG  2.5 1.26  .35 50471
      1.    5.    9.   12.    24.   44.   59.   74.   114.   165.
  179.   193.   221.   165.   338.   248.   342.   337.   351.   161.
MINNOELA DATE 3 RUN-------  50  ********************************************
     20   7   91981 76.2      6817337.27  12.  17.  ENG  2.5 1.26  .35 50471
      1.    4.    9.   14.    18.   34.   58.   74.    90.   132.
  155.   178.   227.   288.   375.   383.   416.   383.   283.   141.
```

APPENDIX C

Table C-1. Manhattan 1980 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	HPD$_R$
5233.03	21.00	224415.38	369208.69	22.96	1093.52	21803321
7521.81	24.00	146391.88	75348.69	51.41	2142.03	21802121
5328.86	22.00	225720.13	229275.44	23.09	1049.71	21802221
3836.07	25.00	136997.75	135627.75	28.54	1141.48	21803211
5097.72	21.50	139607.25	146391.88	36.70	1707.06	21802211
4403.53	20.75	276605.00	249727.31	16.17	779.20	21802311
5340.61	22.50	105488.25	0.0	48.18	2141.31	21803131
5834.39	28.00	131322.13	0.0	44.66	1594.85	21801131
4581.11	21.00	134388.25	0.0	32.62	1553.21	21803231
4699.79	19.75	150045.13	0.0	30.00	1519.16	21802231
3404.20	23.00	136997.75	0.0	24.86	1080.95	21801231
2427.35	21.00	151349.88	0.0	16.05	764.12	21801331
3388.22	21.25	133474.94	79654.38	26.36	1240.53	21803111
4282.39	22.50	99160.25	109793.88	43.61	1938.13	21802111
3037.49	23.00	206149.00	258338.50	15.23	662.14	21803311
2860.32	14.50	181358.94	218511.31	15.51	1069.96	21801221
4504.61	23.00	344451.50	402577.50	13.07	568.25	21802321
2408.69	14.00	187882.63	289554.31	12.61	900.79	21801321
3378.45	21.75	108293.44	96876.94	31.18	1433.49	21801111
2807.98	18.50	253119.69	314312.00	11.00	594.54	21801311
3064.53	20.50	147435.69	152850.31	20.89	1019.12	21801211
1705.36	22.25	152728.44	0.0	11.11	499.26	21801332
3408.60	21.25	152654.63	0.0	21.34	1004.32	21803331
5405.03	19.50	275300.25	0.0	18.83	965.49	21802331
4854.39	20.00	247900.69	0.0	18.76	937.87	21802332
2259.60	22.25	202365.13	0.0	11.11	499.26	21801132
3511.66	21.75	186577.88	116252.38	19.05	875.81	21802312
3817.48	22.50	229634.31	262644.19	16.77	745.20	21803312
3858.59	20.00	213129.25	118405.19	18.11	905.71	21802212
2260.68	16.50	126559.81	201288.69	17.55	1063.73	21801222
5043.79	21.00	193101.63	205594.38	26.07	1241.65	21802222
6853.62	22.25	124863.63	78577.94	54.79	2462.61	21802122
5068.49	23.50	163092.56	161461.63	31.42	1336.88	21801212
3393.32	23.75	103074.50	83960.00	33.91	1427.63	21803112
5040.69	23.00	116252.38	105488.25	44.14	1919.08	21802112
6210.52	20.50	118405.19	0.0	50.35	2456.23	21802132
3105.48	18.75	230939.06	0.0	12.82	683.99	21803332
5149.49	24.00	136997.75	0.0	35.89	1495.32	21803232
4364.43	20.50	138302.50	0.0	30.20	1472.94	21802232
4730.78	23.50	86112.81	0.0	52.68	2241.75	21803132
2628.54	22.25	99160.25	0.0	26.58	1194.74	21801232
2722.21	23.00	105683.94	62431.83	26.34	1145.36	21801112
3708.53	20.00	227024.88	238963.19	16.44	821.90	21801312
3230.32	21.50	165767.19	144239.06	20.05	932.41	21803212
2878.16	17.25	195906.75	230351.75	14.47	838.73	21801322
4046.18	21.50	293566.63	355215.50	13.82	642.87	21802322
5533.37	24.00	117426.63	105488.25	47.42	1975.74	21802123
4591.52	20.75	287042.94	176531.31	16.10	775.73	21802313
4391.61	23.50	178749.44	193753.81	25.19	1071.72	21803213
3782.34	23.50	189187.38	247574.38	20.35	866.03	21803313
3385.55	23.25	127016.50	0.0	25.39	1092.18	21803233
3384.77	25.25	109598.19	0.0	31.08	1230.79	21801233
4818.20	20.75	152654.63	0.0	30.27	1458.63	21802233
2868.09	26.50	87417.63	0.0	32.86	1240.16	21801133
2321.51	17.75	161787.81	0.0	13.73	773.51	21803333
3590.73	23.75	88265.69	0.0	38.76	1631.83	21803133
3311.61	23.25	88722.31	62431.83	37.39	1608.09	21801113
4120.59	20.50	268776.56	361674.00	15.43	752.55	21801313
5451.67	21.00	204517.94	146391.88	26.76	1274.39	21802213
4144.25	23.50	207453.75	425182.19	19.99	850.53	21802323

3043.51	19.50	161787.81	159308.75	18.67	957.57	21801223
2986.78	22.00	200212.31	105486.25	15.13	687.88	21801213
4129.45	28.50	110902.94	62431.83	38.99	1368.09	21803113
5045.11	23.50	96550.81	90418.50	53.07	2258.25	21802113
4438.52	22.00	109793.88	0.0	38.72	1760.16	21802133
2913.85	22.50	185273.13	0.0	15.83	703.38	21801333
4725.54	20.50	242681.75	0.0	18.67	910.86	21802333

Table C-2. Hutchinson 1980 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	P D H R
3436.64	26.75	155264.13	193753.81	21.56	805.81	73803313
4682.55	20.75	91331.81	49514.90	50.26	2422.37	73801333
2709.75	14.50	74370.19	103335.44	35.44	2444.40	73802323
2752.36	22.75	100465.00	79654.38	26.53	1166.26	73801223
2752.36	18.50	70455.94	101182.63	37.83	2045.04	73802333
3584.72	15.00	183968.44	144239.06	19.00	1266.48	73803323
3254.17	15.00	83503.38	51667.72	37.95	2530.10	73801323
3539.99	33.50	154285.56	73195.94	22.17	661.85	73802313
2510.47	17.25	113512.44	150697.50	21.40	1240.31	73803333
2016.16	28.25	67846.50	79654.38	28.81	1019.88	73801233
1220.56	18.50	133083.50	0.0	8.90	481.19	73802212
791.61	26.75	41751.70	94724.13	18.44	689.49	73802232
1928.78	21.50	109598.19	79654.38	17.02	791.86	73801222
3706.24	21.50	75674.94	79654.38	47.75	2220.85	73802332
4486.09	16.00	194406.31	236810.25	22.55	1409.23	73803322
3184.02	26.00	159178.31	139933.38	19.25	744.26	73803312
2902.06	25.00	139607.25	99029.75	20.15	806.17	73802312
4145.33	18.00	167006.81	275561.13	24.12	1339.93	73803332
672.80	32.75	24790.07	60279.01	26.28	802.57	73801312
2110.14	29.50	58713.33	58126.20	34.81	1179.89	73801232
3007.52	15.75	87417.63	133474.94	33.54	2129.64	73802322
4851.34	22.25	109793.88	49514.90	43.17	1940.43	73801332
2166.50	30.75	71760.69	66737.44	29.30	952.96	73801311
4470.68	19.50	104379.25	101182.63	41.71	2139.04	73802331
2441.13	19.50	97855.50	150697.50	24.21	1241.71	73803331
1529.09	20.50	126559.81	99029.75	11.79	570.78	73802221
2794.87	24.75	103074.50	0.0	26.44	1068.10	73803231
2837.82	25.75	105683.94	58126.20	26.06	1012.15	73801221
2734.11	15.75	78284.44	90418.50	34.05	2161.90	73802321
3489.70	16.50	70455.94	55973.36	48.34	2929.85	73801321
3566.20	15.50	189187.38	167920.00	18.32	1181.71	73803321
5800.32	19.50	153959.38	43056.43	36.94	1894.13	73801331
2517.42	28.00	139933.38	124863.63	17.46	623.63	73802311
1678.28	27.50	104379.25	101182.63	15.61	567.50	73803311
1280.17	24.50	83503.38	129169.31	14.90	608.04	73802231
1034.03	19.50	93941.31	182989.69	10.72	549.72	73803211

Table C-3. Parsons 1981 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	H P D R
2095.86	22.00	170790.38	196983.06	12.21	554.93	82813331
2034.97	28.25	77501.56	55973.36	26.06	922.58	82813131
3328.90	21.00	180836.94	148544.63	18.38	875.06	82812331
2910.50	31.25	57408.57	43056.42	51.07	1634.40	82813121
2654.84	19.50	119122.75	176531.31	22.43	1150.08	82812321
3516.69	20.50	87548.06	96876.94	40.19	1960.50	82812221
2829.41	28.75	62001.27	55973.36	45.40	1579.13	82811111
2901.43	23.10	143521.38	174378.56	19.98	864.76	82811211
3344.07	13.00	256903.25	236810.25	12.94	995.01	82812311
3412.16	18.40	126298.81	135627.75	27.34	1486.04	82813211
3158.06	22.00	126298.81	217435.00	24.76	1125.62	82811311
2417.06	23.00	33009.93	38750.79	74.02	3218.34	82813111
2344.46	26.50	67455.06	65661.00	34.77	1312.24	82811221
1038.41	30.25	22963.43	48438.48	45.40	1500.83	82811121
2881.81	27.00	97594.56	103335.38	29.38	1088.02	82811321
1683.56	38.75	44491.64	51667.71	38.08	982.64	82811131
2448.09	30.75	87548.06	93647.69	27.54	895.53	82811231
3484.57	23.25	86112.81	99029.75	40.86	1757.42	82812231
3467.33	24.00	140650.94	163614.25	24.55	1023.04	82811331
3100.00	27.50	84677.63	94724.13	37.71	1371.09	82813231
3652.14	30.00	63149.43	46285.66	59.85	1994.85	82812131
1819.30	22.25	21528.21	35521.55	84.75	3808.84	82812121
2469.06	23.50	87548.06	131322.06	28.28	1203.49	82813321
2765.16	26.50	58843.78	87189.25	47.61	1796.78	82813221
3879.30	16.50	99029.75	105488.25	39.15	2372.68	82812211
5172.66	21.55	146391.81	262644.19	36.05	1672.99	82813311
3463.39	16.25	60279.00	55973.36	57.29	3525.57	82812111
3766.00	14.55	170790.38	180836.94	21.94	1507.70	82812312
3560.85	27.95	86112.88	62431.83	40.86	1461.90	82811212
3925.28	16.50	81807.19	58126.20	47.79	2896.33	82812112
2339.11	27.00	74631.13	109793.88	31.43	1164.10	82811322
1858.15	33.00	51667.72	30139.49	35.94	1089.14	82811122
3010.97	22.00	43056.43	38750.78	70.37	3198.64	82812122
2123.22	33.50	44491.64	45209.24	49.79	1486.37	82813132
3553.19	25.50	53102.92	58126.18	67.49	2646.53	82812132
2086.34	36.00	48797.28	38750.78	42.73	1186.93	82811132
3355.52	25.50	80372.00	79654.38	42.16	1653.22	82813232
2685.32	34.75	74631.13	78577.94	35.80	1030.10	82811232
3456.47	33.00	116252.31	142086.19	30.27	917.17	82811332
4576.29	19.75	121993.19	134551.31	37.92	1920.12	82812322
3321.32	21.75	88983.25	75348.69	37.35	1717.02	82812222
2193.99	32.50	34445.14	27986.67	64.32	1978.97	82813122
5004.28	21.50	94724.13	96876.94	53.65	2495.56	82813212
4945.85	21.50	192318.56	314312.00	26.09	1213.40	82813312
4196.48	16.25	110511.44	122710.81	37.74	2322.16	82812212
2660.94	21.50	51667.71	49514.90	51.71	2404.91	82813112
3512.68	27.00	74057.06	45209.25	47.51	1759.69	82811112
2404.16	20.90	132039.69	161461.63	18.01	861.82	82811312
2390.33	23.25	71760.69	130245.69	33.60	1444.99	82813322
3427.92	26.50	81807.19	63508.23	42.21	1592.98	82813222
4019.24	28.50	88983.25	57049.76	45.40	1592.98	82811222
5003.09	22.00	160744.00	168996.31	31.21	1418.75	82812332
3447.63	22.00	193753.81	119481.63	17.82	810.17	82813332
3613.63	19.00	90418.44	99029.75	40.36	2123.98	82812232
3085.28	31.50	68890.25	83960.00	44.45	1411.24	82811233
3798.75	25.00	100464.94	94724.13	37.62	1504.69	82813233
4027.87	28.75	107641.06	124863.63	38.14	1326.47	82813333

4144.14	30.00	61714.21	85036.44	67.57	2252.40	82813223
1884.28	30.75	41621.21	39827.19	45.40	1476.42	82811123
3024.80	22.00	64584.65	73195.88	46.91	2132.42	82812223
2470.02	27.75	91853.69	73195.94	26.60	958.61	82811213
4327.61	15.25	255468.13	275561.13	16.83	1103.85	82812313
2313.16	29.50	55973.36	43056.43	40.74	1381.14	82811113
3398.04	17.00	63149.43	66737.44	53.65	3156.15	82812113
2380.64	25.25	45926.86	43056.43	75.19	2977.97	82813113
3601.14	19.95	81807.19	83960.00	44.60	2235.76	82813213
2393.08	24.50	83242.38	133474.88	28.96	1182.12	82813323
2129.46	31.25	32292.32	30139.49	66.59	2130.77	82813123
3064.32	33.75	74631.13	78577.94	41.03	1215.84	82811223
3504.65	26.25	55973.36	77501.56	62.86	2394.72	82812233
3703.59	22.25	57408.57	55973.36	64.69	2907.64	82812133
3374.85	26.75	60279.00	57049.76	56.21	2101.29	82813133
2604.96	36.00	48797.28	45209.24	53.41	1483.66	82811133
4433.48	25.75	129169.25	151773.88	34.30	1332.12	82811333
5103.68	23.25	142086.19	175454.88	36.23	1558.20	82812333
4263.83	25.75	163614.25	97953.44	26.28	1020.75	82812323
2691.49	27.50	35880.35	35521.55	76.27	2773.53	82812123
3328.90	25.50	163614.25	177607.63	20.31	796.49	82811323
5568.24	22.50	221022.88	215282.06	25.80	1146.46	82813313
1943.09	23.30	173660.81	223893.38	11.07	475.05	82811313
2724.24	12.90	133474.88	124863.63	20.26	1570.47	82812213

Table C-4. Powhattan 1981 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	H P D R
3798.75	27.75	104770.63	0.0	36.07	1299.86	24811331
3190.96	29.50	61714.21	0.0	51.21	1735.83	24811131
5575.08	25.00	97594.56	0.0	57.42	2296.71	24813231
2121.36	15.00	53102.92	0.0	39.88	2658.56	24813141
4385.82	10.50	246856.81	0.0	17.82	1696.84	24812341
2450.84	15.75	147827.06	0.0	16.31	1035.48	24811341
5604.15	30.15	144956.63	0.0	40.01	1326.90	24813311
6880.94	21.35	238245.50	0.0	29.40	1377.08	24812311
6337.24	23.60	170790.38	0.0	38.53	1632.74	24813321
5270.57	29.95	86112.81	0.0	63.56	2122.20	24811121
5443.05	27.65	68890.25	0.0	83.23	3010.25	24813121
5251.02	29.80	90418.44	0.0	59.81	2007.14	24811221
4700.82	21.00	66019.81	0.0	75.01	3571.84	24812121
5813.57	27.20	139215.75	0.0	43.06	1583.08	24811321
4319.14	32.00	61714.21	0.0	72.85	2276.60	24813111
3209.28	12.00	185142.50	0.0	17.24	1437.08	24813341
3057.25	11.50	93288.88	0.0	32.13	2793.85	24812241
4361.96	11.50	129169.31	0.0	33.29	2895.07	24812141
5127.17	23.00	88983.25	0.0	57.85	2515.15	24812231
5912.75	21.50	134910.13	0.0	43.95	2044.24	24812331
2898.16	31.50	71760.69	0.0	39.95	1268.32	24811231
5232.88	23.00	103335.38	0.0	51.07	2220.65	24813331
4205.99	21.00	66019.81	0.0	63.17	3007.87	24812131
3328.16	24.50	55973.36	0.0	59.02	2408.98	24813131
2812.65	18.25	79654.38	0.0	34.97	1916.18	24811241
2660.94	14.50	71760.69	0.0	37.23	2567.45	24813241

1980.48	17.75	81807.19	0.0	23.89	1346.18	24811141
3763.36	28.50	63149.43	0.0	60.88	2136.04	24812111
6382.29	31.75	117687.56	0.0	55.92	1761.24	24813211
6752.37	24.00	130891.56	0.0	53.76	2240.13	24812211
6112.58	25.15	111946.69	0.0	57.04	2268.03	24813221
7574.00	20.05	175096.06	0.0	44.66	2227.22	24812321
7519.73	18.85	136345.31	0.0	56.87	3016.95	24812221
6326.54	19.60	90418.44	0.0	72.06	3676.71	24812222
5547.72	19.75	73195.88	0.0	78.34	3966.44	24812122
7047.21	18.65	152132.69	0.0	47.54	2549.14	24812322
6392.40	28.90	129169.25	0.0	51.45	1780.39	24813212
5913.93	26.30	106205.81	0.0	56.75	2157.79	24812212
1403.51	16.00	77501.56	0.0	17.66	1103.47	24811242
2037.28	11.50	47362.06	0.0	42.65	3708.56	24812142
3767.15	12.75	116252.38	0.0	31.95	2505.74	24813142
6619.89	23.50	124863.63	0.0	53.23	2265.00	24813232
2851.89	23.00	41334.18	0.0	68.10	2960.87	24812132
3625.02	11.00	87548.06	0.0	41.38	3761.91	24812242
2793.93	13.50	177966.44	0.0	15.74	1166.19	24813342
2634.69	15.00	127734.06	0.0	20.40	1360.30	24811342
7088.47	25.60	170790.38	0.0	42.35	1654.21	24812312
5967.83	27.75	87548.06	0.0	70.70	2547.93	24812112
6541.38	24.45	103335.38	0.0	66.21	2707.91	24813122
3953.82	13.50	76066.31	0.0	54.82	4060.93	24811222
7243.92	28.25	163614.25	0.0	46.20	1635.27	24811322
7025.80	26.50	99029.75	0.0	75.01	2830.52	24813222
3103.64	28.00	71760.69	0.0	44.49	1589.00	24811122
6717.65	23.80	223893.38	0.0	31.72	1332.85	24813322
4599.11	29.65	58843.78	0.0	81.94	2763.62	24813112
6635.20	29.25	140650.94	0.0	49.11	1678.84	24813312
3518.55	11.25	173660.81	0.0	19.89	1767.64	24812342
988.01	17.00	38750.79	0.0	25.22	1483.66	24811142
3606.35	28.15	94724.13	0.0	37.83	1343.99	24813242
5980.47	21.75	140650.94	0.0	43.08	1980.86	24812332
3920.82	21.50	76066.31	0.0	51.40	2390.52	24813332
5044.87	22.25	80372.00	0.0	63.24	2842.05	24812232
5102.85	28.00	86112.88	0.0	59.02	2107.86	24813133
3568.88	30.00	77501.56	0.0	45.40	1513.33	24811233
1770.39	15.00	38750.78	0.0	45.40	3026.67	24813143
2797.12	11.75	68890.25	0.0	40.67	3461.35	24812143
2572.25	11.25	180836.94	0.0	14.41	1281.13	24813343
4632.12	27.00	63149.43	0.0	76.35.	2827.95	24812113
5394.13	28.60	86112.81	0.0	65.83	2301.75	24813213
6634.83	28.40	142086.19	0.0	48.84	1719.70	24813313
6792.51	20.00	116252.31	0.0	60.53	3026.66	24812223
3892.05	28.80	86112.81	0.0	47.67	1655.21	24811223
6688.14	24.10	150697.44	0.0	46.70	1937.64	24813323
7039.78	27.00	130604.50	0.0	56.38	2087.99	24813223
4379.13	26.60	63149.43	0.0	73.67	2769.62	24813123
3787.00	27.15	71760.69	0.0	54.48	2006.63	24811123
5639.46	30.80	63149.43	0.0	96.99	3149.06	24813113
7062.38	23.75	126298.81	0.0	57.52	2422.06	24812213
6864.77	24.50	180836.94	0.0	38.91	1588.34	24812313
2107.75	16.75	87548.06	0.0	23.82	1421.87	24811243
1248.65	18.50	50232.50	0.0	24.65	1332.20	24811143
4378.24	11.75	173660.81	0.0	25.14	2139.48	24812343
5489.14	24.75	80372.00	0.0	68.10	2751.51	24812133
3902.97	25.50	67455.06	0.0	57.96	2272.84	24813233
5665.78	20.50	134910.13	0.0	42.02	2049.71	24812333
5814.32	21.75	109076.25	0.0	53.76	2471.87	24812233

2229.38	26.50	88983.25	0.0	24.90	939.50	24811333
5192.07	23.50	113381.88	0.0	45.97	1956.37	24813333
4205.29	12.50	124863.63	0.0	33.66	2692.69	24812243
2679.22	13.25	120558.00	0.0	22.16	1672.42	24813243
3419.01	15.50	206670.69	0.0	16.55	1067.88	24811343
7448.96	27.30	192318.56	0.0	40.32	1476.85	24811323
7315.07	20.25	176531.31	0.0	43.19	2132.61	24812323
5730.09	20.80	74631.13	0.0	79.45	3819.71	24812123

Table C-5. St. John 1981 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	HPDR
4186.96	23.00	100464.94	73195.88	41.51	1804.72	71812211
3504.65	26.50	35880.35	31215.91	98.06	3700.53	71812111
2625.47	25.75	38750.78	25833.85	68.10	2644.66	71813111
1822.32	19.00	33009.93	54896.94	52.31	2753.09	71811331
1135.88	21.50	15787.35	17222.57	68.10	3167.44	71811131
1571.27	22.50	43056.43	31215.91	34.50	1533.51	71813131
5906.95	22.20	73195.88	82883.56	85.01	3829.45	71812221
3731.06	25.15	77501.56	53820.54	52.55	2089.32	71813221
3089.07	28.00	47362.06	65661.00	67.41	2407.58	71811321
4524.96	25.25	76066.31	77501.56	63.82	2527.40	71813321
5452.71	28.15	68890.25	22604.62	86.07	3057.58	71813121
6871.73	20.35	143521.38	128092.81	50.62	2487.52	71812321
4240.49	16.50	87548.06	86112.81	46.14	2796.62	71812231
4327.62	16.75	124863.63	148544.63	32.88	1962.74	71812331
2419.84	19.00	60279.00	59202.58	37.83	1991.23	71813331
4916.85	25.00	116252.31	121634.38	42.32	1692.69	71813311
2757.06	28.00	60279.00	49514.88	45.40	1621.43	71811311
1723.81	30.00	27269.07	19375.39	63.22	2110.70	71811111
2823.19	26.50	54538.14	45209.24	51.97	1961.17	71811211
3859.85	24.75	66019.81	52744.12	58.23	2352.74	71813211
3252.48	22.00	111946.69	144239.00	29.10	1322.84	71812311
2065.23	23.00	51667.72	38750.78	37.83	1644.93	71811231
2960.16	17.50	25833.86	53820.54	108.46	6197.46	71812131
3135.65	19.75	78936.75	89342.06	37.56	1901.68	71813231
4533.69	30.25	57408.58	27986.67	81.72	2701.49	71811121
4496.22	27.65	60279.00	40903.60	77.83	2814.78	71811221
4410.58	26.30	34445.15	21528.21	136.20	5178.71	71812121
5084.48	28.00	51667.72	19375.39	104.42	3729.28	71813122
3982.37	25.10	80372.00	85036.44	51.89	2067.16	71811322
4928.89	26.70	77501.56	46285.66	65.58	2456.10	71811222
4188.00	19.50	76066.31	71043.06	52.68	2701.60	71811332
2239.75	18.00	48797.28	40903.60	43.40	2410.95	71813232
3094.50	17.25	55973.36	71043.06	52.38	3036.79	71812332
2426.09	27.50	77501.56	66737.44	31.11	1131.18	71811312
1562.97	30.00	24398.63	10764.10	64.09	2136.47	71811112
3544.79	22.00	140650.94	142086.19	25.02	1137.11	71812312
2800.33	25.75	47362.06	21528.21	59.16	2297.38	71813112
3136.65	25.75	68890.25	34445.14	45.40	1763.11	71811212
4726.39	27.75	91853.69	107641.06	51.07	1840.54	71813312
3091.15	16.50	71760.69	29063.09	40.86	2476.36	71812132
2792.00	20.50	48797.28	40903.60	54.75	2670.59	71811232
2989.19	23.25	43056.43	32292.31	66.28	2850.92	71811132

6006.42	26.15	103335.38	61355.41	62.74	2399.25	71813222
4366.13	19.70	64584.64	65661.00	70.62	3584.88	71812222
6712.22	23.75	60279.00	35521.55	116.74	4915.48	71812122
4977.96	20.00	71760.69	102259.00	72.64	3632.00	71812322
4319.14	29.20	45926.87	22604.62	97.89	3352.53	71811122
5604.48	23.75	126298.81	103335.38	47.72	2009.33	71813322
4048.46	18.50	99029.75	107641.06	38.62	2098.39	71813332
4894.32	21.00	86112.88	12916.92	53.91	2567.26	71813132
3313.55	18.25	48797.28	30139.49	64.76	3548.59	71812232
3940.81	25.75	68890.25	47362.06	57.70	2240.61	71813212
2347.14	25.50	34445.14	26910.27	68.10	2670.59	71812112
3344.07	24.50	57408.57	69966.69	57.88	2362.65	71812212
2950.65	27.50	48797.28	25833.85	60.09	2185.03	71811113
4111.76	24.00	86112.81	101182.56	48.05	2002.01	71812313
1442.54	29.50	45926.87	29063.09	31.21	1058.05	71811213
3644.63	19.50	81807.19	47362.06	42.21	2164.82	71813333
2872.59	26.75	48797.29	27986.67	56.08	2096.54	71811133
4871.88	18.25	77501.56	88265.63	59.69	3270.83	71812233
4637.63	27.30	63149.43	52744.12	76.35	2796.87	71811223
5158.17	24.05	57408.57	64584.64	95.34	3964.24	71812223
5850.15	24.50	94724.13	99029.75	65.69	2681.32	71813323
4845.26	26.75	74631.13	58126.18	68.97	2578.43	71811323
5968.88	24.10	51667.72	37674.37	124.85	5180.50	71812123
5268.20	32.50	40186.00	16146.16	139.44	4290.55	71813123
4961.90	20.00	103335.44	50591.30	45.40	2270.00	71813233
3842.61	19.00	77501.56	20451.80	47.08	2477.97	71813133
4386.79	17.75	90418.44	71043.06	46.12	2598.35	71812333
1315.86	30.50	74631.13	67813.81	17.46	572.51	71811313
3894.05	25.00	58843.78	48438.48	66.44	2657.56	71813213
4293.27	22.50	109076.25	113023.13	39.43	1752.28	71813313
5174.15	25.75	50232.50	40903.60	102.47	3979.58	71812113
3544.79	25.25	40186.00	18298.98	87.56	3467.61	71813113
3245.04	30.50	63149.44	95800.50	51.59	1691.50	71812213
1772.47	28.00	40186.00	27986.67	42.16	1505.61	71811233
3594.64	24.75	81807.19	54896.94	41.82	1689.53	71811333
4456.08	18.50	58556.75	41980.01	72.11	3897.61	71812133
3348.08	37.00	44491.64	21528.21	79.08	2137.40	71811123
5138.62	28.70	51667.71	49514.88	106.56	3713.03	71813223
7014.57	21.55	116252.31	136704.13	63.34	2939.02	71812323

Table C-6. Minneola 1981 plot data.

Yield (kg/ha)	Wt 1000 seeds(g)	Heads/ ha	Stand count (pl/ha)	Head wt (g)	Seeds/ panicle	H P D R
5213.03	21.25	51667.71	36597.96	98.37	4629.02	63812221
6318.73	21.25	87548.06	91494.88	71.08	3344.80	63812321
7163.33	25.50	103335.38	46285.66	68.73	2695.32	63813221
4501.24	20.00	88983.25	85036.44	49.43	2471.37	63812331
4459.28	18.50	33009.93	24757.44	131.27	7095.41	63813131
4002.96	24.00	94724.13	39827.19	41.62	1734.03	63811331
6425.86	26.00	93288.88	29063.09	68.45	2632.66	63813111
5835.73	22.00	107641.06	54896.94	53.87	2448.85	63813211
5529.21	25.00	94724.13	59202.58	58.47	2338.79	63812211
5317.19	26.50	173660.81	137780.56	30.39	1146.86	63812311
6389.43	22.25	146391.81	124863.63	43.62	1960.43	63813311

5000.27	33.25	73195.88	23681.03	67.65	2034.73	63811111
4554.80	18.25	111946.69	13993.34	39.58	2168.74	63812131
4324.86	21.50	129169.25	21528.21	32.79	1525.06	63811131
4411.02	18.50	129169.25	68890.25	33.29	1799.64	63813331
6447.27	27.00	76066.31	17222.57	84.80	3140.88	63813121
5012.53	33.75	64584.65	10764.10	75.67	2241.97	63811121
4631.53	27.50	80372.00	31215.91	56.75	2063.64	63811221
6432.39	27.75	109076.25	68890.25	57.94	2088.10	63811321
6504.51	23.00	109076.25	95800.50	57.94	2519.34	63813321
7054.46	24.50	71043.13	29063.09	97.68	3986.89	63812121
3315.67	18.00	67455.06	30139.49	48.30	2683.21	63812231
4424.67	22.75	117687.56	33368.73	36.82	1618.39	63811231
4549.75	18.00	109076.25	26910.27	40.62	2256.72	63813231
5281.28	31.00	91853.69	43056.42	56.75	1830.65	63811211
6554.99	27.00	81807.19	32292.31	80.45	2979.47	63812111
5495.39	29.00	129169.25	62431.82	42.37	1461.15	63811311
5158.28	22.25	99029.75	21528.21	50.33	2262.24	63813112
4312.89	32.50	57408.57	19375.39	74.91	2304.92	63811112
5495.39	25.50	97594.56	73195.88	56.08	2199.31	63812212
3233.00	17.50	91853.69	16146.16	34.05	1945.71	63813132
6115.29	22.50	155003.13	17222.57	38.46	1709.50	63811132
4713.53	18.25	104770.63	68890.25	44.16	2419.52	63813332
4713.53	27.75	68890.25	51667.71	67.15	2419.97	63811322
5747.70	21.75	97594.56	77501.56	57.42	2639.89	63813322
5974.89	30.75	68890.25	39827.19	85.13	2768.29	63811222
5688.86	25.50	55973.36	22604.62	99.53	3903.17	63813122
5722.13	21.00	64584.64	40903.60	86.76	4131.64	63812222
6429.31	21.00	91853.69	78577.94	69.16	3293.53	63812322
5480.37	18.00	120558.00	13993.34	44.32	2462.17	63812132
4561.26	18.00	106779.94	41980.01	41.74	2318.82	63812232
4504.25	18.50	143521.44	34445.14	30.87	1668.76	63813232
5476.65	26.50	144956.63	122710.81	37.76	1424.85	63812312
5489.14	28.50	84677.63	44132.84	64.64	2267.97	63811212
4852.18	30.00	104770.63	59202.58	46.02	1534.06	63811312
5126.05	24.50	61714.21	33368.73	82.35	3361.37	63812112
5867.84	23.75	109076.25	62431.82	53.76	2263.71	63813212
6142.61	23.50	121993.19	94724.13	50.21	2136.47	63812312
10292.40	18.25	177966.56	57049.76	56.38	3089.53	63812332
5110.00	22.25	146391.88	37674.37	34.18	1536.34	63811232
2767.43	24.00	74631.13	9687.70	36.23	1509.69	63811332
6662.89	24.50	99029.75	38750.78	66.78	2725.88	63813222
5954.82	21.50	55112.24	19375.39	106.41	4949.13	63812122
4808.07	32.25	68890.25	20451.80	68.81	2133.62	63811122
6026.86	21.50	64584.64	66737.44	92.31	4293.64	63812223
6830.20	22.75	48797.29	18298.98	140.21	6162.89	63812123
6014.22	28.50	100464.94	71043.06	59.02	2070.88	63811323
4349.03	21.50	117687.56	58126.18	35.99	1673.85	63812133
5402.89	19.75	116252.38	41980.01	45.82	2320.02	63813233
3701.02	18.00	71760.69	20451.80	50.39	2799.67	63812233
6170.56	26.00	84677.63	24757.44	72.33	2782.01	63813113
3788.34	25.50	101900.19	65661.00	36.45	1429.33	63811313
4008.84	28.50	70325.44	44132.84	56.52	1983.10	63811213
5455.69	23.75	129169.25	97953.38	40.86	1720.42	63813313
5926.27	25.50	101900.19	57049.76	58.19	2281.91	63813213
5796.03	26.25	78936.75	36597.96	73.47	2798.68	63812113
4697.69	19.50	121993.19	66737.44	37.92	1944.73	63813333
5077.02	23.75	132913.31	19375.39	37.41	1575.03	63811133
3992.18	22.25	97594.56	34445.14	40.06	1800.40	63811233
5644.37	26.50	60279.01	19375.39	92.42	3487.60	63813123
3605.01	31.00	60279.01	17222.57	58.37	1882.95	63811123

6087.15	22.75	83242.38	69966.69	72.01	3165.44	63813323
5782.91	21.75	83242.38	74272.31	68.49	3149.03	63812323
5005.92	26.75	48797.28	31215.91	101.48	3793.73	63813223
5134.75	30.50	71760.69	35521.55	69.92	2292.33	63811223
5236.23	17.75	129169.25	95800.50	39.35	2216.71	63812333
5268.12	21.75	129169.25	53820.54	39.85	1832.23	63811333
5186.27	16.75	109076.25	11840.52	46.00	2746.11	63813133
6512.39	25.75	114817.13	71043.06	56.75	2203.88	63812213
6163.58	25.25	130604.50	106564.63	46.90	1857.30	63812313
3717.71	29.50	66019.81	20451.80	55.27	1873.54	63811113

Note: H (hybrid), P (population or rate), D (date), and R (replicate or block) for tables C-1 to C-6.

Table C-7. JULIAN DATE CALENDAR

(PERPETUAL)

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Day
1	001	032	060	091	121	152	182	213	244	274	305	335	1
2	002	033	061	092	122	153	183	214	245	275	306	336	2
3	003	034	062	093	123	154	184	215	246	276	307	337	3
4	004	035	063	094	124	155	185	216	247	277	308	338	4
5	005	036	064	095	125	156	186	217	248	278	309	339	5
6	006	037	065	096	126	157	187	218	249	279	310	340	6
7	007	038	066	097	127	158	188	219	250	280	311	341	7
8	008	039	067	098	128	159	189	220	251	281	312	342	8
9	009	040	068	099	129	160	190	221	252	282	313	343	9
10	010	041	069	100	130	161	191	222	253	283	314	344	10
11	011	042	070	101	131	162	192	223	254	284	315	345	11
12	012	043	071	102	132	163	193	224	255	285	316	346	12
13	013	044	072	103	133	164	194	225	256	286	317	347	13
14	014	045	073	104	134	165	195	226	257	287	318	348	14
15	015	046	074	105	135	166	196	227	258	288	319	349	15
16	016	047	075	106	136	167	197	228	259	289	320	350	16
17	017	048	076	107	137	168	198	229	260	290	321	351	17
18	018	049	077	108	138	169	199	230	261	291	322	352	18
19	019	050	078	109	139	170	200	231	262	292	323	353	19
20	020	051	079	110	140	171	201	232	263	293	324	354	20
21	021	052	080	111	141	172	202	233	264	294	325	355	21
22	022	053	081	112	142	173	203	234	265	295	326	356	22
23	023	054	082	113	143	174	204	235	266	296	327	357	23
24	024	055	083	114	144	175	205	236	267	297	328	358	24
25	025	056	084	115	145	176	206	237	268	298	329	359	25
26	026	057	085	116	146	177	207	238	269	299	330	360	26
27	027	058	086	117	147	178	208	239	270	300	331	361	27
28	028	059	087	118	148	179	209	240	271	301	332	362	28
29	029		088	119	149	180	210	241	272	302	333	363	29
30	030		089	120	150	181	211	242	273	303	334	364	30
31	031		090		151		212	243		304		365	31

MODELING RATE OF PLANTING, DATE OF PLANTING AND HYBRID MATURITY EFFECTS ON YIELD OF GRAIN SORGHUM (*SORGHUM BICOLOR*, (L.) MOENCH)

by

Daniel Myron Baker

B.S., Kansas State University, 1978

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the requirements
for the degree

MASTER OF SCIENCE

Department of Agronomy

Kansas State University

Manhattan, Kansas

1982

Grain sorghum rate of planting, date of planting, and hybrid maturity affect the yield in a growing season and therefore, management decisions in sorghum production. One common management problem in Kansas regards replanting.

Any decision to replant an established stand of grain sorghum should involve a knowledge of optimum yield based on rate, date, and maturity. To develop optimum yield data from actual studies alone is difficult; size of experiment and number of years and locations become a practical limitation.

An alternative is to use a simulation model, tested and refined with actual data from diverse locations. When the model is suitable, optimum yield curves can be developed over a range of actual climatic conditions by location. Then replant guidelines can be devised.

The objectives of this study were: to determine the effects of rate of planting, date of planting, and hybrid maturity on yield of grain sorghum; to model these effects using the physiological growth model SORFG; to determine how closely the model response approximates the actual response, and if the model might be used to develop replant guidelines; to determine areas for improvement in SORFG.

Data to test SORFG were compiled from six locations in Kansas, from 1980 to 1981. Three rates of planting (low, middle, high), three dates of planting (early to late), and three hybrid maturities (early, medium, late) were used.

SORFG was modified by the addition of a tiller step, completion of the grain fill period based on heat unit accumulation, and dry matter production halted at frost.

The years of 1980 and 1981 were climatic opposites. High temperature and moisture stress affected locations in 1980. Generally, favorable conditions prevailed at most locations in 1981.

Actual yields under favorable conditions of 1981 show medium and late hybrid maturities gave greater yields than the early maturity hybrid. Increasing population increased yield (Powhattan, 1981), and had no significant effect on yield (St. John and Minneola, 1981). Date effects were not established.

Actual yields from locations which encountered stress during the growing season (Manhattan and Hutchinson, 1980; Parsons, 1981) show a trend toward a medium maturity hybrid yield advantage. Optimum population for maximum yield was lower than in favorable years. Evidence indicates that optimum population varies for hybrid maturities under stress. Date effects are inconclusive, however, early and recommended dates of planting appear to be most affected by stress. Yield component analysis indicates number of heads and number of seeds per panicle the major determining factors of yield in grain sorghum.

Model yield results were variable. SORGF modeled rate response well. Generally date response was inconsistent and early maturity hybrid yields were over modeled. At this time SORGF does not appear ready for use in development of replant guidelines. Some possible areas for improvement regard the inclusion of high temperature stress effects on yield, a tiller subroutine, and the modeling of yield components (seed weight, and number of seeds per panicle).